Draft Barred Owl Management Strategy

U.S. Fish and Wildlife Service
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Contents

1. Purpose and Use of the Barred Owl Management Strategy

The 2011 Northern Spotted Owl Recovery Plan (Recovery Plan) identified barred owls as one of the two primary threats to the survival and recovery of northern spotted owls, habitat loss being the other (USFWS 2011, pp. II-4, III-62). The Recovery Plan included barred owl specific Recovery Actions, including Recovery Action 30: Manage to reduce the negative effects of barred owls on spotted owls so that Recovery Criterion 1 can be met. This included implementing the results of research to adaptively manage the effects of barred owls to meet Recovery Criterion 1. Recovery Criterion 1 focuses on stable spotted owl population trends: "The overall population trend of spotted owls throughout the range is stable or increasing over 10 years, as measured by a statistically reliable monitoring effort." The U.S. Fish and Wildlife Service (Service) chose to begin implementation of Recovery Action 30 through the development of this Barred Owl Management Strategy (Strategy). This does not limit others from implementing Recovery Action 30 thorough other efforts.

California spotted owls were proposed for listing in February 2023. Barred owls are still relatively low in numbers in the Sierra Nevada, though they have been detected as far south as the Sequoia National Forest. A self-sustaining barred owl population was established in the northern Sierra Nevada, but was effectively removed under a scientific take permit. While barred owls have not yet reached levels where they are having population-level impacts on California spotted owls, the potential for expansion of the barred owl range and populations into the subspecies range remains very high. In the proposed listing, the Service considered the barred owl to represent a significant threat to the persistence of California spotted owls (USFWS 2023, p. 11619).

The Strategy is focused on addressing the threat to northern and California spotted owl survival and recovery from invasive barred owl competition by providing a comprehensive management approach for reducing barred owl impacts.

The Strategy is specific to barred owl management. The Strategy does not address spotted owl habitat or other spotted owl conservation issues, including those addressed under other conservation efforts, management planning, or legal requirements. The Strategy is not a replacement for, and would not result in any change in, northern spotted owl designated critical habitat, nor does it have any effect on Federal agency consultations regarding the northern spotted owl although, as discussed further below, it could be utilized by Federal agencies in various ways under ESA section 7. While the Strategy is the Service's effort at implementing Recovery Action 30, it does not serve as a replacement for, or result in changes in, the Northern Spotted Owl Recovery Plan.

The Strategy can be applied to barred owl management in forested areas managed across all types of land ownerships, but is not a replacement for, and would not result in any change in, management as included in current land use plans or agreements, and does not make any changes to existing plans or agreements. The actions described were designed to be implemented in concert with existing land management requirements.

In terms of the role of the Strategy in relation to section 7 of the ESA, the Service intends the Strategy and associated MBTA permit to be a voluntary tool in efforts to reduce the impact of the barred owl for the conservation of the northern spotted owl. The Service encourages Federal agencies to implement the Strategy as part of their ESA section 7(a)(1) conservation planning as the Service believes this is the most effective and comprehensive way to utilize the Strategy for the benefit to the northern spotted owl and other listed species impacted by the invasive barred owl. This does not preclude Federal agencies from choosing to implement the Strategy as part of proposed actions considered in consultation with the Service under section 7(a)(2), nor does it preclude the Service from recommending implementation of the Strategy in a particular area as a non-binding conservation recommendation where warranted.

The Strategy is the Service's recommended approach to implementation of Recovery Action 30 and the management of non-native barred owls for the conservation of native spotted owls, but it is not the only possible approach. This Strategy does not prevent other entities from choosing to develop their own barred owl management programs and applying for their own required permits. The Strategy also does not limit ongoing or future barred owl research.

2. Spotted Owl

2.1 Biology

Spotted owls are a medium-sized forest owl native to western North America. Of the three identified subspecies, two are the subject of this action, the northern spotted owl *(Strix occidentalis caurina)* and the California spotted owl *(Strix occidentalis occidentalis)* (Map 1). Northern spotted owls were historically found in the western forests of southwest British Columbia through Washington and Oregon to northwestern California. The California spotted owl is found in the Sierra Nevada Mountains, the mountains of central coastal California, and the peninsular and transverse ranges of southern California. There is a distinct geographic separation between the Sierra Nevada and Coastal-Southern California populations (Verner et al. 1992, p. 4).

Map 1. Range of northern and California spotted owls.

Both subspecies select structurally diverse forests with larger trees and moderate to dense canopy closure for nesting, with more variable habitat acceptable for

foraging. Their primary prey include flying squirrels (*Glaucomys* spp.), woodrats (*Neotoma* spp.), lagomorphs (*Lepus americanus, Sylvilagus bachmani*), and red tree voles (*Arborimus longicaudus*).

2.2 Management Status

The U.S. Fish and Wildlife Service (Service) listed the northern spotted owl as a threatened species under the ESA on June 26, 1990 (55 FR 26114). The primary reason for listing the northern spotted owl was the widespread loss of their habitat across the range and the inadequacy of existing regulatory mechanisms to conserve the subspecies. On December 15, 2020, we published a 12-month finding (85 FR 81144), in which we announced that reclassification of the northern spotted owl from a threatened species to an endangered species is warranted but precluded by higher-priority actions. On June 27, 2023, we affirmed that reclassification of the northern spotted owl to endangered is warranted but precluded; proposed rules to reclassify threatened species to endangered are a lower priority than listing currently unprotected species (i.e., candidate species), since species like the northern spotted owl currently listed as threatened are already afforded the protection of the ESA and implementing regulations. (88 FR 41560, 41578). The primary stressors affecting the northern spotted owl's current biological status include lag effects of past habitat loss, continued timber harvest, wildfire, and incursion of the nonnative northern barred owl (*Strix varia varia*), which is currently the stressor with the largest negative impact on northern spotted owls (88 FR 41578). Critical habitat for the northern spotted owl was last revised on November 10, 2021 (86 FR 62606). The northern spotted owl is listed as Endangered by the State of Washington and Threatened by the States of Oregon and California.

The Service proposed the California spotted owl for listing on February 23, 2023 (88 FR 11600). The Sierra Nevada Distinct Population Segment (DPS) of the California spotted owl is proposed for listing as threatened due to the impact of high-severity fire, tree mortality, drought, and barred owls. The Coastal-Southern California DPS is proposed for listing as endangered due to continuing population declines, fragmented habitat, risk of high severity fire, tree mortality, and drought. The subspecies is listed as a species of special concern by the State of California.

2.3 Past and Ongoing Spotted Owl Management

Northern spotted owls have been the focus of management direction and efforts since long before their listing, starting with the Oregon Spotted Owl Management Plan in 1977. This expanded into a two-state regional effort with Washington in 1978 (Thomas et al. 1990, pp. 17-18, 51-58). In 1982, Region 5 of the U.S. Forest Service (Forest Service) developed regional guidelines for management of northern spotted owls in California. Management continued to evolve, culminating with the Northwest Forest Plan for Federal lands in 1994 (USDA and USDI 1994). The Northwest Forest Plan was designed, in part, to arrest the downward trends in northern spotted owl populations by providing for late successional/old growth over the long term, through the maintenance and restoration of habitat conditions necessary to support viable populations on federally-administered lands throughout the range of the subspecies. This remains the management approach for Forest Service and Bureau of Land Management (BLM) lands in California within the northern spotted owl range. BLM lands in Oregon are managed under

Southwestern Oregon, and Northwestern and Coastal Oregon Resource Management Plans (RMP), which have similar land allocations as the Northwest Forest Plan.

All of these plans focus on management of northern spotted owl habitat. These plans significantly reduced the loss of forest habitat to timber harvest on Federal lands. Initially, the Northwest Forest Plan appeared to be resulting in improvements in spotted owl population dynamics. The 5-year demography analyses appeared to show a slow improvement in the rate of spotted owl population decline until around 2008, after which the rate of decline again accelerated (Forsman et al. 1996; Franklin et al. 1999, Anthony et al. 2006, Forsman et al. 2011, Dugger et al. 2016, Franklin et al. 2021). This decline corresponds with the continued invasion and population expansion of barred owls. Habitat protection and management remains an important component of the conservation and recovery of the northern spotted owl. Conservation of spotted owls under land management plans on National Forests and BLM Districts provides highly valuable contributions to the habitat component of the recovery of spotted owls. Only the recent BLM Southwestern Oregon, and Northwestern and Coastal Oregon RMPs include provisions for barred owl management.

State lands are managed under a variety of plans. In Washington, the Department of Natural Resources completed the State Trust Lands Habitat Conservation Plan (HCP) in 1997 (amended in 2019). This ecosystem-based forest management plan addresses forest management and other activities on the State trust lands it manages for revenue for the respective Trusts while developing and protecting habitat for spotted owls. In Oregon, the Oregon Department of Forestry (ODF) lands are managed under the 2010 Northwest Oregon Forest Management Plan implementation plans. ODF is currently preparing the Western Oregon State Forests HCP and a companion Forest Management Plan is in development and will replace the 2010 Northwest Oregon FMP. The draft HCP includes designated conservation areas that protect some spotted owl habitat. The Oregon Department of State Lands is developing an HCP for the Elliott State Research Forest in Coos and Douglas Counties. The draft HCP includes management activities for the conservation of rare species and their habitat on the forest. In California, the Management Plan for the Jackson State Demonstration Forest, managed by the California Department of Forestry and Fire Protection, includes protection of northern spotted owl sites. None of the existing plans provide specific barred owl management provisions, though some of the draft HCPs include potential barred owl management.

Each State has regulations for the harvest of timber on private lands. They include varying levels of protection for active, and sometimes historic, spotted owl sites. Within each State, there are HCPs developed with private and non-federal landowners which cover actions related to northern spotted owls. Each one is specific to the conditions and capabilities of the permittee. Most include some level of forest management that support one or more aspects of spotted owl biology. Only two, the Green Diamond Resources Company and Sierra Pacific Industries HCPs include barred owl removal research as a component of the plans.

California spotted owls are managed under a variety of Federal land use plans. The Forest Service has been a part of ongoing conservation efforts for California spotted owls, including the 2004 Sierra Nevada Forest Plan Amendment, the 2005 Southern California National Forest Land and Resource Management Plans, the 2015 Lake Tahoe Basin Management Unit Land and

Resource Management Plan, the 2019 Inyo National Forest Plan, the 2023 Sierra National Forest Land Management Plan, and the 2023 Sequoia National Forest Land Management Plan. The main goals of these conservation efforts across all National Forests are the protection and management of California spotted owl activity centers and home range core areas, increasing the frequency of large trees on the landscape, and increasing structural habitat diversity. California BLM lands within the range of the California spotted owl are managed under a variety of RMPs. The Redding RMP (1993) and South Coast RMP (1994) do not mention California spotted owls specifically, but as a BLM sensitive species, the general provisions are to minimize the decline and promote the enhancement of Special Status Species, including the California spotted owl. The Eagle Lake and Sierra RMPs were completed in 2008. All contain direction to manage suitable habitat to maintain or increase forest characteristics for California spotted owls, as does the Bakersfield RMP for the Kaweah Area of Critical Environmental Concern. The Sierra Pacific Industries HCP includes lands within the California spotted owl range and the commitment to address barred owls through the implementation of several barred owl studies that include removal of barred owls.

The primary reason for listing the northern spotted owl was the widespread loss of their habitat across the range and the inadequacy of existing regulatory mechanisms to conserve the spotted owl. This led to the focus on habitat management for northern spotted owls. With the exception of the Green Diamond Resources Company and Sierra Pacific Industries HCPs, spotted owl management to date has been focused on habitat management.

3. Barred Owl

3.1 Biology

Barred owls are a medium sized forest owl native to eastern North America which were historically found east of the Great Plains and south of the 49th parallel (Livezey 2009a p. 53), with a subspecies in central Mexico. They began to expand their range around 1900, concurrent with European settlement and facilitated by the subsequent human-caused changes to the Great Plains and northern boreal forest. Barred owls arrived in the spotted owl range in the Pacific Northwest in the early 1970s, establishing populations in northern Washington in the early 1980s. They continue to spread southward in the Cascades and coastal mountains, building dense populations behind the invasion front (Map 2) (See Section 3.3 and Appendix 1 for more details).

In the West, barred owls prefer the same older, structurally diverse forest type selected by spotted owls, though barred owls will utilize a wider range of forested habitat types than spotted owls. This includes wooded urban areas and large tracts of second-growth forests.

Barred owls are generalist predators, eating a wide variety of prey items. Barred owls consume the same nocturnal arboreal rodents that are the focus of the spotted owls' diet, and in large quantities given their dense populations (Baumbusch 2023 entire, Kryshak et al. 2022 entire, Woods et al. 2020 entire). However, they also consume numerous other species, including other mammals, amphibians, insects, crayfish, and mollusks. Because of their adaptability to a

wide variety of forested habitats and ability to eat a wide variety of prey, barred owls can develop dense populations.

3.2 Management Status

The barred owl is protected under the Migratory Bird Treaty Act (MBTA; 16 U.S.C. 793 et seq.), which prohibits take (as defined at 50 CFR 10.12) of protected migratory bird species unless authorized by the Service in accordance with the MBTA and implementing regulations. Implementation of the Strategy would require a permit or other authorization under the MBTA. Barred owls are not listed or special status species in Washington, Oregon, or California.

3.3 The Western Invasion of Barred Owls

Barred owl populations began to expand westward in the early 1900s (Livezey 2009a, p. 50). Barred and spotted owl are both forest owls, whose ranges were separated by the relatively treeless Great Plains and harsh conditions in the Northern Boreal Forest, both likely formidable barriers to expansion (Livezey 2009b, entire). While the mechanism and route that facilitated westward expansion are not well documented, theories point to potential changes in the conditions on the Great Plains and Northern Boreal Forest as probable explanations.

Livezey (2009b, entire), using strength of evidence analysis, concluded that the historical lack of trees in the Great Plains acted as a barrier to the range expansion and that increases in forest caused by the anthropogenic impact of European settlement enabled the westward extension of the barred owl range. These include anthropogenic impacts such as fire exclusion and suppression, bison and beaver extirpation, deer and elk overhunting, establishment of riparian forests, and extensive planting of trees and shelterbelts in the northern Great Plains and southern edges of Northern Boreal Forests, all of which may have contributed to tree and forest expansion. In addition, Northern Boreal Forests experienced a continued increase in temperatures as CO_2 levels in the atmosphere rose, with short but pronounced warming periods in the early to mid-1900s (Campbell et al. 1993 entire; Gullett and Skinner 1992 entire; Schindler et al. 1998 entire). (For more detail, see Appendix 1).

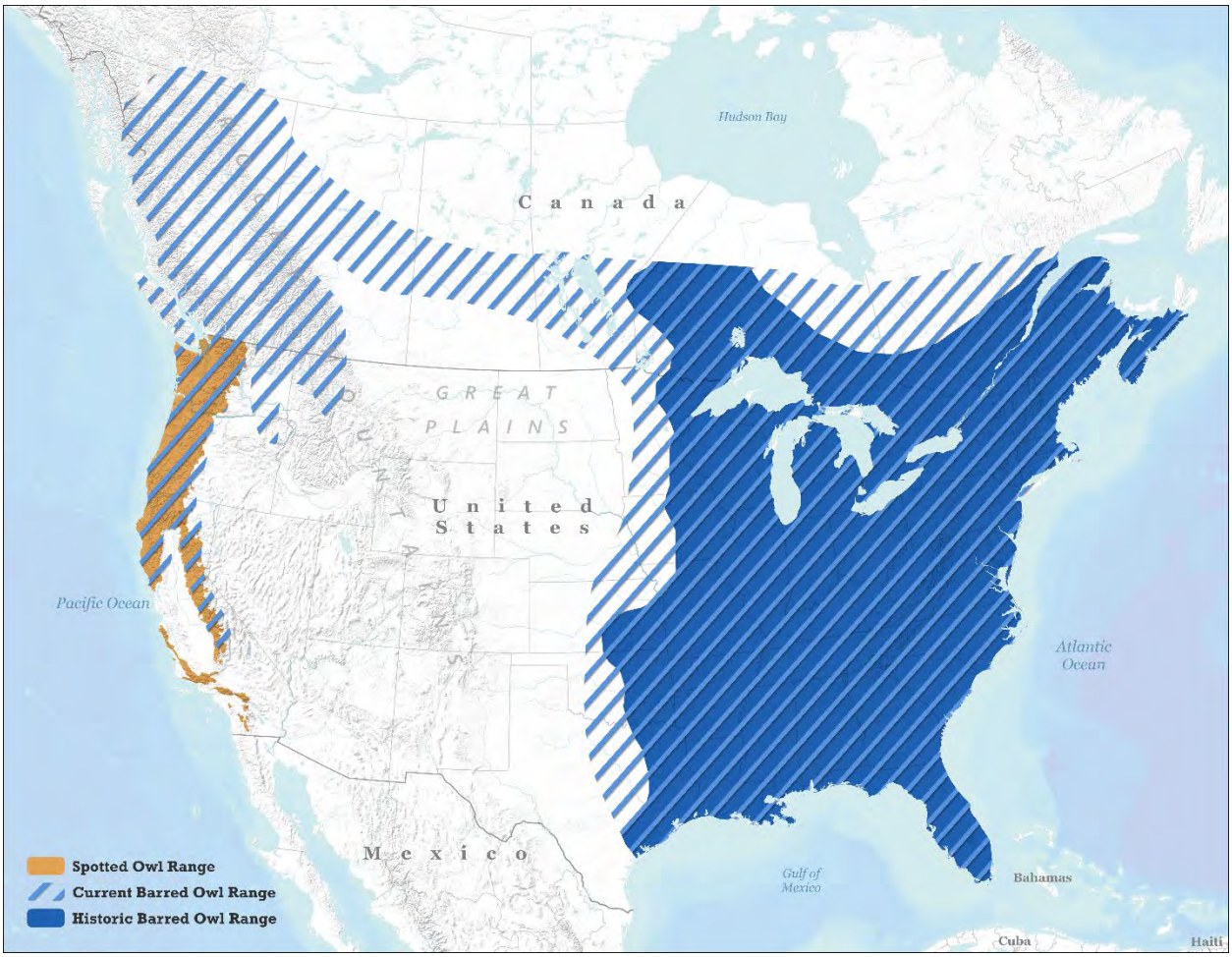
3.4 Current Range of the Barred Owl in the West

The first record of barred owls within the range of the northern spotted owl was in 1959 in British Columbia, Canada. Barred owls established populations, subsequently spreading south (Grant 1966, p. 39). Barred owls were first located in western Washington within the range of the spotted owl in 1972 and the first breeding record was 1974 (Smith et al. 1997, p. 230). The first record in Oregon was from 1974 and California in 1976 (Livezey 2009a, p. 40).

Barred owls are now found throughout the range of the northern spotted owl and have invaded the range of the California spotted owl as far south as the Sequoia National Forest in the southern Sierra Nevada. Barred owls have not been documented in the Coastal-Southern California population of California spotted owls yet but have been found south of the northern spotted owl range along the central coast (Map 2).

Barred owl populations expand behind the invasion front and generally occur in dense populations where they have been in place for the longest period and habitat is readily available. This includes Washington and northern Oregon, with the densest documented populations occurring in the Oregon Coast Ranges. Barred owl densities are generally lower in the southern provinces and very few individuals are found in the far southern portion of the northern spotted owl range, Marin and Sonoma Counties, California.

Map 2. Historic and current range of barred owls and overlap with northern and California spotted owl range.



Barred owls established a population in the northern Sierra Nevada by 2017, from which 65 barred and hybrid owls were removed during an experiment between 2018 and 2020. Removal of detected barred owls continues as part of ongoing research in the Sierra Nevada at a rate of 10 to 15 barred owls per year (2020 to 2022). At the current time, most barred owl detections appear to be dispersers that are detected one time and then are not located on subsequent follow-up surveys.

4. Spotted Owl Population Condition

Northern spotted owl populations have been tracked on eight Federal and three non-federal demography study areas for over 25 years. The most recent demography analysis (Franklin et al. 2021, entire) used data from 1993 through 2018. Spotted owl populations on all study areas were declining, at rates of between 2 and 9 percent annually. The highest annual rates of decline were in the Olympic and Cle Elum study areas in Washington with over 8 percent annual decline and the Oregon Coast Ranges study area in Oregon with over 7 percent annual decline. The lowest rates of decline were in the Hoopa and Northwest California Study areas. (Franklin et al. 2021, pp. 11-12; Franklin pers. comm. 2023).

Another way to describe the cumulative effect of population declines is to analyze the realized population change. As noted in Franklin et al. (2021, p. 12) this provides a depiction of the cumulative consequences of the annual estimates of population change, expressed relative to an initial population in 1995. The Washington study areas declined by 75 to over 80 percent over the period 1995 to 2017. In Oregon, all study areas declined by more than 60 percent, and some more than 75 percent. California study areas declined the least, but the Northwest California area declined by 50 percent, and the Green Diamond area by greater than 60 percent. Because the Hoopa study area results were truncated in 2012, the documented decline is limited to the period between 1995 and 2012, when the population declined about 30 percent. For perspective, only three study areas had more than 35 percent of their 1995 population level remaining by 2017 (Franklin et al. 2021, p. 13) and populations have continued to decline.

California spotted owl populations have been tracked on three National Forest and one National Park Service demography study areas for over 30 years in the Sierra Nevada, California. Additionally, a single demographic study of California spotted owls was conducted on the San Bernardino National Forest from 1987 to 1998, with opportunistic occupancy surveys conducted in subsequent years across multiple mountain ranges of southern California. Spotted owl populations on all National Forest study areas were declining, at annual rates of 3.3 percent on the Lassen National Forest, 1.5 percent on the Sierra National Forest, 3.1 percent on the Eldorado National Forest, and at a rate 8 percent for southern California (Keane et al. 2023, Peery et al. 2021, LaHaye et al. 2004). The Sequoia-Kings Canyon National Park study area had an increase of 1.9% from 1990 to 2012 (Keane et al. 2023). This latter study was unfunded from 2014 to 2016, surveys were reinitiated in 2017 with greater focus on occupancy surveys and additional time required to estimate a demographic trend.

Estimates of realized population change provide an additional approach to assess the cumulative effect of population declines by estimating the change in population size relative to the initial population at the start of the studies (Franklin et al. 2021). The Lassen, Eldorado and Sierra National Forest study areas declined by 41 to 45 percent over the study periods. The Sequoia-Kings Canyon National Park study area increased by 36 percent.

Population change can also be assessed by monitoring change in site or territory occupancy, that is, what proportion of territories or owl sites within a study area are occupied by owls over time. Territory occupancy on the Eldorado National Forest declined by 60 percent between 1990 and 2020 (Peery et al. 2021). Territory occupancy declined by 52 percent across multiple mountain

ranges in southern California (Tempel et al. 2022). Linking density estimates from the long-term demography study areas to occupancy estimates from bioregional-scale passive acoustic monitoring, Kelly et al. (2023) estimated that the Sierra Nevada spotted owl occupancy was between 30 to 42 percent and population size was estimated between 2218 and 2328 owls.

5. Barred Owl Impact on Spotted Owl Populations

Our understanding of the impact of barred owls on our native spotted owls has evolved over time. In 1990, at the time of listing, the Service stated that the long-term impact of barred owls on the northern spotted owl was unknown but of considerable concern (55 FR 26114). By 2004, the Service had identified competition from the invasive barred owl as a primary threat to northern spotted owl populations (USFWS 2004).

The Recovery Plan (USFWS 2011, entire) identified past habitat loss, current habitat loss, and competition from the recently arrived barred owl as the most pressing threats to the northern spotted owl (USFWS 2011, p. I-6.), identifying 10 recovery actions specific to barred owls. In the proposed listing of the California spotted owl, the Service similarly concluded ". . . barred owls are a significant threat to the persistence of California spotted owls, and we expect the magnitude of the threat to increase into the foreseeable future, particularly if management efforts are not continued" (88 FR 11619).

Franklin et al. (2021, p. 13) noted, "Since the last meta-analysis (Dugger et al., 2016), we found that [northern spotted owl] populations continued to experience dramatic declines on study areas distributed across the species' geographic range. Evidence that the presence of [barred owls] was a primary causative factor for those declines is stronger, and [barred owl] presence was found to negatively affect every demographic trait we estimated for [northern spotted owl]."

The mechanism for the negative impact of barred owls on spotted owls is a combination of interference competition, where barred owls exclude spotted owls from breeding territories, and exploitation competition for habitat and food (Gutiérrez et al., 2007, p. 189; Hamer et al., 2007, p. 763; Wiens et al., 2014, p. 38). Franklin et al. (2021, p. 15) noted "Our study provides range-wide evidence that the negative consequences of interspecific competition with [barred owl] have increasingly overwhelmed dwindling populations of [northern spotted owl] since the last meta-analysis reported by Dugger et al. (2016)." For more information, see Appendix 6 for excerpts from recent Service documents on the effect of invasive barred owls on northern and California spotted owls.

In recent years, barred owls have penetrated into the range of the California spotted owl in the Sierra Nevada Mountains, although their population remains low and scattered in most of the California spotted owl range at this time. A rapidly expanding population of barred owls was established in the northern Sierra Nevada by 2018 (Wood et al. 2020, p. 5). The bulk of those barred owls, and associated spotted x barred owl hybrids, were removed during a research study between 2018 and 2020 (Hofstadter et al. 2022, p. 5). While barred owls have not impacted California spotted owls to any significant degree to date, the potential for invasion is increasing as barred owl populations to the north expand. Barred owls are considered a significant threat to the persistence of California spotted owls, and we expect the magnitude of the threat to

increase into the foreseeable future (USFWS 2023, p. 11619). For more information, see Appendix 6 for excerpts from recent Service documents on the effect of invasive barred owls on northern and California spotted owls.

6. Barred Owls as an Invasive Species in the West

We evaluated the status of barred owls under Executive Order 13112 (Invasive Species) to determine if barred owls met the definition of an invasive species in the ranges of the northern and California spotted owl. A full description of this analysis is contained in Appendix 1.

We concluded that the barred owl in western North America meets the definition of an invasive species as defined in E.O. 13112 for the following reasons. The barred owl is an alien species, not native to the range of the northern and California spotted owls. Barred owls were introduced unintentionally through dissemination across the previous barrier to movement of this forest owl created by the generally treeless conditions of the Great Plains and harsh conditions of the Northern Boreal Forest. This movement was made possible by human-caused changes to the Great Plains and Northern Boreal Forest. Barred owls are causing significant environmental harm to northern spotted owls, a subspecies listed as threatened under the ESA, and are likely to cause significant harm to California spotted owls as barred owl populations continue to expand. They are also likely harming other species through predation or competition and are considered a risk to create a trophic cascade in some forest systems. In other words, the addition of barred owls to a new ecosystem has the potential to alter the food web in ways that could cause local extirpations of competitors or prey, and even affect fundamental ecosystem processes like the transfer of nutrients between fungi, plants, and animals (Holm et al. 2016).

7. Past and Ongoing Research Addressing Barred Owl Effects on Spotted Owls and Barred Owl Removal

Research on the potential effect of the non-native barred owl on native spotted owls, including removal experiments, has been ongoing since 1986. Hamer et al. (2007, entire) conducted some of the first studies looking at barred and spotted owls in areas of overlap in the northern Cascade Range of Washington from 1986 to 1989. This was the first study to document the exclusion of spotted owl from territories by barred owls. Kelly et al. (2003, entire) compiled historic data on barred and spotted owls in Oregon and examined data from demography study areas in Oregon and Washington through 1999. They documented that spotted owl site occupancy declined in the presence of barred owls. Olson et al. (2005, entire) also concluded that the increasing presence of barred owls on spotted owl sites would likely lead to further declines in spotted owl site occupancy. Wiens et al. (2014 entire) conducted similar work from 2007 to 2009 in the Oregon Coast Ranges. Their study found a negative effect of barred owls on movements, resource selection, and reproduction of spotted owls and a strong potential for both exploitation and interference competition between spotted owls and recently established barred owls. Several additional studies corroborated these conclusions, including but not limited to Gutiérrez et al. (2007, entire), Dugger et al. (2011, entire), and Yackulic et al. (2014, entire).

The spotted owl demographic meta-analyses have been conducted every five years since 1992. In the fourth analysis, Anthony et al. (2006, p. 32) found a weak negative effect of barred owls on spotted owl survival on a few of the study areas. Forsman et al. (2011, p. 70) found evidence of negative relationship between demographic rates of spotted owls and the presence of barred owls, on more of the study areas and stronger than reported by Anthony et al. (2006). Five years later, Dugger et al. (2016, pp. 98-99) identified barred owls as a primary influence negatively affecting life history traits, territory occupancy rates, and, ultimately, rates of population change in northern spotted owls. In the most recent demography analysis, Franklin et al. (2021, p. 13) noted that northern spotted owls continued to experience dramatic declines on all study areas. The evidence that barred owl presence is a primary causative factor in the declines was stronger than in past analyses and barred owl presence was found to negatively affect every demographic trait.

Several studies have investigated the effect of removing barred owl on spotted owls, starting with work by Lowell Diller on Green Diamond Resource Company lands in 2009 (Diller et al. 2016, entire). The ongoing demography study area was divided into treatment and control areas, and barred owls were removed from the treatment area through 2013. Following the initiation of barred owl removal, the rate of population change of northern spotted owls significantly increased in the treated areas with the mean rate greater than 1.0, suggesting a stable or increasing population, but declined steeply on the control area (Diller et al. 2016, p. 702). Seven northern spotted owl sites, occupied by barred owls prior to removal, were reoccupied by spotted owls within the year. Spotted owl survival rates recovered to rates similar to the early study period (circa 2009) on the treatment area, while they continued to decline on the control area.

In 2013, the Service initiated the Barred Owl Removal Experiment to implement Recovery Action 29 in the Recovery Plan – "Design and implement large-scale control experiments to assess the effects of barred owl removal on spotted owl site occupancy, reproduction, and survival" (USFWS 2011, p. III-65). Removal of barred owls began on the Hoopa Reservation in California in 2013. Study areas were added in Cle Elum (Washington) and the Oregon Coast Ranges (Oregon) in 2015, and Union/Myrtle (Klamath) (Oregon) in 2016. The removal of barred owls had a strong, positive effect on the survival of northern spotted owls and a positive, but weaker, effect on recruitment of spotted owls. The weaker effect of removals on recruitment was likely the result of limited availability of new recruits due to years of depressed reproduction in spotted owls. After removals, the estimated annual rate of spotted owl population change stabilized in areas with removals (0.2% decline per year), but continued to decline sharply in areas without removals (12.1% decline per year) (Wiens et al. 2021, pp. 1, 5).

Barred owls and barred x spotted owl hybrids established a rapidly growing population in the northern Sierra Nevada in the range of the California spotted owl by 2017 (Wood et al. 2020, p. 4). Barred owls were lethally removed starting in 2018. Sixty-five barred and hybrid owls were removed from this population (Hofstadter et al. 2022, entire). As a result, occupancy of spotted owl territories by barred owls decreased from 0.19 to 0.03. Fifteen of the 27 former spotted owl territories from which barred owls or hybrids were removed were reoccupied by spotted owls within one year. Recolonization of sites by barred owls was very low the year following removals.

There are several ongoing barred owl removal experiments in California, including additional research on the Green Diamond Resource Company lands (initiated 2020, anticipated duration five to ten years) and continued removal on the Hoopa Reservation. Sierra Pacific Industries initiated experimental removal on their lands in the northern and California spotted owl ranges in 2014 to provide additional scientific information to researchers studying genetics of the barred owl invasion (Sierra Pacific Industries 2020 p. 37).

8 Barred Owl Management Strategy

8.1 Background

In initiating the Strategy development, Service managers provided the following policy guidance:

1. The Strategy should be a Service decision and document. We would convene an intergovernmental interagency Core Team (Team) to develop the Strategy to ensure coordination and to develop a Strategy that met the needs of potential implementers to the maximum extent practicable. The Service would conduct NEPA compliance on the Strategy and would issue an MBTA permit for implementation if the Strategy met the general permit issuance criteria and requirements for issuance.

2. The Strategy should cover the ranges of both the northern and California spotted owls. Barred owls represent a threat to both subspecies and developing a coordinated strategy was important to addressing this threat.

3. The Strategy should be developed at a landscape level, considering all lands, Federal and non-federal. We would address conservation needs and management options across the landscape. The Strategy would not create any specific requirements for proactive actions, or limitations on non-federal lands other than those associated with any needed permitting for willing landowners. The Strategy would be focused on recommendations.

4. With the extensive range and different ownerships, elements of the Strategy would likely need to vary in space and time. Specific management options could vary by geographic area, as needed and appropriate. In addition, the Strategy could include temporal elements allowing the spread of application or implementation over an extended time frame.

Using this guidance, the Team developed goals for the development of the Strategy. The focus of this Strategy is to develop a framework within which effective management of the invasive barred owl can be efficiently implemented to reduce threats from barred owls to the northern and California spotted owl and contribute to their survival and recovery into the future. This included:

1. maintaining or enhancing spotted owl populations and distribution across their ranges sufficient to promote for conservation/recovery of each subspecies;

2. reducing the rate of loss of occupied spotted owl range resulting from barred owl competition; and

3. providing spotted owl habitat that is free of, or with reduced competition from, invasive barred owls.

The management direction and goals were incorporated into the following purpose and need statement for the Strategy:

> The purpose of this action is to reduce barred owl populations to improve the survival and recovery of northern spotted owls and to prevent declines in California spotted owls from barred owl competition. Relative to northern spotted owls, the purpose is to reduce barred owl populations within selected treatment areas in the short term and increase northern spotted owl populations in those treatment areas. Relative to the California spotted owl, the purpose is to limit the invasion of barred owls into the range of the subspecies and provide for a rapid response to reduce barred owl populations that may become established.
>
> The need for this action is that invasive barred owls compete with northern and California spotted owls. Competition from the invasive barred owl is a primary cause of the rapid and ongoing decline of northern spotted owl populations. Due to the rapidity of the decline, it is critical that we manage invasive barred owl populations to reduce their negative effect before northern spotted owls are extirpated from large portions of their native range. As stated in the recent northern spotted owl demographic meta-analysis: "[N]orthern spotted owl populations potentially face extirpation if the negative effects of barred owls are not ameliorated while maintaining northern spotted owl habitat across their range" (Franklin et al. 2021, p. 2). The Recovery Plan also emphasizes the need for action in Recovery Action 30: "Manage to reduce the negative effects of barred owls on northern spotted owls so that Recovery Criterion 1 can be met." Recovery Criterion 1 is to provide for a stable or increasing population trend of northern spotted owls throughout the range over 10 years (USFWS 2011, p. II-1). Therefore, the management strategy needs to provide for rapid implementation and result in swift reduction in barred owl numbers.
>
> California spotted owls face a similar risk from barred owl competition as barred owl populations continue to expand southward. While California spotted owls have not yet experienced substantial declines as a result of barred owl competition, the southward invasion of the barred owl has reached their range, and we expect additional impacts to California spotted owl populations would be inevitable without barred owl management. Invasive species are very difficult to remove once established. Therefore, the management strategy needs to focus on limiting the invasion of barred owls into the California spotted owl range. If barred owl populations do become established, the management strategy needs to provide for early intervention to prevent adverse effects of barred owls on California spotted owl populations.

8.2 General Elements and Considerations

As described in Section 1.0, the Strategy only addresses barred owl threats and management. It does not change underlying land management or result in changes to section 7 consultation requirements under the ESA. It does not modify northern spotted owl critical habitat, the Recovery Plan, or any land designations. It is complementary to, and does not replace, the management of spotted owl habitat.

As described in the guidance from managers above, the Strategy is a set of recommendations for the management of barred owls. The Strategy provides a management framework for entities (Federal, State, or Tribal government agencies, or private entities) that choose to implement this barred owl management. Nothing in the Strategy requires any entity to implement barred owl management; rather, it outlines management approaches, geographic areas, and other components to guide management actions by interested and willing landowners or land managers.

The Strategy does not create any specific requirements for proactive actions, nor does it place any additional limitations on Federal or non-federal lands. However, any actions that are conducted under this Strategy and associated MBTA permit must fit within the description of the Strategy and follow the protocol for barred owl removal and required monitoring. Management of barred owls described in the Strategy can only be conducted on lands of willing landowners or land managers. Presence of an area within the mapped or described area does not convey any additional rights to the implementing entities.

Because barred owls are a protected species under the MBTA, implementation of actions described in the Strategy would require an MBTA permit from the Service's Migratory Bird Program. The Service will apply for a Special Purpose MBTA permit for the implementation of actions under the Strategy. If issued, the Service may designate other qualifying entities, governmental or non-governmental to implement actions consistent with the Service's permit. Entities may also choose to apply for an MBTA Special Purpose permit of their own using the Strategy.

8.3 Barred Owl Population Management

Removal methods: Under the Strategy, management of barred owl populations would be accomplished by lethally removing barred owls, thereby reducing or eliminating barred owl populations. Management may include removal of spotted x barred owl hybrids, though the removal protocol for hybrids is more restrictive to reduce risk of accidentally injuring or killing a spotted owl. Hybrids represent the same impact to spotted owls as genetically pure barred owls, displacing them from their territories.

Removal methods are designed to:

- Minimize the number of barred owls in the management area. While we do not anticipate removal of all barred owls in a management area, we do anticipate reducing and maintaining barred owl populations at levels lower than would occur without management, and that these lower levels will allow for increased spotted owl survival and recruitment.
- Be as humane and quick as possible within the confines of the method.
- Pose little to no risk of injury to nontarget species, including the spotted owl.

We considered potential approaches to reducing barred owl populations or their effect on spotted owls. Only those that result in the removal of barred owls from the landscape meet the purpose and need for the Strategy (Section 9.1). Lethal removal of barred owls from identified management areas is the only population reduction method that is proven to work in reducing barred owl populations, thereby improving spotted owl population response (Diller et al. 2016, Wiens et al. 2020, Hofstadter et al. 2022). Therefore, barred owl management under the Strategy is focused on lethal removal of barred owls.

Lethal removal is accomplished by attracting the barred owls with recorded calls and shooting birds that respond and approach closely. The protocol is described in Appendix 2. It is based on the experience gathered from several previous barred owl removal studies. The protocol is designed to ensure a quick, humane kill, minimize the potential for non-fatal injury to barred owls, and strongly reduce the potential for non-target species injury or death. In areas where firearm use is inadvisable, the protocol includes an option to capture and euthanize barred owls. Basic documentation and information will be required for all removals to ensure application of the protocol and to provide information for future modifications to this protocol.

All actions taken under the auspices of the Strategy must conform to the protocol in Appendix 2 and any additional conditions of the issued MBTA permit. Entities implementing barred owl removal under this Strategy will be required to meet the requirements of training for removal specialists described in Appendix 2, abide by the protocol for removal, and provide all required reports.

We will continue to pursue new information and we will consider modifying the protocol as needed to ensure removal is as humane as possible.

Duration of Barred Owl Management Actions: Barred owl management is most effective when continued for an extended time period. Based on removal experiments, continued removal over several years resulted in a continuing decline in barred owl density over that time and allowed spotted owls to respond to the newly available habitat.

Where barred owl populations are well established, a single year of removal is less likely to lead to improvements in spotted owl populations. Therefore, we recommend, but do not require, that anyone implementing barred owl removal do so with the intent to continue the effort for at least five years. We are not requiring a specific commitment, knowing the potential for changes in funding and personnel, but the intent to try to continue funding and removal actions is important. In cases where the management area is affected by catastrophic events, such as wildfire, or other

factors make continuation of a specific area unrealistic, the area may be reconfigured, or the effort moved to a location unaffected by the event.

In areas at the leading edge of the invasion of barred owls, where few territorial barred owls exist on the landscape, a single year of removal, or removal conducted only when and where barred owls are located, could have significant value in slowing the invasion. In this case, we still recommend continued monitoring and additional removal if barred owls recolonize that area. Even a multiple year effort may not involve removal every year, but only when barred owls reoccupy the area. We include monitoring for barred owl recolonization as a component of the management action.

8.4 Northern Spotted Owl Range

The purpose of the Strategy in the northern spotted owl range is to stop or slow spotted owl population declines from barred owls within selected treatment areas in the short term and increase spotted owl populations in the intermediate term. Competition from the invasive barred owl is a primary cause of the recent rapid and ongoing decline of northern spotted owl populations. Due to the rapidity of the decline, it is critical that we manage invasive barred owl populations to reduce their negative effect on spotted owls before northern spotted owls are extirpated from large portions of their native range. The Recovery Plan emphasizes the need for action in Recovery Action 30: “Manage to reduce the negative effects of barred owls on northern spotted owls so that Recovery Criterion 1 can be met.” Recovery Criterion 1 is to provide for a stable or increasing population trend of spotted owls throughout the range over 10 years (USFWS 2011, p. II-1). Therefore, the management strategy needs to provide for rapid implementation and result in swift reduction in barred owl competition.

In the range of the northern spotted owl, the Strategy is organized by physiographic province, in keeping with the Recovery Plan. Recovery Criterion 2 specifically addresses population distribution in terms of viable spotted owl subpopulations within each province, which the Recovery Plan defines as recovery units. In addition, we included consideration of connections between provinces where habitat exists to support such connection.

Northern spotted owl populations, as demonstrated by the most recent demography meta-analysis results, are declining at between two and nine percent annually, with greater declines generally in the north where barred owls have been established for a longer time period (Franklin et al. 2021). Rates of population decline are lower on the California study areas, though still significant. The presence of barred owls was identified as a primary causative factor for the declines and negatively affected every demographic trait estimated for the northern spotted owl in the recent demography meta-analysis (Franklin et al. 2021, p. 13). In a two-species occupancy model, barred owl occupancy was a dominant negative effect on colonization of territories by spotted owls. However, other factors, such as habitat components and climate, were also important in the dynamics of territory occupancy, reinforcing the importance of maintaining spotted owl habitat on the landscape (Franklin et al. 2021, p. 18; Dugger et al., 2011, pp. 2464, 2467). Maintenance of a landscape with adequate amounts and distribution of habitat also provides areas available for re-colonization by northern spotted owls should management actions allow for reduction of

barred owl populations, and facilitates connectivity for northern spotted owls dispersing among occupied areas (Sovern et al., 2014, p. 5).

Barred owls are now found throughout the range of the northern spotted owl. Barred owl populations have grown within their invaded range and generally occur in dense populations where they have been in place for the longest period, including Washington and northern Oregon. The densest documented populations occur in the Oregon Coast Ranges, with generally lower densities in the southern provinces and very few barred owls in the far southern portion of the northern spotted owl range, Marin and Sonoma Counties, California.

8.4.1 Common Elements Across All Provinces

The Strategy includes three approaches to barred owl management, applied across the range at varying scales – 1) spotted owl site management, 2) General Management Areas (GMAs) with associated Focal Management Areas (FMAs), and 3) Special Designated Areas. The details of management under these approaches may vary by province, depending on the condition of spotted owls, barred owls, and habitat within the province (as described in Section 10. and Appendices 4-1 through 4-10). The following provides the general background on these three management approaches.

8.4.1.1 Prioritization

All actions described in the Strategy are prioritized within each province to provide focus and recommendations to implementing entities. The priorities are non-binding and any action described by the Strategy may be implemented at any time. That is, we do not need to implement all Priority A items before starting on Priority B items. In some cases, a landowner that wants to participate in barred owl management may only have Priority D or E options on their lands. This allows them to implement such management even though the options available to them are not the highest priority. Within the northern spotted owl range, the Strategy used a five-level prioritization system (A to E), applied at the province level. See Appendix 3 for more details.

> **Priority A** defines actions that should, and can, be implemented immediately to prevent extinction or extirpation of spotted owls in the province or targeted areas in the province, particularly in areas with very low spotted owl populations. Additionally, in areas where spotted owl populations are not critically low, this defines actions needed to secure key areas with remaining populations as anchors to the eventual expansion of managed areas and healthy populations.
>
> **Priority B** defines actions that should be implemented as soon as possible to slow spotted owl population declines.
>
> **Priority C** defines actions that should be implemented in the near future to establish areas for spotted owl populations to stabilize and increase to sustainable levels.
>
> **Priority D** defines action that, if implemented, would further assist in stabilizing or increasing spotted owl populations.

Priority E defines actions that, if implemented, would provide additional support to spotted owl populations.

8.4.1.2 Spotted Owl Site Management

Removal of barred owls within and around spotted owl sites is a component of management in all provinces and can be applied anywhere within the province, within or outside of GMAs and Special Designated Areas. Prioritization of spotted owl site management varies between provinces based on the size and condition of the remaining spotted owl populations.

Removing barred owls within and around occupied spotted owl sites retains the existing population, increases the potential for recruitment of young, and provides source populations for recolonization of areas where barred owl management occurs. Removing barred owls from within and around occupied spotted owl sites provides for the maintenance of the remaining spotted owls while larger block management efforts are developed and implemented.

Managed spotted owl sites within GMAs may provide a source of young for colonization of FMAs as barred owl populations are reduced in those area. They may enhance connectivity between FMAs within the GMA, particularly between smaller GMAs. These spotted owl sites may be the nucleus of spotted owl populations in future management blocks, especially where spotted owl site management is applied to clusters of neighboring sites. They can provide key populations on which to build FMAs. Including recently occupied spotted owl sites in FMAs provides a potential core population for development of spotted owl populations once barred owl populations are reduced.

Removing barred owls from currently unoccupied spotted owl sites provides support for recolonization and population growth. If habitat has not changed substantially, previous use by spotted owls demonstrates the ability of these areas to support spotted owls.

Managed spotted owl sites between GMAs may serve to increase potential connectivity between GMAs, increasing spotted owl population connectivity within the provinces. If spotted owl sites are deemed not important for block management in the long run, they may provide a source of spotted owl individuals for direct augmentation of block management areas in the future should such management action be necessary. This could include captive breeding and translocation.

Due to the smaller size of these management areas, spotted owl site management provides a wider range of options for landowner contribution to barred owl management, particularly for smaller landowners, or areas where there are not large amounts of suitable habitat due to terrain, or extensive loss of habitat from wildfires or harvest. Their smaller size also requires less logistical support and may allow for management to be initiated more quickly in these areas.

The specific values considered in developing the recommendations for spotted owl site management in each province are described in Appendices 4-1 to 4-10.

Spotted Owl Site Management Recommendations:

Spotted owl site management involves the lethal removal of barred owls within an area that represents 1.5 and 2 home range radii of a spotted owl core. The home range radii were established based on the area used by radio-tagged spotted owls over a calendar year and vary by province and are commonly used in ESA consultation. The values in Table 1 describe the area represented by a circle of 1.5 and 2 home range radii. This acreage can be distributed in a circle around the core area, or implementers can use local knowledge, topography, and habitat condition to design an area of the appropriate size that provides the best conditions for barred owl management. In areas where spotted owl sites are isolated, and particularly for sites in Priority A condition, we recommend a larger management area, up to 3 home range radii. Throughout the Strategy we use the following home range radii. While this generally applies to all provinces in the northern spotted owl range, conditions in some provinces may warrant variations on this approach (See Appendices 4-1 to 4-10).

Table 1. Standardized home range radii (HRR) for spotted owl sites in the range of the northern spotted owl for barred owl management.

Physiographic Province	HRR in Miles	1.5 HRR in miles	Area within 1.5 HRR in Acres	2.0 HRR in Miles	Area within 2.0 HRR in Acres	3.0 HRR in miles	Area within 3.0 HRR in Acres
Olympic Peninsula[1]	1.8	2.7	14,657	3.6	26,058	5.4	58,630
Western Washington Cascades	1.8	2.7	14,657	3.6	26,058	5.4	58,630
Eastern Washington Cascades	1.8	2.7	14,657	3.6	26,058	5.4	58,630
Oregon Coast Ranges	1.5	2.3	10,179	3.0	18,096	4.5	40,715
Western Oregon Cascades	1.2	1.8	6,514	2.4	11,581	3.6	26,058
Eastern Oregon Cascades	1.2	1.8	6,514	2.4	11,581	3.6	26,058
Oregon Klamath	1.3	2.0	7,645	2.6	13,592	3.9	30,582
California Klamath	1.3	2.0	7,645	2.6	13,592	3.9	30,582
California Cascades	1.3	2.0	7,645	2.6	13,592	3.9	30,582
California Coast – Mixed Conifer Zone	1.3	2.0	7,645	2.6	13,592	3.9	30,582
California Coast – Redwood Zone	0.7	1.1	2,217	1.4	3,941	2.1	8,867

[1]In consultation the home range radii used for the Olympic Peninsula is 2.7 mile, based on west side radiotelemetry. This is also used in the Washington Forest Practices rules. For the purpose of barred owl management, this resulted in an extremely larger area. The biologists decided that 1.8 miles was adequate for barred owl management in this situation. This does not change other uses of the 2.7-mile radius.

Some spotted owl sites will overlap with GMAs, and in areas with larger remaining spotted owl populations, buffered sites will overlap significantly with one another.

9.4.1.3 General Management Areas

General Management Areas are the primary focus of management in most provinces. These are large, mapped areas within the boundaries of which barred owl management may occur. The interagency, intergovernmental Team developed and mapped these GMAs at the physiographic province scale, in keeping with the Recovery Plan's focus on maintaining viable spotted owl subpopulations within each province (USFWS 2011, p II-1). We included the small, forested edges of the Willamette Valley Physiographic Province with the adjacent forested provinces (Oregon Coast Ranges or Western Oregon Cascades Physiographic Provinces).

We generally designed GMAs to include enough area to potentially support 200 to 300 spotted owl sites, though they may be smaller or larger due to topographic or habitat conditions, or specific goals. These sizes are based on home range sizes used by radio-tagged spotted owls over a calendar year and assuming a 25 percent overlap between neighboring spotted owl sites, also based on this same data. The sizes vary by province (Table 2).

Table 2. General size of an area in acres capable of containing 200 and 300 spotted owl pairs.

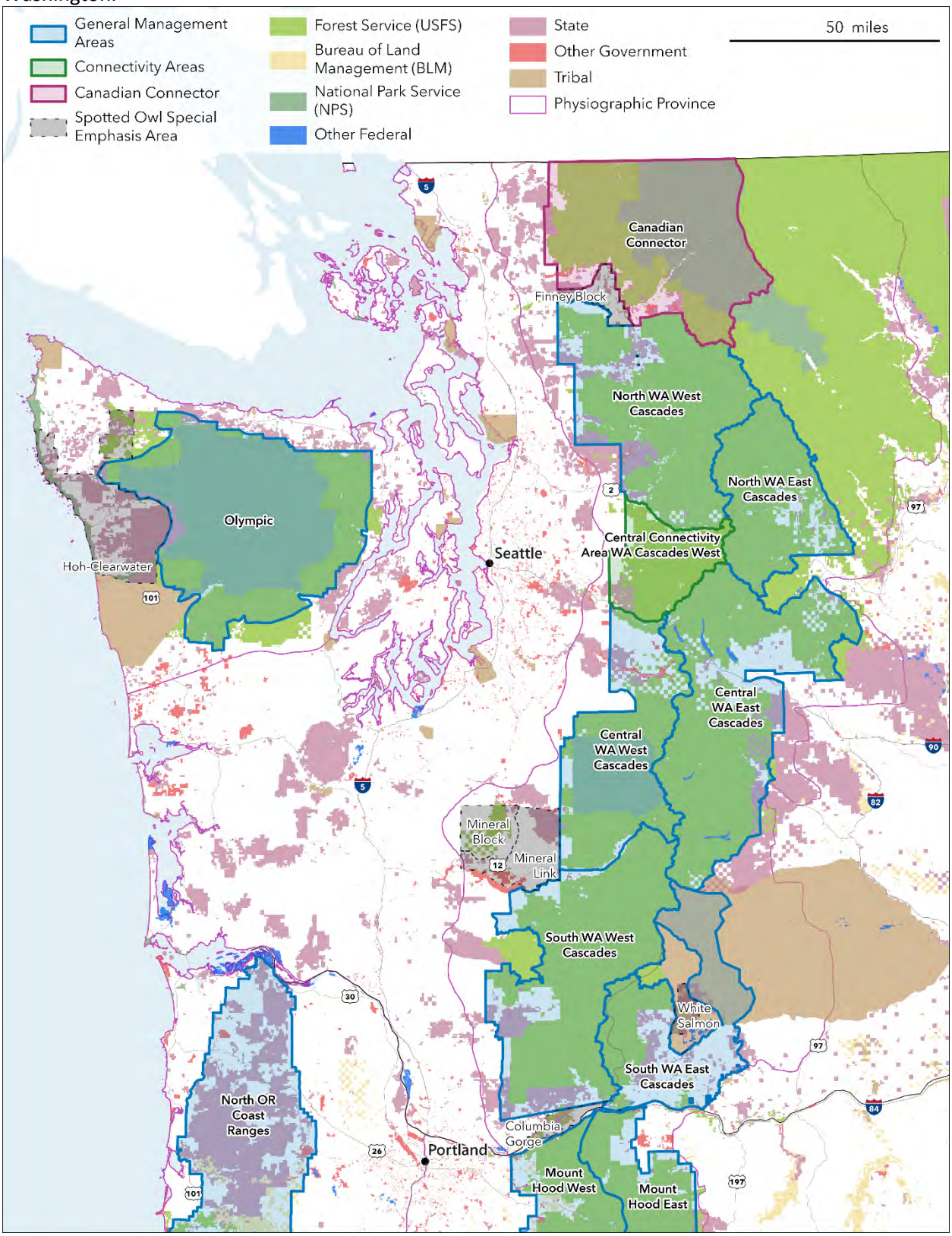
Physiographic Provinces	200 Pair Size Area in Acres	300 Pair Size Area in Acres
Olympic Peninsula, Western Washington Cascades, Eastern Washington Cascades	1,140,021	1,710,031
Oregon Coast Ranges	791,681	1,187,522
Western Oregon Cascades, Eastern Oregon Cascades	506,676	760,014
Oregon Klamath, California Klamath, California Cascades, California Coast (Mixed conifer areas)	594,641	891,961
California Coast (Redwood areas)	172,411	258,616

These large areas allow for the creation of multiple smaller focal management areas (FMAs) within each GMA (See section 9.4.1.3.1.) Multiple smaller management areas within such a landscape provide some redundancy to protect against loss to catastrophic events, such as large, high-severity wildfires. The GMAs represent the boundaries within which these smaller, focal barred owl management areas would be created at the time of implementation.

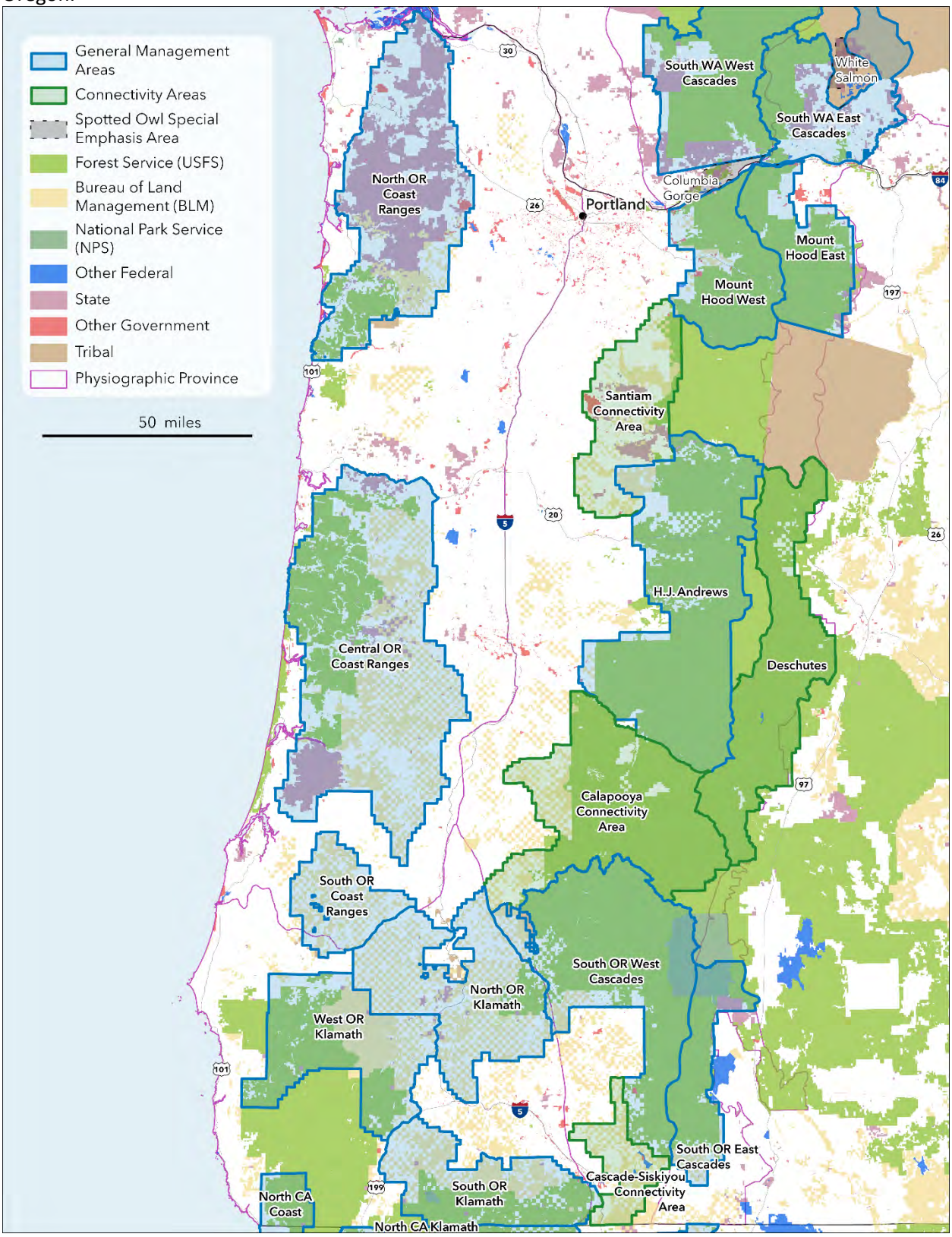
We did not include Tribal lands within GMAs unless requested to do so by the Tribe. The Yurok Tribe requested inclusion of their lands in northern California and the Yakama Nation requested inclusion of a portion of their lands in the Eastern Washington Cascades within GMAs, thereby allowing for barred owl management on these areas under the Strategy. Where possible around the edges of the GMAs, we did not include towns and other human-populated areas. However, some such populated areas do lie within the boundaries. These areas would not be part of any barred owl management area, and no removal activity would occur within one-quarter mile of any occupied dwellings, established open campgrounds, and other locations with regular human use (Appendix 2). Again, barred owls will only be removed from the lands of willing landowners or land managers.

Considerations used in mapping the proposed GMAs included, but were not limited to, known locations and densities of spotted owl sites, spotted owl habitat density and diversity, estimated barred owl density, locations of previous and ongoing research and monitoring efforts, connectivity across province boundaries, potential risk of catastrophic losses to wildfire and other stochastic events, potential or current isolation of spotted owl populations, and the presence of potential barriers to barred owl invasion. We used landscape-scale GIS layers including, but not limited to, ownership, management status, spotted owl habitat, forest lands, fire risk maps, and spotted owl site history. The results of this mapping are shown on Map 3 to 5. The details on the considerations for mapping of each GMA are found in Appendices 4-1 to 4-10.

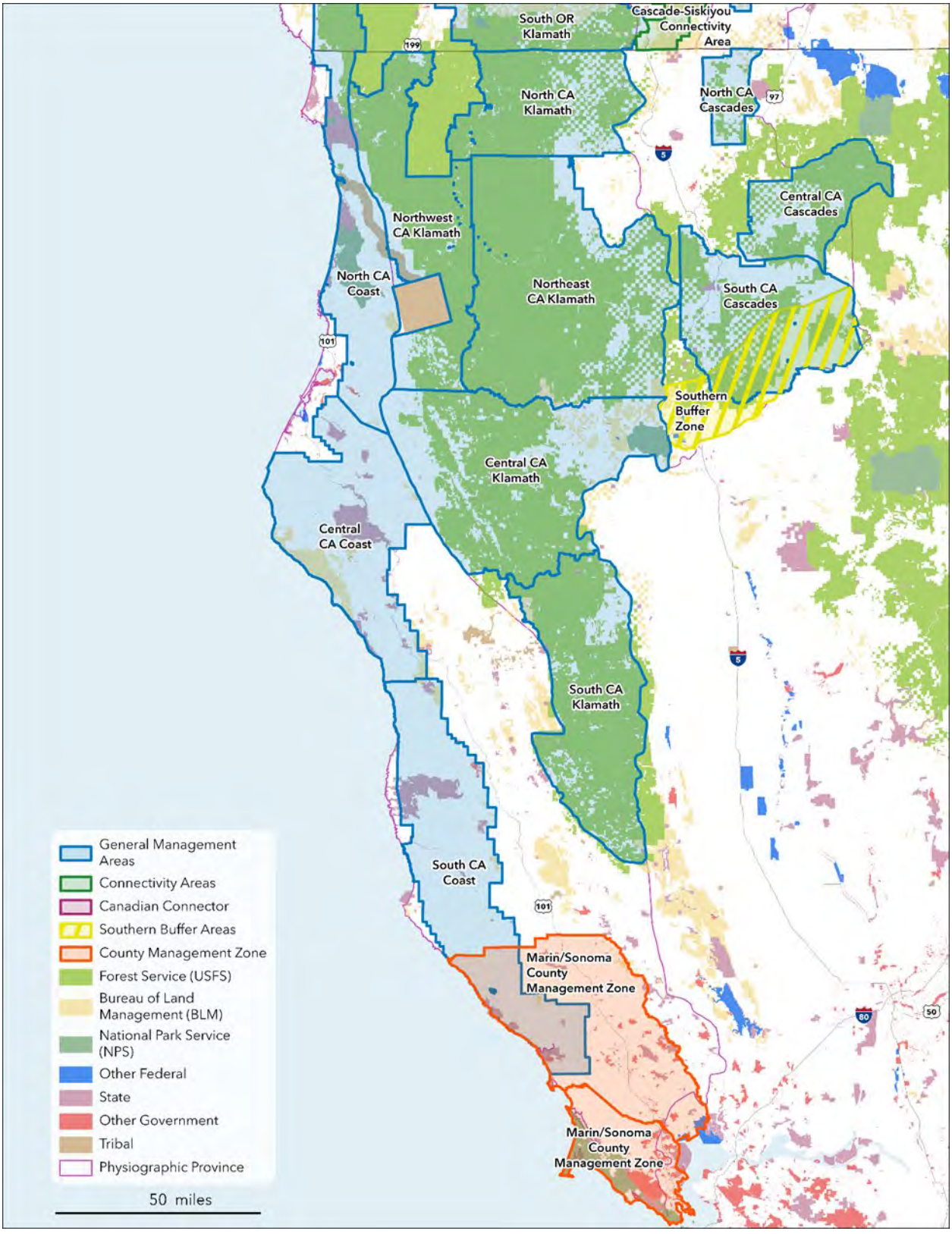
Map 3. General management areas and special designated areas in the northern spotted owl range in Washington.



Map 4. General management areas and special designated areas in the northern spotted owl range in Oregon.



Map 5. General management areas and special designated areas in the northern spotted owl range in northern California.



The entire area within any GMA would not be under barred owl management at any one time in most cases. To encourage distributing implementation across the range of the subspecies, we have set the maximum level of management for each GMA based on their priority rating, by decade out to 30 years. We express acreage in this document in terms of the percentage of forest lands, in which we include any lands with the capability to grow forests or which were historically forested, including recently harvested or burned landscapes, and all ages of forest. This represents a reasonable representation of potential barred owl habitat.

Under this Strategy, Priority A GMAs could be managed on up to 50 percent of the forest lands in all decades. For Priority B GMAs, FMA management would be limited to 35 percent of the forest lands in the first decade, and 50 percent in later decades. For Priority C GMAs, FMA management is limited to 25 percent of the forest lands in the first decade, and 35 percent in the second decade, and 50 percent in the following decades. These maximum percentages do not include areas outside of FMAs that are managed according to spotted owl site management guidelines. Table 3 provides the maximum acres of forest potentially under barred owl management applying the above management limits, by GMA. Note, the location of management areas may move within the GMA over time particularly if a portion of a GMA is lost to fire or other catastrophic events.

Table 3. General Management Areas, priority, and maximum forest acres under barred owl management at any one time by physiographic province and decade.

Physiographic Province	GMA Name	Priority	Total Forest Area	Maximum Forest Acres Under Concurrent Management		
				Decade 1	Decade 2	Decade 3
Olympic Peninsula	Olympic	A	1,196,916	598,458	598,458	598,458
Western Washington Cascades	Central WA West Cascades	A	654,932	327,466	327,466	327,466
	South WA West Cascades	B	1,101,666	385,583	550,833	550,833
	North WA West Cascades	C	903,600	225,900	316,260	451,800
Eastern Washington Cascades	Central WA East Cascades	A	1,094,518	547,259	547,259	547,259
	North WA East Cascades	B	452,374	158,331	226,187	226,187
	South WA East Cascades	C	620,797	155,199	217,279	310,359
Oregon Coast Ranges	Central OR Coast Ranges	A	1,724,822	862,411	862,411	862,411
	North OR Coast Ranges	B	1,113,268	389,643	556,634	556,634
	South OR Coast Ranges	C	298,932	74,733	104,626	149,466

Physiographic Province	GMA Name	Priority	Total Forest Area	Maximum Forest Acres Under Concurrent Management		
				Decade 1	Decade 2	Decade 3
Western Oregon Cascades	H.J. Andrews	A	1,273,146	636,573	636,573	636,573
	South OR West Cascades	B	1,019,074	356,676	509,537	509,537
	Mount Hood West	C	464,686	116,171	162,640	232,343
Eastern Oregon Cascades	South OR East Cascades	A	316,392	158,196	158,196	158,196
	Deschutes	A	683,834	341,917	341,917	341,917
	Mount Hood East	C	401,858	100,465	140,650	200,929
Oregon Klamath	North OR Klamath	A	755,556	377,778	377,778	377,778
	West OR Klamath	B	660,034	231,012	330,017	330,017
	South OR Klamath	B	516,220	180,677	258,110	258,110
California Coast	North CA Coast	A	646,150	323,075	323,075	323,075
	Central CA Coast	B	813,174	284,611	406,587	406,587
	South CA Coast	C	972,840	243,210	340,494	486,420
California Klamath	Northwest CA Klamath	A	797,188	398,594	398,594	398,594
	North CA Klamath	B	608,764	213,067	304,382	304,382
	Central CA Klamath	B	1,232,536	431,387	616,268	616,268
	Northeast CA Klamath	C	1,500,432	375,108	525,151	750,216
	South CA Klamath	C	866,632	216,658	303,321	433,316
California Cascades	South CA Cascades	B	773,176	270,611	386,588	386,588
	North CA Cascades	C	139,642	34,911	48,875	69,821
	Central CA Cascades	C	399,968	99,992	139,988	199,984

Focal Management Areas

GMAs represent the outer boundaries of areas within which smaller Focal Management Areas would be established during implementation of the Strategy. These would be selected by the implementing agency or entity, or a group of agencies/entities, based on general direction and prioritization provided in Appendices 4-1 to 4-10. This provides the implementing entities with the opportunity to set the focal management area boundaries, where active removals would occur, based on the latest local knowledge, interests, and agency management goals. Focal management areas could occur anywhere within the GMA boundaries.

In most GMAs, we recommend FMAs be of a size that could support 50 spotted owl pairs if fully occupied (Table 4). However, habitat and topographic conditions may limit the size of FMAs in some GMAs. In this case, smaller FMAs may be developed, though we recommend

that these be as large as possible, with a focus on areas capable of supporting a cluster of spotted owl sites, rather than single sites, and that they be placed in closer proximity to allow for population interaction. The appropriate size is described for each GMA and Province in Appendices 4-1 to 4-10.

Table 4. General size of an area capable of containing 20 and 50 spotted owl pairs.

Physiographic Provinces	20 Pair Size Area in Acres	50 Pair Size Area in Acres
Olympic Peninsula, Western Washington Cascades, Eastern Washington Cascades	114,002	285,005
Oregon Coast Ranges	79,168	197,920
Western Oregon Cascades, Eastern Oregon Cascades	50,668	126,669
Oregon Klamath, California Klamath, California Cascades, California Coast (Mixed conifer areas)	59,464	148,660
California Coast (Redwood areas)	17,241	43,103

The boundaries of FMAs may change over time. For example, if a substantial portion of an FMA is lost to wildfire, changes to the boundaries or moving the management effort to another area, would be appropriate. Changes in land management plans, results of monitoring, and other factors may lead to a decision to modify boundaries of or move an FMAs. If management succeeds in greatly reducing the density of barred owls, implementers may consider expanding the management area to include surrounding areas. In all cases, the total area under management within a GMA at any one time would be limited to the area in Table 3.

8.4.1.4 Special Designated Areas.

Five additional types of special designated areas are mapped to meet various needs, depending on conditions within the province (Table 5). Management direction varies by designations and priority within the province. The described activity is in addition to, and not a replacement for, spotted owl site management described above. The following is a general description of these area types.

Connectivity Areas. These areas are mapped in Washington and Oregon. They generally lie between larger GMAs and are intended to provide for some connection and movement between GMAs once spotted owl populations stabilize in the GMAs. While these are generally of lower priority and will meet their full value as spotted owl populations develop in the neighboring GMAs, management to maintain existing spotted owl sites within these areas will provide a base for expanding management in the future. Therefore, we anticipate barred owl management may occur on up to 25 percent of the forest lands in the connectivity areas in each province where they occur (Map 3 and 4). More specific direction on management is found in Appendices 4-2, 5).

Canadian Connector. The Government of British Columbia, Canada, is engaged in a barred owl management and spotted owl reintroduction effort. If those efforts are successful, management in this block on the U.S. side of the border with Canada could be valuable to that effort. While we

do not know what that would entail at this time, we anticipate some barred owl management activity in this area may be of conservation value in the future. Barred owl management could

Table 5. Special Designated Areas, priority, and maximum forest acres under management at any one time.

Physiographic Province	Special Designation Block Name	Priority	Total Forest Acres	Maximum Forest Area Under Concurrent Management
Olympic Peninsula	Olympic Hoh-Clearwater SOSEA	E	359,408	89,852
Western Washington Cascades	Canadian Connector	E	745,180	74,518
	Central Connectivity Area WA Cascades West	D	269,240	67,310
	Finney Block SOSEA	E	58,504	14,626
	Mineral Block SOSEA	E	105,056	26,264
	Mineral Link SOSEA	E	155,876	38,969
	Columbia Gorge SOSEA	E	31,772	7,943
Eastern Washington Cascades	White Salmon SOSEA	E	34,090	8,522
Western Oregon Cascades	Santiam Connectivity Area	D	507,260	126,815
	Calapooya Connectivity Area	D	986,012	246,503
	Cascade-Siskiyou Connectivity Area	D	196,944	49,236
California Coast	Marin/Sonoma County Management Zone	B	587,434	587,434
California Cascades	Southern Buffer Zone	A	450,393	450,393

occur on up to 10 percent of the forest lands in this designation at any one time (Map 3 and Appendix 4-2).

Spotted Owl Special Emphasis Areas. The State of Washington identified key landscapes, referred to as Spotted Owl Special Emphasis Areas (SOSEAs), where spotted owl conservation in the form of demographic and/or dispersal support was important on non-federal lands. Where these areas lie within GMAs, connectivity areas, or the Canadian Connector, barred owl management as described for those designations would apply. However, barred owl management on portions of the SOSEAs that lie outside of these areas could provide support to spotted owl populations in the provinces. While these are generally of lower priority, barred owl management may occur on 25 percent of forest lands within the SOSEAs outside of other designations (Map 3 and Appendices 4-1 to 4-3).

Southern Buffer Zone. This area includes a 15-mile-wide stretch of forest along the border of the northern spotted owl and California spotted owl range and represents the most likely invasion pathway for barred owls into the California spotted owl range from the north. The Strategy includes focused surveys for, and removal of, any barred owls in this area to slow the flow of barred owls into the California spotted owl range. Barred owl management could occur on the entire area at any time (Map 5, Appendix 4-10).

Marin/Sonoma County Management Zone. Conditions in Marin and Sonoma County are substantially different than in the rest of the northern spotted owl range. Barred owls are present in small numbers and have not yet established significant populations. The remaining spotted owl habitat is found in blocks of limited size managed by a variety of agencies and landowners. Management focus in this area is on preventing barred owls from becoming established and displacing the remaining spotted owls. Therefore, barred owls may be removed from the land of willing landowners and land managers anywhere within these counties (Map 5, Appendix 4-8).

9. Potential Impact of the Strategy on Barred Owl Populations

Non-native barred owls currently occur in dense populations in most of the range of the northern spotted owls. Based on data from the densities identified in the Barred Owl Removal Experiment on the areas where barred owls were not removed, the number of territorial barred owls present range from approximately one to three barred owls per 1,000 acres of forest land. This study ended in 2020, and these estimates do not account for the likely increase in barred owls in the southern study areas since that time. The northern study areas may be at carrying capacity and therefore barred owl densities may be stable on these areas. Barred owls are also found in many areas not generally classified as forest, such as suburban parks and neighborhoods, and in the young forests of the Washington Lowlands physiographic province, which is not included in this Strategy. Based on the densities described above, and the acres of forest land within the range of the northern spotted owl covered by the Strategy, we estimate that there are over 100,000 barred owls currently in the area potentially affected by the Strategy.

Under the Strategy, barred owl management is limited to up to 50 percent of mapped management areas at any one time and additional management within and around spotted owl sites outside of these areas. Not all lands are included in mapped management areas, though spotted owl site management (management of barred owls around spotted owl sites) may occur anywhere in the province. Areas with high density spotted owl habitat were generally included in mapped management areas, leaving the areas outside with lower habitat density. Therefore, we anticipate that spotted owl site management outside of mapped management areas would impact less than 50 percent of the area. Including activities both inside and outside of management areas, we do not expect that more than 50 percent of any one province would likely be subject to active barred owl management at any one time, and in most provinces the percentage would be substantially less.

In the California spotted owl range and associated potential invasion pathways, territorial barred owl populations are currently low. The intent of the Strategy is to prevent the establishment of non-native barred owls in the range of the California spotted owl.

Impacts of the Strategy on barred owl populations vary by scale. In the northern spotted owl range, on areas of active barred owl management (spotted owl site or block management area scale), barred owl populations will be reduced. Based on past removal experiments, even in these areas barred owl populations will persist, though at lower levels. In areas outside of active management, barred owl populations will persist and will likely increase, at least in the southern portions of the northern spotted owl range where barred owls have not yet reached carrying

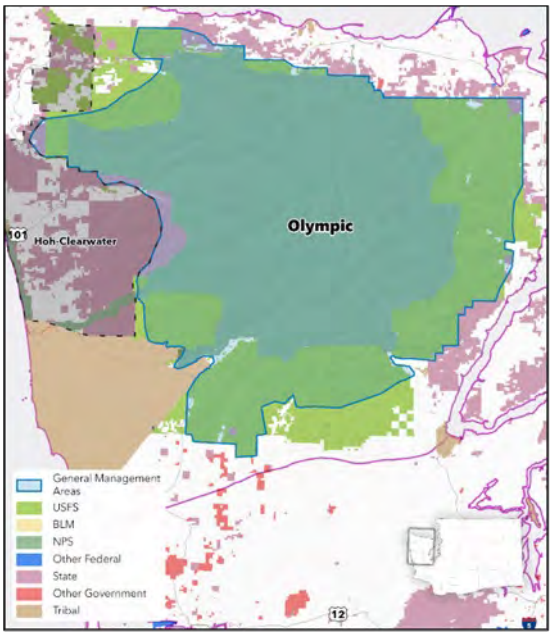
capacity. Measurable impacts to barred owl populations may occur at the province scale if management is implemented at the maximum level allowed, though this is unlikely in the early years of implementation. In the California spotted owl range, if we succeed in removing territorial barred owls as they settle, there will be very limited impact on barred owls as populations would not be able to develop. None of the barred owl management activity in this Strategy will affect the native populations of barred owls in eastern North America.

10. Summary of the Strategy by Province in the Northern Spotted Owl Range.

The following provides a summary of the Strategy components by physiographic province, including 1) Spotted owl site management recommendations and priorities, 2) GMA information on reasons for selection of the GMAs and recommendation for the size and management of FMAs, and 3) Special Designated Area management recommendations and priorities. Some additional details may be found in Appendices 4-1 to 10.

10.1 Olympic Peninsula Province

The following is a summary of recommended management in the Olympic Province. Additional details are found in Appendix 4-1.



10.1.1 Spotted Owl Site Management

Given the limited number of spotted owls remaining in this province, it is crucial to protect the remaining spotted owls through barred owl management. Removing barred owls within and around recently occupied spotted owl sites will help to reduce the rate of spotted owl population decline as quickly as possible and prevent extinction/extirpation of the spotted owl in the province.

Spotted owl site management also provides the opportunity for maintaining spotted owls in areas where block management is not feasible or recommended. These sites can serve to increase potential connectivity across the GMA.

10.1.1.1 Spotted Owl Site Management Priorities:

Priority	Spotted Owl Site Condition
A	Sites that have been occupied by resident spotted owls (pair or single) in the past five years, or where there have been detections of spotted owls (not reaching resident status) in the past five years.
B	Sites that were occupied by resident spotted owls (pair or single) between five and ten years ago
C	Sites that were occupied by resident spotted owls (pair or single) more than ten years ago, whether or not they have been surveyed recently.
D	Areas with sufficient high-quality habitat to support a spotted owl site, whether surveyed recently or not.

Other considerations for selection of spotted owl sites for management:

If spotted owl site management cannot be initiated on all sites, we recommend the following be considered in selecting the specific spotted owl sites for management.

- Select spotted owl sites with the most recent occupancy, particularly if surveys have been conducted on these areas in recent years. Do not discount spotted owl sites as unoccupied based on lack of recent surveys.
- Focus first on spotted owl sites with recent occupancy by pairs, then singles, then detections.
- Consider past reproductive history of the spotted owl site. Select sites with a history of reproduction on the site where surveys are available.
- Consider the condition of habitat in the area, particularly loss of habitat to fire or other actions since the last surveys. Spotted owl sites where much of the habitat has been removed, from high severity fire or timber harvest would be a lower priority.

10.1.2 General Management Areas

10.1.2.1 Olympic GMA - Priority A

The Olympic GMA lies on the Olympic Peninsula and includes most of the Olympic National Park (except the coastal strip), and much of the Olympic National Forest, particularly where there has been more recent presence of northern spotted owl. The GMA includes a small amount of State forest in the Hoh-Clearwater Spotted Owl Special Emphasis area, adjacent to the Olympic National Forest, on the west side of the Olympic Peninsula. Very few private lands are included in this GMA. It includes 97 percent Federal lands (National Park and National Forests) and 3 percent State land.

Primary reasons for selecting this area

The Olympic GMA contains the most current and recent know spotted owl pair activity and a large portion of the high-quality habitat in the province. It includes the Olympic Spotted Owl Demography Study Area, with its historic and recent spotted owl data.

Focal Management Areas (FMAs)

We recommend developing FMAs large enough to potentially support 50 spotted owl pair sites where possible. However, where the landscape or forest conditions do not allow this, smaller or more sinuous areas may be appropriate. For example, in higher elevation areas within Olympic National Park, where habitat is confined to valley bottoms, large blocky FMAs may not be reasonable or effective, and smaller, but still multiple pair areas, may be a practical option. These may be more sinuous in nature due to the habitat limitations.

Where smaller areas are developed due to ecological or implementation constraints, we recommend these be closer together and multiple areas designed with the intent of encouraging exchange of spotted owls between these smaller areas. Coordinate FMA locations with the spotted owl site management described above. Including recently occupied spotted owl sites in FMAs provides a potential core population for development of spotted owl populations as barred owl populations are reduced. Recommendations on priorities for defining and selecting Focal Management Areas within the Central Washington East Cascades GMA are listed in Appendix 4-1.

10.1.3 Special Designated Areas:

10.1.3.1 Spotted Owl Special Emphasis Areas – Priority E

The State of Washington identified 10 key landscapes, referred to as Spotted Owl Special Emphasis Areas (SOSEAs), where northern spotted owl conservation in the form of demographic and/or dispersal support was important on non-federal lands. In mapping the Strategy, some SOSEAs were included in mapped GMAs, Central Connectivity Area WA Cascades West, or the Canadian Connector. Where SOSEAs lie within GMAs, barred owl management as described for those designations would apply. Where SOSEA lands fell outside of these designations, we mapped the areas as SOSEA special designation areas.

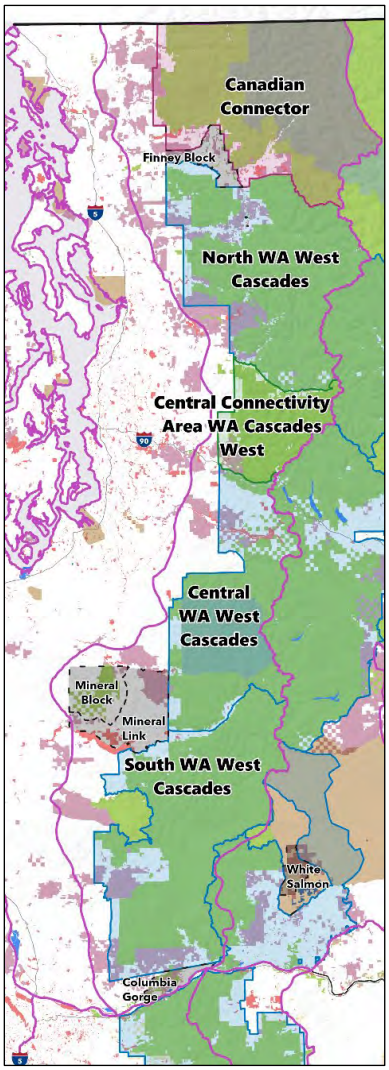
There is one SOSEA Special Designated Area in the Olympic Peninsula Province.

SOSEA	Forest Acres on Federal lands	Forest Acres on State Lands	Forest Acres on Private Lands	Maximum Forest Acres Under Management
Hoh-Clearwater SOSEA	49,359	182,776	121,791	89,852

For the Strategy, barred owl management in the form of removal could be occur at any scale in a SOSEA. We recommend spotted owl site-based management as described in Section 9.4.1.2. of the Strategy. Removal of barred owls within and around spotted owl sites can be applied anywhere within the province and is an appropriate small scale management effort in SOSEAs. Removing barred owls within and around occupied spotted owl sites retains the existing population, increases the potential for recruitment of young, and provides source populations for recolonization of areas where barred owl management occurs. Spotted owl site management can provide connectivity between larger block areas. Where feasible, clustering spotted owl site management into small blocks increases the functionality of this management.

10.2. Western Washington Cascades Province

The following is a summary of recommended management in the Western Washington Cascades Province. Additional details are found in Appendix 4-2.



10.2.1 Spotted Owl Site Management

Given the very limited number of spotted owls remaining in this province, it is crucial to protect the remaining spotted owls through barred owl management. Current site locations are not well known as outside of the Rainier Demography Study Areas due to limited survey effort. Removing barred owls within and around recently occupied spotted owl sites will help to reduce the rate of spotted owl population decline as quickly as possible and prevent extinction/extirpation of the spotted owl in the province. Site management may help to prevent genetic bottlenecks or reduction in genetic diversity, by conserving remaining northern spotted owl, and the genetic diversity they represent, across the province.

Maintaining spotted owl sites distributed across the province, whether within block management areas or not, will reduce the risk of loss of spotted owls in the province from catastrophic events, such as wildfire, by spreading sites across the area. Spotted owl site management also provides the opportunity for maintaining spotted owls in areas where block management is not feasible or recommended.

10.2.1.1 Spotted Owl Site Management Priorities:

Priority	Spotted Owl Site Condition
A	Sites that have been occupied by resident spotted owls (pair or single) in the past five years, or where there have been detections of spotted owls (not reaching resident status) in the past five years
B	Sites that were occupied by resident spotted owls (pair or single) between five and ten years ago
C	Sites that were occupied by resident spotted owls (pair or single) more than ten years ago, whether or not they have been surveyed recently.
D	Areas with sufficient high-quality habitat to support a spotted owl site, whether surveyed recently or not.

Other considerations for selection of spotted owl sites for management:

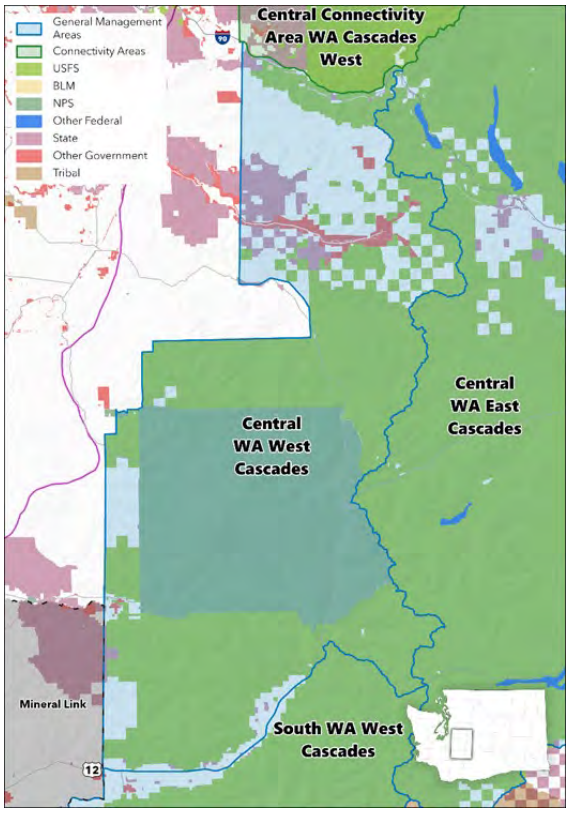
If spotted owl site management cannot be initiated on all sites, we recommend the following be considered in selecting the specific spotted owl sites for management.

- Select spotted owl sites with the most recent occupancy, particularly if surveys have been conducted on these areas in recent years. Do not discount spotted owl sites as unoccupied based on lack of recent surveys.
- Focus first on spotted owl sites with recent occupancy by pairs, then singles, then detections.
- Consider past reproductive history of the spotted owl site. Select spotted owl sites with a history of reproduction on the site where surveys are available.
- Consider the condition of habitat in the area, particularly loss of habitat to fire or other actions since the last surveys. Spotted owl sites where much of the habitat has been removed, from high severity fire or timber harvest would be a lower priority.

10.2.2 General Management Areas

10.2.2.1 Central Washington West Cascades GMA - Priority A

The Central Washington West Cascades GMA lies west of the Cascade crest, south of Interstate 90 and extends south to Highway 12. It includes parts of the Snoqualmie District of the Mount Baker-Snoqualmie National Forest, Mount Rainier National Park, and parts of the Cowlitz Ranger District on the Gifford Pinchot National Forest, as well as State SOSEA lands and private lands. It includes 77 percent Federal lands (National Forests and National Parks), 3 percent State land and the remainder primarily in private ownership.



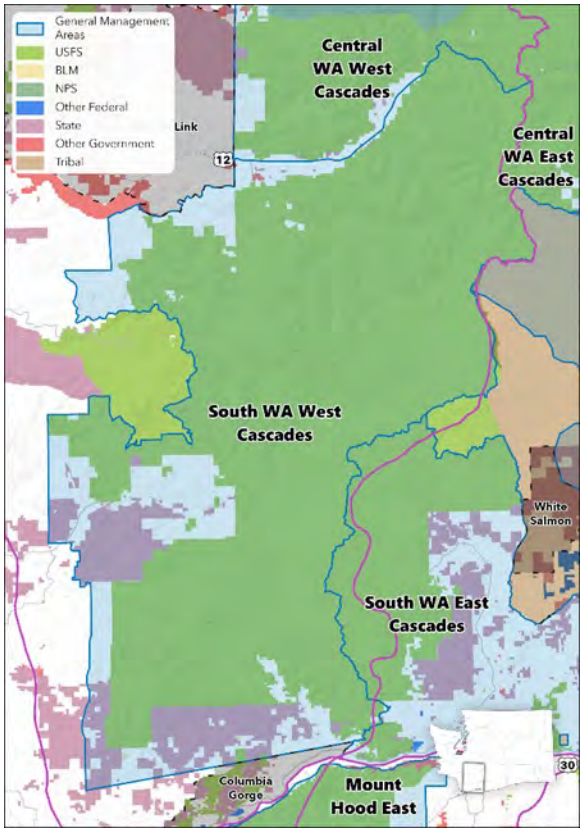
Primary reasons for selecting this area:
The Central Washington West Cascades GMA contains the most current and recent known spotted owl pair activity in the Washington West Cascades Physiographic province. It includes the Rainier Spotted Owl Demography Study Area, with its historic and recent spotted owl data. The GMA is centrally located, allowing for connectivity to GMAs to the east and south, the Central Connectivity Area Washington Cascades West, and the Mineral Link and Mineral Block SOSEAs.

Focal Management Areas (FMAs)

We recommend developing FMAs large enough to potentially support 50 spotted owl pair sites where possible. However, where the landscape or forest conditions do not allow this, smaller or more sinuous areas may be appropriate. For example, in higher elevation areas where habitat is confined to valley bottoms, large blocky FMAs may not be reasonable or effective, and smaller, but still multiple pair areas, may be a practical option. These may be more sinuous in nature due to the habitat limitations.

Where smaller areas are developed due to ecological or implementation constraints, we recommend these be closer together and multiple areas designed with the intent of encouraging exchange of spotted owls between these smaller areas. Coordinate FMA locations with the spotted owl site management described above. Including recently occupied spotted owl sites in FMAs provides a potential core population for development of spotted owl populations as barred owl populations are reduced. Recommendations on priorities for defining and selecting Focal Management Areas within the Central Washington East Cascades GMA are listed in Appendix 4-2.

10.2.2.2 South Washington West Cascades GMA- Priority B



The South Washington West Cascades GMA lies west of the Cascade crest, south of Highway 12 and stretches south almost to the Columbia River. It includes the Mt Adams Ranger district and parts of the Cowlitz Ranger district on the Mount Baker Snoqualmie National Forest, most of the Mt St. Helens National Volcanic Monument as well as State SOSEA lands and some private lands. It includes 78 percent Federal lands (National Forests and National Monument), 8 percent State land and the remainder primarily in private ownership.

Primary reasons for selecting this area:
The South Washington West Cascades GMA contains historic spotted owl pairs, though the current data on presence and occupancy is unknown due to very low survey efforts. The GMA contains a large amount of habitat capable of supporting spotted owls. This location provides connection to Central Washington West Cascades GMA, the South Washington East Cascades GMA, and the Mineral Link and Columbia Gorge SOSEAs.

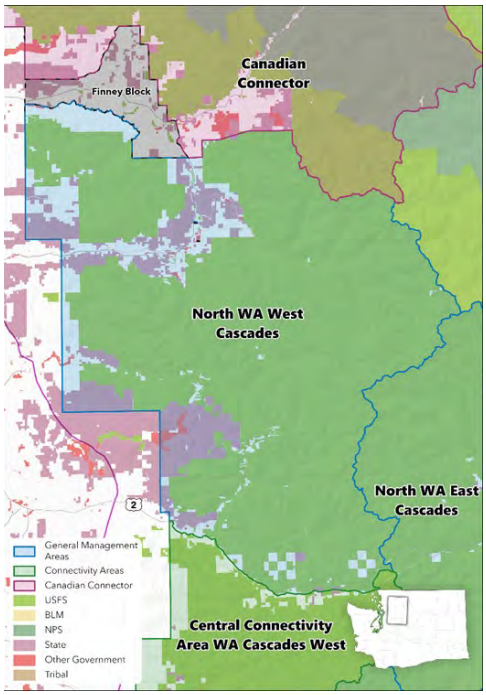
Focal Management Areas (FMAs)

We recommend developing FMAs large enough to potentially support 50 spotted owl pair sites where possible. However, where the landscape or forest conditions do not allow this, smaller or more sinuous areas may be appropriate. For example, in higher elevation areas where habitat is confined to valley bottoms, large blocky FMAs may not be reasonable or effective, and smaller, but still multiple pair areas, may be a practical option. These may be more sinuous in nature due to the habitat limitations.

Where smaller areas are developed due to ecological or implementation constraints, we recommend these be closer together and multiple areas designed with the intent of encouraging exchange of spotted owls between these smaller areas. Coordinate FMA locations with the spotted owl site management described above. Including recently occupied spotted owl sites in FMAs provides a potential core population for development of spotted owl populations as barred owl populations are reduced. Recommendations on priorities for defining and selecting Focal Management Areas within the Central Washington East Cascades GMA are listed in Appendix 4-2.

10.2.2.3 North Washington West Cascades GMA - Priority C

The North Washington West Cascades GMA lies south of Highway 20 and west of the Cascade crest, and includes parts of the Mt Baker Snoqualmie National Forest (including most of the Darrington Ranger district, and southern parts of the Mt. Baker Ranger District) as well as State lands, SOSEA lands and some private lands. It includes 80 percent Federal lands (National Forests), 10 percent State land and the remainder primarily in private ownership.



Primary reasons for selecting this area:
The North Washington West Cascades GMA contains the historic spotted owl site centers, though the current data on presence and occupancy is unknown. The GMA contains a large amount of habitat capable of supporting spotted owls. The location provides connection to Central Connectivity Area WA Cascades West. The North Washington East Cascades GMA, the Canadian Connector, and the Finney Block SOSEA.

Focal Management Areas (FMAs)

We recommend developing FMAs large enough to potentially support 50 spotted owl pair sites where possible. However, where the landscape or forest conditions do not allow this, smaller or more sinuous areas may be appropriate. For example, in higher elevation areas where habitat is confined to valley bottoms, large blocky FMAs may not be reasonable or effective, and smaller,

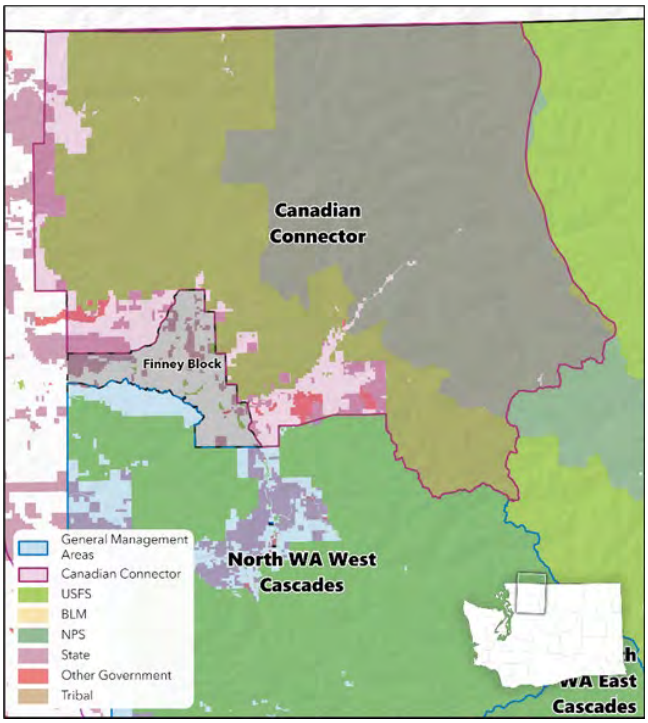
but still multiple pair areas, may be a practical option. These may be more sinuous in nature due to the habitat limitations.

Where smaller areas are developed due to ecological or implementation constraints, we recommend these be closer together and multiple areas designed with the intent of encouraging exchange of spotted owls between these smaller areas. Coordinate FMA locations with the spotted owl site management described above. Recommendations on priorities for defining and selecting Focal Management Areas within the Central Washington East Cascades GMA are listed in Appendix 4-2.

10.2.3 Special Designated Areas:

10.2.3.1 Canadian Connector – Priority D

The Canadian Connector special designation area lies north of Highway 20 and west of the Cascade crest, and includes parts of the Mt Baker Snoqualmie National Forest and parts of North Cascades National Park as well as State lands, SOSEA lands and some private lands. It includes 89 percent Federal lands (National Forests and National Park), 3 percent State land and the remainder primarily in private ownership.



Primary reasons for selecting this area:
The primary reason for mapping this area was to provide future opportunities to support the Canadian spotted owl reintroduction should that occur. The Canadian Connector contains historic spotted owl sites, but there is no survey recent information. It could provide connection from the North Washington West Cascades GMA to the Canadian Border.

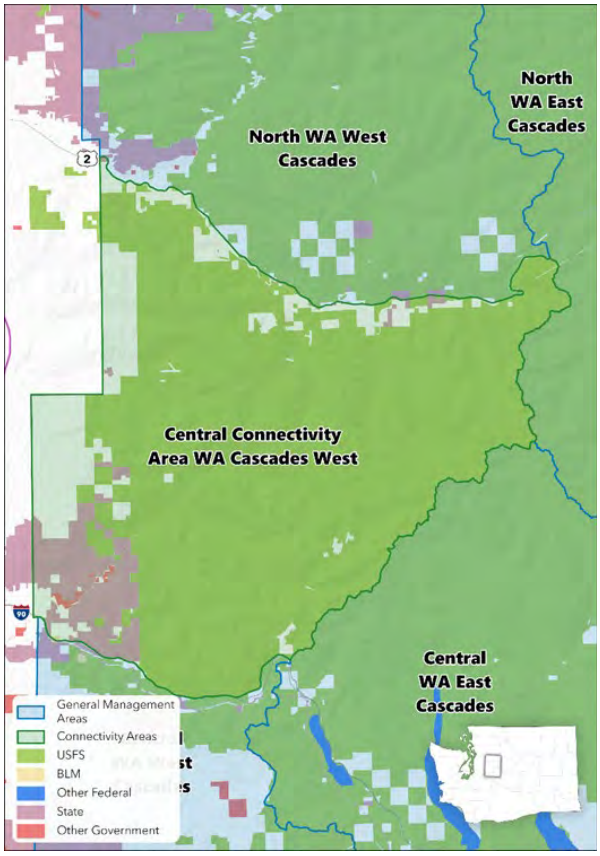
Focal Management Areas (FMAs)

While the primary function of the Canadian Connector is future opportunity to support spotted owl reintroduction in Canada, the management of blocks of habitat for spotted owl populations provides the best potential for such contributions. We recommend developing FMAs large enough to potentially support 50 spotted owl pair sites where possible. However, where the landscape or forest conditions do not allow this, smaller or more sinuous areas may be appropriate. For example, in higher elevation areas where habitat is confined to valley bottoms, large blocky FMAs may not be reasonable or effective, and smaller, but still multiple pair areas, may be a practical option.

Where smaller areas are developed due to ecological or implementation constraints, we recommend these be closer together and multiple areas designed with the intent of encouraging exchange of spotted owls between these smaller areas. Recommendations on priorities for defining and selecting Focal Management Areas within the Canadian Connector are listed in Appendix 4-2.

10.2.3.2 Central Connectivity Area WA Cascades West – Priority D

The Central Connectivity Area WA Cascades West lies north of I-90 and south of the North Washington West Cascades GMA, and west of the Cascade crest, and includes parts of the Mt Baker Snoqualmie National Forest (including parts of the Darrington and Snoqualmie Ranger Districts) as well as State lands, SOSEA lands and some private lands. It includes 81 percent Federal lands (National Forests), 6 percent State land and the remainder primarily in private ownership.



Primary reasons for selecting this area:
The primary reason for mapping this area is for connectivity between the North Washington West Cascades, North Washington East Cascades, Central Washington East Cascades, and Central Washington West Cascades GMAs. The area contains historic spotted owl sites, though no recent survey data. It contains high-quality spotted owl habitat but at a lower density than other areas in the province but does have good access for management.

Management within the Connectivity Area

The primary function of the Central Connectivity Area WA Cascades West to provide opportunities for spotted owl demographic exchange between GMAs to the north, east, and south.

The short-term focus for management in this area is to identify remaining occupied spotted owl sites and conduct barred owl management to protect these remaining sites. Longer term, focus on creating smaller blocks of habitat allowing for spotted owl populations to connect across this area and reducing overall barred owl population density to support spotted owl connections across this area.

Initially, we recommend conducting surveys of historical spotted owl sites, and areas with high quality spotted owl habitat without historical spotted owl data. If occupied spotted owl sites are found, manage all these sites using the spotted owl site management described above, with at least 11,581 acres (2 home range radii), and preferably larger.

In the longer term, we recommend developing barred owl management areas around the occupied and historic spotted owl sites, with a focus on scattered small blocks across the entire connectivity area to provide for connection. In addition, general barred owl removal in this area, designed to reduce barred owl densities, may provide opportunities for successful dispersal of spotted owls. This is not anticipated to be as intense or continuous at that within management blocks.

Where opportunities exist, consider developing FMAs large enough to potentially support 50 spotted owl pair sites where possible. However, where the landscape or forest conditions do not allow this, smaller or more sinuous areas may be appropriate. Recommendations on priorities for management within the Central Connectivity Area WA Cascades West are listed in Appendix 4-2.

10.2.3.2 Spotted Owl Special Emphasis Areas – Priority E

The State of Washington identified 10 key landscapes, referred to as Spotted Owl Special Emphasis Areas (SOSEAs), where northern spotted owl conservation in the form of demographic and/or dispersal support was important on non-federal lands. In mapping the Strategy, some SOSEAs were included in mapped GMAs, Central Connectivity Area WA Cascades West, or the Canadian Connector. Where SOSEAs lie within GMAs, connectivity areas, or the Canadian Connector, barred owl management as described for those designations would apply. Where SOSEA lands fell outside of these designations, we mapped the areas as SOSEA special designation areas.

There are four SOSEA Special Designated Areas in the Western Washington Cascades.

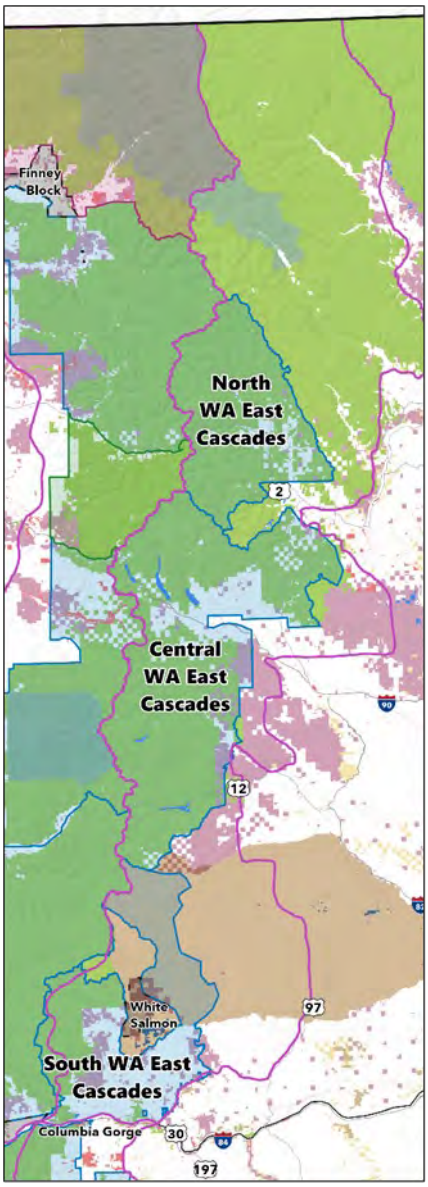
SOSEA	Forest Acres on Federal Lands	Forest Acres on State Lands	Forest Acres on Private Lands	Maximum Forest Acres Under Management
Finney Block SOSEA	1,070	13,020	44,225	14,626
Mineral Block SOSEA	37,151	2,435	65,358	26,264
Mineral Link SOSEA	0	33,414	112,672	38,969
Columbia Gorge SOSEA	10,985	9,379	11,629	7,943

For the Strategy, barred owl management in the form of removal could occur at any scale in a SOSEA. We recommend spotted owl site-based management as described in Section 9.4.1.2. of the Strategy and Section B.1 above. Removal of barred owls within and around spotted owl sites can be applied anywhere within the province and is an appropriate small scale management effort in SOSEAs. Removing barred owls within and around occupied spotted owl sites retains the existing population, increases the potential for recruitment of young, and provides source populations for recolonization of areas where barred owl management occurs. Spotted owl site

management can provide connectivity between larger block areas. Where feasible, clustering spotted owl site management into small blocks increases the functionality of this management.

10.3. Eastern Washington Cascades Province

The following is a summary of recommended management in the Eastern Washington Cascades Province. Additional details are found in Appendix 4-3.



10.3.1 Spotted Owl Site Management

Given the very limited number of spotted owls remaining in this province, it is crucial to protect the remaining spotted owls through barred owl management. Removing barred owls within and around recently occupied spotted owl sites will help to reduce the rate of spotted owl population decline as quickly as possible and prevent extinction/extirpation of the spotted owl in the province.

Maintaining spotted owl sites distributed across the province, whether within block management areas or not, will reduce the risk of loss of spotted owls in the province from catastrophic events, such as wildfire, by spreading sites across the area. Spotted owl site management also provides the opportunity for maintaining spotted owls in areas where block management is not feasible or recommended.

10.3.1.1 Spotted Owl Site Management Priorities:

Priority	Spotted Owl Site Condition
A	Sites that have been occupied by resident spotted owls (pair or single) in the last five years, or where there have been detections of spotted owls (not reaching resident status). in the past five years
B	Sites that were occupied by resident spotted owls (pair or single) between five and ten years ago
C	Sites that were occupied by resident spotted owls (pair or single) more than ten years ago, whether or not they have been surveyed recently.
D	Areas with sufficient high-quality habitat to support a spotted owl site, whether surveyed recently or not.

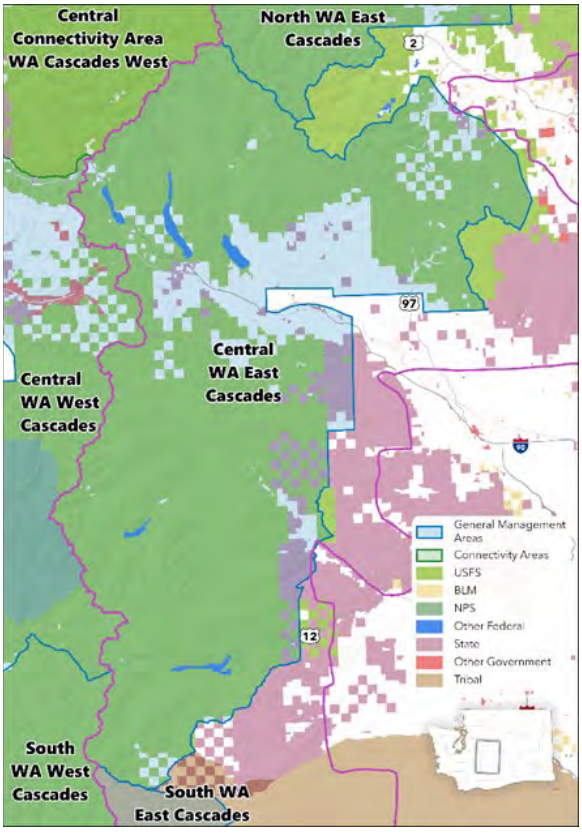
Other considerations for selection of spotted owl sites for management:

If spotted owl site management cannot be initiated on all sites, we recommend the following be considered in selecting the specific spotted owl sites for management.

- Select spotted owl sites with the most recent occupancy, particularly if surveys have been conducted on these areas in recent years. Do not discount spotted owl sites as unoccupied based on lack of recent surveys.
- Focus first on spotted owl sites with recent occupancy by pairs, then singles, then detections.
- Consider past reproductive history of the spotted owl site. Select spotted owl sites with a history of reproduction on the site where surveys are available.
- Consider the condition of habitat in the area, particularly loss of habitat to fire or other actions since the last surveys. Spotted owl sites where much of the habitat has been removed, from high severity fire or timber harvest would be a lower priority.

10.3.2 General Management Areas

10.3.2.1 Central Washington East Cascades GMA - Priority A



The Central Washington East Cascades GMA lies east of the Cascade crest, north of the Yakama Nation Reservation and includes the Naches Ranger District, the Cle Elum Ranger District and parts of the Wenatchee River Ranger district on the Okanogan-Wenatchee National Forest as well as State SOSEA lands and some private lands. It includes 81 percent Federal lands (National Forests), 5 percent State land and the remainder primarily in private ownership.

Primary reasons for selecting this area:
This GMA contains the most current and recent known spotted owl pair activity in the Washington East Cascades Physiographic province. It includes the Cle Elum Spotted Owl Demography Study Area, with its historic and recent spotted owl data.

The Central Washington East Cascades GMA is centrally located, allowing for connectivity to GMAs to the north and west. It contains a diversity of habitat types, from relatively cool/moist to warmer/drier. This allows for management in the range of habitat types that spotted owl occupy in the province. Historically, some of the highest fecundity rates for spotted owls occurred in the Cle Elum demography study area. Some of the few remaining spotted owl pairs are found in the warmer and drier portions of

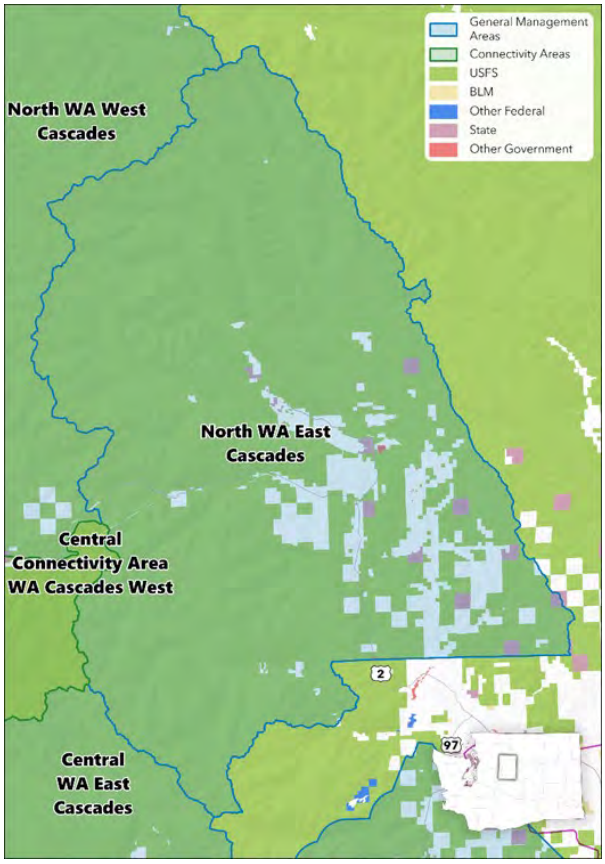
this GMA. By including a range of forest types in this GMA that connect warmer/drier forest types to relatively cooler/moister forest types that are predicted to function as fire refugia, particularly in the mid, to long term future, we build in connectivity to more resilient and diverse habitat types for a future spotted owl population in this GMA.

Focal Management Areas (FMAs)

We recommend developing FMAs large enough to potentially support 50 spotted owl pair sites where possible. However, where the landscape or forest conditions do not allow this, smaller or more sinuous areas may be appropriate. For example, in higher elevation areas where habitat is confined to valley bottoms, large blocky FMAs may not be reasonable or effective, and smaller, but still multiple pair areas, may be a practical option. These may be more sinuous in nature due to the habitat limitations.

Where smaller areas are developed due to ecological or implementation constraints, we recommend these be closer together and multiple areas designed with the intent of encouraging exchange of spotted owls between these smaller areas. Coordinate FMA locations with the spotted owl site management described above. Including recently occupied spotted owl sites in FMAs provides a potential core population for development of spotted owl populations as barred owl populations are reduced. Recommendations on priorities for defining and selecting Focal Management Areas within the Central Washington East Cascades GMA are listed in Appendix 4-3.

10.3.2.2 North Washington East Cascades GMA - Priority B



North Washington East Cascades GMA lies east of the Cascade crest, north of the Cle Elum Ranger District and includes most of the Wenatchee River Ranger district on the Okanogan-Wenatchee National Forest as well as State SOSEA lands and some private lands. It lies on both the north and south side of the Hwy 2 corridor and stretches north to Entiat ridge and the south boundary of the Entiat Ranger District. It includes 90 percent Federal lands (National Forests), 1 percent State land and the remainder primarily in private ownership.

Primary reasons for selecting this area:
This GMA contains current and recent known spotted owl presence and pair activity. This GMA has a high amount and density of habitat capable of supporting spotted owl populations and connectivity to areas with high densities of spotted owl habitat and recent spotted owl presence to the South. It contains a diversity of habitat types (relatively cool/moist to warmer/drier for WA East Cascades), which should improve long term resilience of the GMA to substantial loss from catastrophic wildfire and provide connectivity for spotted owls in less resilient areas to areas identified as fire refugia.

Focal Management Areas (FMAs)

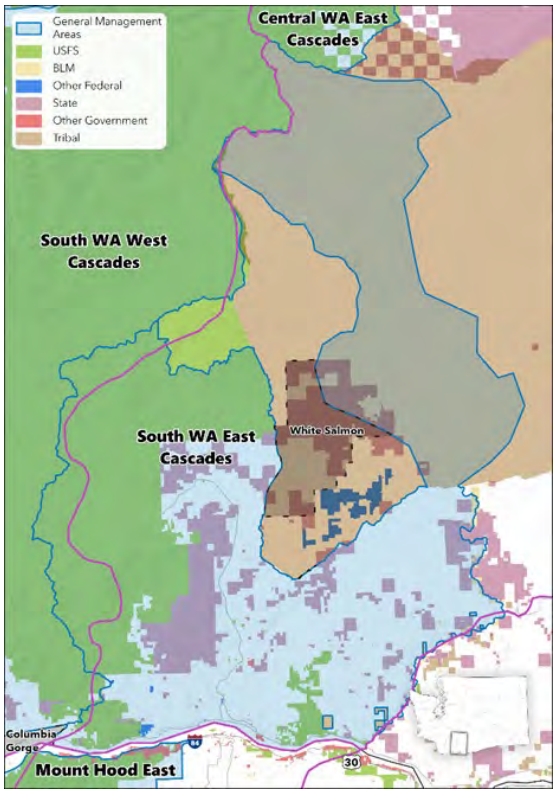
We recommend developing FMAs large enough to potentially support 50 spotted owl pair sites where possible. However, where the landscape or forest conditions do not allow this, smaller or more sinuous areas may be appropriate. For example, in higher elevation areas where habitat is confined to valley bottoms, large blocky FMAs may not be reasonable or effective, and smaller, but still multiple pair areas, may be a practical option. These may be more sinuous in nature due to the habitat limitations.

Where smaller areas are developed due to biological or implementation constraints, we recommend these be closer together and multiple areas designed with the intent of encouraging exchange of spotted owls between these smaller areas.

Coordinate FMA locations with the spotted owl site management described above. Including recently occupied spotted owl sites in FMAs provides a potential core population for development of spotted owl populations as barred owl populations are reduced.

Recommendations on priorities for defining and selecting Focal Management Areas within the North Washington East Cascades GMA are listed in Appendix 4-3.

10.3.2.3 South Washington East Cascades GMA - Priority C



The South Washington East Cascades GMA lies north of the Columbia River and east of the Cascade crest, and includes the eastern most parts of the Gifford Pinchot Nation Forest (mostly on the Mt. Adams Ranger district) as well as State lands, SOSEA lands and some private lands. It stretches north to the southern boundary of the Yakama Nation and includes parts of the Columbia River Gorge National Scenic Area on its southern edge. It includes 31 percent Yakama Nation lands, 21 percent Federal lands (National Forests), 10 percent State land and the remainder primarily in private ownership.

Primary reasons for selecting this area:
This GMA contains historic spotted owl sites, but no recent surveys, and therefore, current presence is unknown. This GMA has a high amount and density of habitat capable of supporting spotted owl populations, but lower than the two northern GMAs in this province. This GMA has connectivity to areas with high densities of spotted owl habitat and recent spotted owl presence to the North, West and South habitat. It contains a diversity of habitat types (relatively cool/moist to warmer/drier for WA East Cascades), which should improve long term resilience of the GMA to substantial loss from catastrophic wildfire and provide connectivity for spotted owls in less resilient areas to areas identified as fire refugia. The southeastern portion of this GMA has lower density of spotted owl habitat, but juvenile spotted owls from the Yakama Reservation have been located in this area.

Focal Management Areas (FMAs)

We recommend developing FMAs large enough to potentially support 50 spotted owl pair sites where possible. However, where the landscape or forest conditions do not allow this, smaller or more sinuous areas may be appropriate. Where smaller areas are developed due to biological or implementation constraints, we recommend these be closer together and multiple areas designed with the intent of encouraging exchange of spotted owls between these smaller areas.

Coordinate FMA locations with the spotted owl site management described above. Including recently occupied spotted owl sites in FMAs provides a potential core population for development of spotted owl populations as barred owl populations are reduced. Recommendations on priorities for defining and selecting Focal Management Areas within the South Washington East Cascades GMA are listed in Appendix 4-4.

10.3.3 Special Designated Areas:

10.3.3.1 Spotted Owl Special Emphasis Areas – Priority E

The State of Washington identified 10 key landscapes, referred to as Spotted Owl Special Emphasis Areas (SOSEAs), where northern spotted owl conservation in the form of demographic and/or dispersal support was important on non-federal lands. In mapping the Strategy, some SOSEAs were included in mapped GMAs, Central Connectivity Area WA Cascades West, or the Canadian Connector. Where SOSEAs lie within GMAs, barred owl management as described for those designations would apply. Where SOSEA lands fell outside of these designations, we mapped the areas as SOSEA special designation areas.

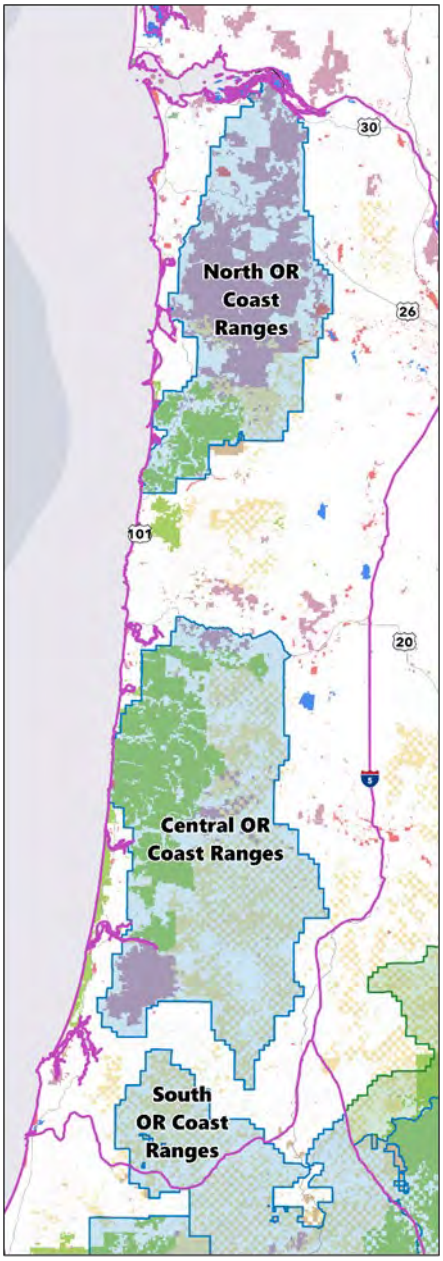
There is one SOSEA Special Designated Areas in the Eastern Washington Cascades Province.

SOSEA	Forest Acres on Federal lands	Forest Acres on State Lands	Forest Acres on Private Lands	Maximum Forest Acres Under Management
White Salmon SOSEA	0	28,005	16,903	8,522

For the Strategy, barred owl management in the form of removal could be occur at any scale in a SOSEA. We recommend spotted owl site-based management as described in Section 9.4.1.2. of the Strategy and Section B.1 above. Removal of barred owls within and around spotted owl sites can be applied anywhere within the province and is an appropriate small scale management effort in SOSEAs. Removing barred owls within and around occupied spotted owl sites retains the existing population, increases the potential for recruitment of young, and provides source populations for recolonization of areas where barred owl management occurs. Spotted owl site management can provide connectivity between larger block areas. Where feasible, clustering spotted owl site management into small blocks increases the functionality of this management.

10.4 Oregon Coast Ranges Province

The following is a summary of recommended management in the Oregon Coast Ranges Province. Additional details are found in Appendix 4-4.



10.4.1 Spotted Owl Site Management

Given the limited number of spotted owls remaining in this province, and the high pressure from barred owls, it is crucial to protect the remaining spotted owls through barred owl management. Managing recently occupied spotted owl sites will help to reduce the rate of spotted owl population decline as quickly as possible and prevent extinction/extirpation of the spotted owl in the province.

10.4.1.1. Spotted Owl Site Management Priorities:

Priority	Spotted Owl Site Condition
A	Sites that h where there have been detections of spotted owls (not reaching resident status), in the past five years
C	Sites that were occupied by resident spotted owls more than five years ago, with or without recent surveys, but without detections in the last five years, as well as areas with sufficient high-quality habitat to support a spotted owl site, and no recent surveys.
D	Areas with sufficient high-quality habitat to support a spotted owl site, with recent surveys but no recent detections.

Other considerations for selection of spotted owl sites for management:

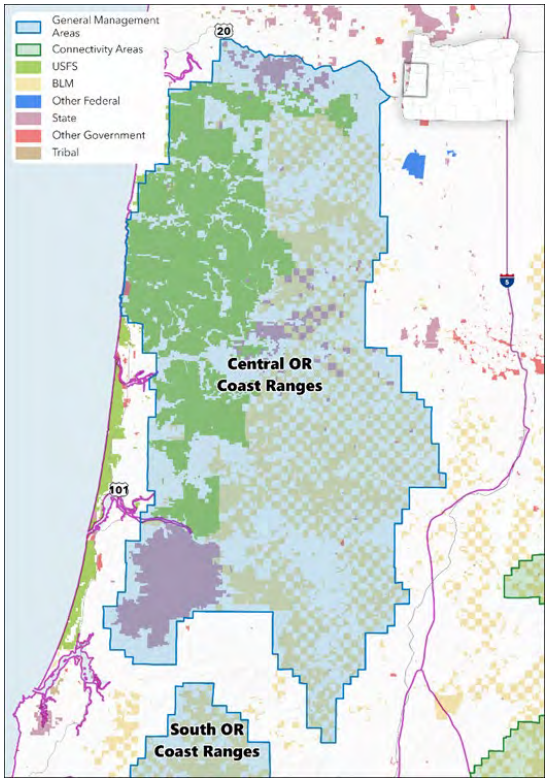
If spotted owl site management cannot be initiated on all sites, we recommend the following be considered in selecting the specific spotted owl sites for management.

- Select spotted owl sites with the most recent occupancy, and where information is available, the best recent reproduction and demographic performance and history of occupancy.
- Preferentially select spotted owl sites with good accessibility, to maximize the efficiency of implementation.
- Consider the condition of habitat in the area. Select spotted owl sites with abundant high-quality habitat.

- Choose spotted owl sites within GMAs, near GMAs, or creating stepping-stone connectivity between GMAs.

10.4.2 General Management Areas

10.4.2.1 Central Oregon Coast Ranges GMA - Priority A



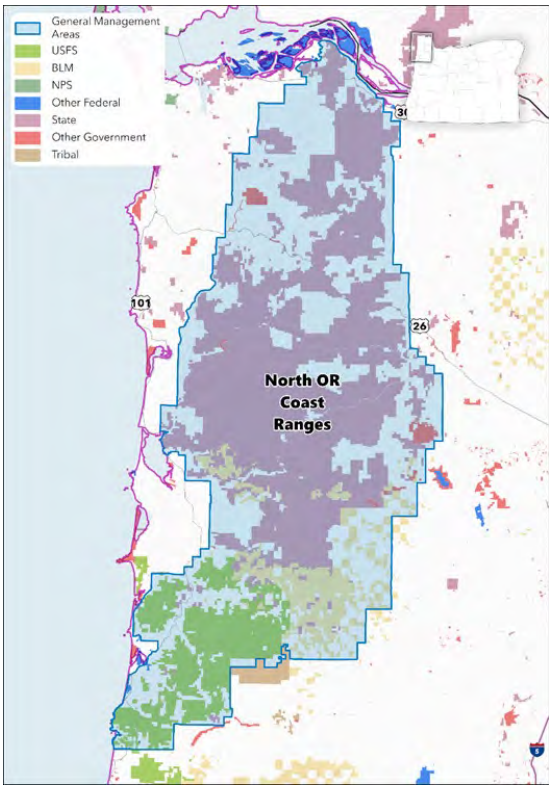
The Central Oregon Coast Ranges GMA lies in the south-central portion of the Oregon Coast Ranges Province and spans the province from west to east, including some adjacent areas within the forested foothills of the Willamette Valley Province. It includes the Elliott State Research Forest, the largest contiguous portion of the Siuslaw National Forest, and adjacent and interspersed Bureau of Land Management, State, and private lands. It includes 77 percent Federal lands (National Forests and BLM), 3 percent State land and the remainder primarily in private ownership.

Primary reasons for selecting this area:
This GMA includes highest habitat density within the Oregon Coast Ranges Province. The GMA includes the Oregon Coast Ranges and Tyee Demography Study Areas, with their historical and recent spotted owl data and planned higher level of monitoring.

Focal Management Areas (FMAs)

In this GMA, we recommend developing FMAs large enough to potentially support 50 spotted owl pair sites. Where smaller areas are developed due to biological or implementation constraints, we recommend these be closer together and multiple areas designed with the intent of encouraging exchange of spotted owls between these smaller areas. Coordinate FMA locations with the spotted owl site management described above as including recently occupied sites in FMAs provides a potential core population for development of spotted owl populations. Recommendations on priorities for defining and selecting Focal Management Areas within the Central Oregon Coast Ranges GMA are listed in Appendix 4-4.

10.4.2.2 North Oregon Coast Ranges GMA - Priority B



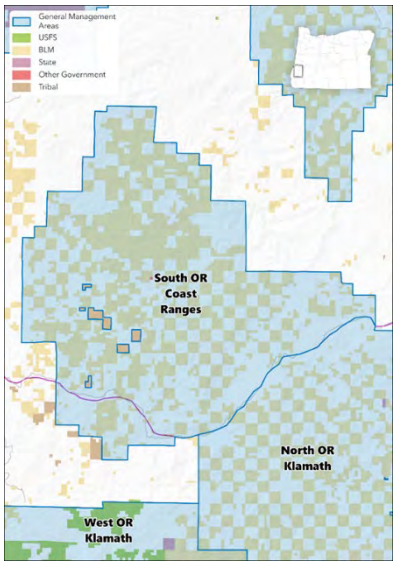
The North Oregon Coast Ranges GMA lies in the northern portion of the Oregon Coast Ranges Province and spans the province from west to east. It includes most of the Clatsop and Tillamook State Forests, adjacent BLM lands, and the northernmost portion of the Siuslaw National Forest. Saddle Mountain State Natural Area and the municipal watershed for the city of Astoria are also within the GMA. This GMA also contains substantial amounts of adjacent and interspersed private lands, where the density and quality of suitable spotted owl habitat is low, but which may provide habitat for barred owls. It includes 17 percent Federal lands (National Forests and BLM), 44 percent State land and the remainder primarily in private ownership.

Primary reasons for selecting this area:
In spite of high densities of barred owls and relatively low-quality spotted owl habitat, spotted owls persist on this landscape. Where habitat remains and is reserved, habitat quantity and quality are likely to increase over time as the landscape recovers from historical fire and harvest. The Oregon Department of Forestry has expressed interest in barred owl management on their lands and has drafted an HCP that includes barred owl management as a conservation measure. A relatively detailed survey history is available for most of the area within the GMA, providing information for creating FMAs. The GMA also includes the northernmost area of the Oregon Coast Ranges Demography Study Area. This GMA includes the northernmost population of spotted owls within Oregon.

Focal Management Areas (FMAs)

In this GMA, we recommend developing FMAs large enough to potentially support 50 spotted owl pair sites in large block areas. However, where the landscape or forest conditions do not allow this, smaller or more sinuous areas may be appropriate. Where smaller areas are developed due to ecological or implementation constraints, we recommend these be closer together and multiple areas designed with the intent of encouraging exchange of spotted owls between these smaller areas. Coordinate FMA locations with the spotted owl site management described above as including recently occupied sites in FMAs provides a potential core population for development of spotted owl populations. Recommendations on priorities for When defining and selecting Focal Management Areas within the North Oregon Coast Ranges GMA are listed in Appendix 4-4.

10.4.2.3 South Oregon Coast Ranges GMA - Priority C



The South Oregon Coast Ranges GMA lies in the southernmost portion of the Oregon Coast Ranges Province and includes small areas of the Oregon Klamath Province to the south. It consists of BLM checkerboard lands with private lands interspersed. It includes 45 percent Federal lands (BLM) and the remainder primarily in private ownership.

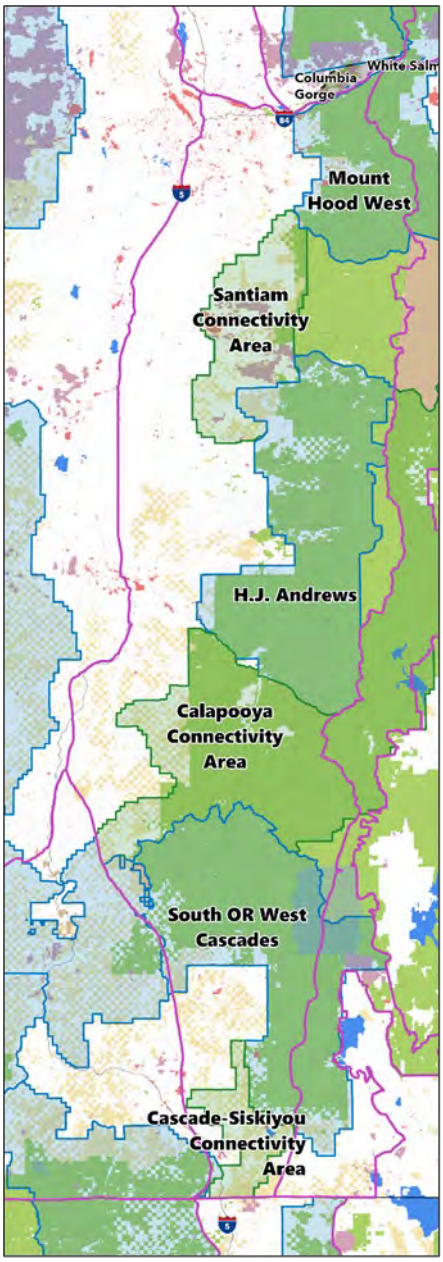
Reason for selecting this area:
The GMA includes the southernmost area of spotted owl habitat and public land in the province. The location along the southern border with the Oregon Klamath Province, immediately adjacent to the North Oregon Klamath GMA allows for connectivity to other Oregon Klamath GMAs and to management areas in the Oregon West Cascades Province. If healthy spotted owl populations can be supported here, they could provide for natural recolonization to neighboring areas in multiple provinces.

Focal Management Areas (FMAs)

In this GMA, we recommend developing at least one FMA large enough to potentially support 50 spotted owl pair sites. In this GMA, development of multiple large FMAs would require designation of at least one FMA be shared between this GMA and the North Oregon Klamath GMA. Therefore, in this GMA, smaller or more sinuous areas may be appropriate in some areas. Where smaller areas are developed due to ecological or implementation limitations, we recommend these be closer together and multiple areas designed with the intent of encouraging exchange of spotted owls between these smaller areas. Coordinate FMA locations with the spotted owl site management described above, as including recently occupied sites in FMAs provides a potential core population for development of spotted owl populations once barred owl populations are reduced. Recommendations on priorities for defining and selecting Focal Management Areas within the South Oregon Coast Ranges GMA are listed in Appendix 4-4.

10.5 Western Oregon Cascades Province

The following is a summary of recommended management in the Western Oregon Cascades Province. Additional details are found in Appendix 4-5.



10.5.1 Spotted Owl Site Management

Although the number of spotted owls remaining in this province is larger than in some other provinces, spotted owl populations continue to decline, and therefore it is crucial to protect the remaining spotted owls through barred owl management, especially in the northern portions of the province where the barred owl influence is likely to be strongest and local extirpations may be more imminent.

Managing recently occupied spotted owl sites will help to reduce the rate of spotted owl population decline as quickly as possible and prevent extinction/extirpation of the spotted owl in the province. At present, the prevention of local extirpation is especially important in the northern portions of the province, but reducing the rate of population decline is important throughout.

Maintaining spotted owl sites distributed across the province, whether within block management areas or not, will reduce the risk of loss of spotted owls in the province from catastrophic events, such as wildfire, by spreading sites across the area. Managing spotted owl sites also provides the opportunity for maintaining spotted owls in areas where block management is not feasible or recommended. This approach applies across the entire province, whether or not the locations are within a GMA or other mapped designation.

10.5.1.1. Spotted Owl Site Management Priorities:

Priority	Spotted Owl Site Condition
A	Sites that have been occupied by resident spotted owls (pair or single) in the last five years, or where there have been detections of spotted owls (not reaching resident status), in the past five years
C	Sites that were occupied by resident spotted owls more than five years ago, with or without recent surveys, but without detections in the last five years, as well as areas with sufficient high-quality habitat to support a spotted owl site, and no recent surveys.
D	Areas with sufficient high-quality habitat to support a spotted owl site, with recent surveys but no recent detections.

10.5.1.2 Spotted Owl Site Management Priorities:

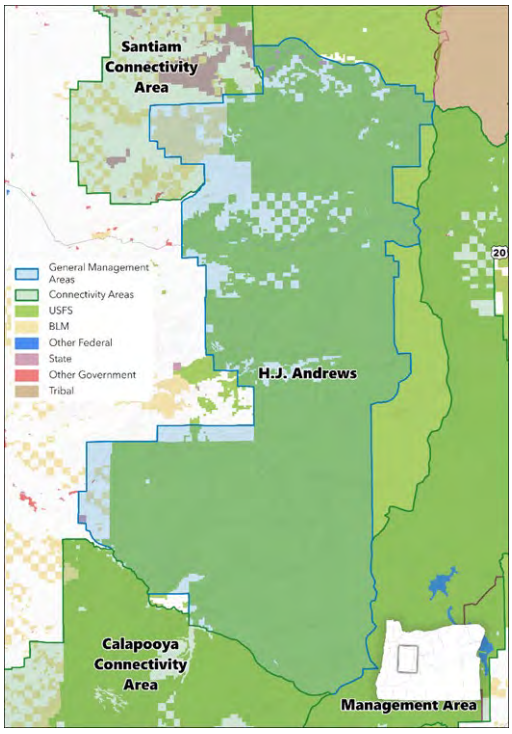
Other considerations for selection of spotted owl sites for management:

If spotted owl site management cannot be initiated on all sites, we recommend the following be considered in selecting the specific spotted owl sites for management.

- Select spotted owl sites with the most recent occupancy.
- Focus first on spotted owl sites with recent occupancy by pairs, then singles, then detections.
- Where relevant information is available, select spotted owl sites with the best recent demographic performance (i.e., select the sites where the largest numbers of young have fledged).
- Preferentially select spotted owl sites with good accessibility, to maximize the efficiency of implementation.
- Consider the condition of habitat in the area. All other things being equal, select spotted owl sites with abundant high-quality habitat. Sites that have lost substantial amounts of habitat to harvest or other disturbances may be lower priority, other factors being equal.
- Choose spotted owl sites within GMAs, near GMAs, or creating stepping-stone connectivity between GMAs.
- Consider the history of spotted owl use at the site. Where historical survey information is available, focus first on spotted owl sites with a long history of pair occupancy, including reproduction.

10.5.2 General Management Areas

10.5.2.1 H.J. Andrews GMA - Priority A



The H.J. Andrews GMA is located in the central portion of the Oregon West Cascades Province, and generally includes all of the mid-elevation centered on the H.J. Andrews Experimental Forest, with additional areas to the north and south. It includes a large portion of the Willamette National Forest, as well as some lower elevation areas managed by the BLM Northwest Oregon District, a few small parcels of State lands, and adjacent and interspersed private lands. It includes 89 percent Federal lands (National Forests and BLM) and the remainder primarily in private ownership.

Primary reasons for selecting this area:
This GMA includes the central portion of the spotted owl range within this province, and area with high habitat density. The GMA includes the H.J. Andrews Demography Study Areas, with its historical and recent

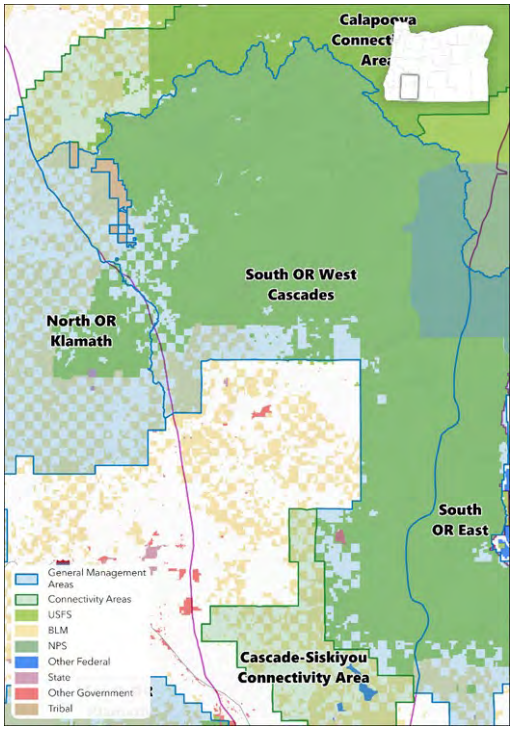
spotted owl data and planned higher level of monitoring.

Demographic information from the study area indicates that spotted owls in the Study Area maintained better demographic rates, more characteristic of areas further south, in spite of having higher barred owl occupancy rates more characteristic of areas further north. This may be due to the high quantity and quality of available spotted owl habitat. We interpret this as an indication that the potential for population recovery is high here, once the pressure from barred owls is reduced. However, recent information indicating the possibility of rapid declines in spotted owl numbers in this area highlights the urgency of management here. Taken together, these factors indicate that rapid implementation of GMA management in this area may have the greatest impact on both the short-term likelihood of extirpation, as well as the long-term likelihood of recovery, in this province.

Focal Management Areas (FMAs)

In this GMA, we recommend developing FMAs large enough to support as many spotted owl pair sites as possible, up to 50 pair sites per FMA. Where smaller areas are developed due to ecological or implementation constraints, we recommend these be closer together and multiple areas designed with the intent of encouraging exchange of spotted owls between these smaller areas. In areas where habitat connectivity is limited, spotted owl site management may help to provide connectivity between smaller FMAs. Recommendations on priorities for defining and selecting Focal Management Areas within the H.J. Andrews GMA are listed in Appendix 4-5.

10.5.2.2 South Oregon West Cascades GMA - Priority B



The South Oregon West Cascades GMA is located in the southern portion of the Oregon West Cascades Province and spans the province from west to east and includes a small neighboring area of the Oregon Klamath Province. It is primarily made up of Federal lands, including portions of Umpqua and Rogue River Siskiyou National Forests, Crater Lake National Park, and BLM lands associated with the Medford and Roseburg Districts. It also includes adjacent and interspersed private lands, and one county park surrounded by Forest Service lands. It includes 90 percent Federal lands (National Forests and BLM) and the remainder primarily in private ownership.

Primary reasons for selecting this area:
This area allows for connectivity to both the Oregon East Cascades and Oregon Klamath Provinces, and from there to the Oregon Coast Ranges Province and other provinces in California. It includes the largest concentrations of spotted owl habitat in the southern portion of the province. A portion of the area overlaps the South Cascades Demographic Study

Area, with its historical and recent spotted owl data. Demographic data from the South Cascades study area indicates that spotted owls here have a potential for high fecundity if the negative influence of barred owls can be reduced.

Focal Management Area (FMA) designation.

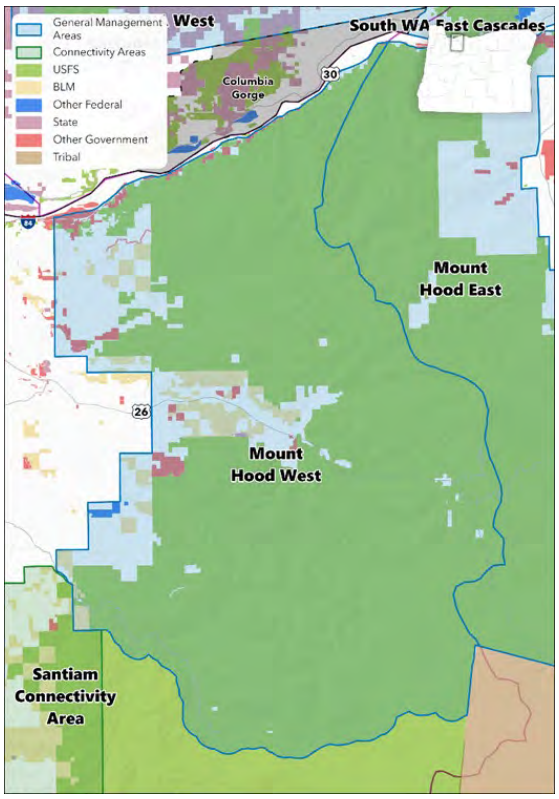
In this GMA, we recommend developing FMAs large enough to support as many spotted owl pair sites as possible, up to 50 pair sites per FMA. It may be beneficial to designate FMAs that span the boundary between this GMA and the South Oregon East Cascades GMA, or the North Oregon Klamath GMA. Alternatively, smaller FMAs could be designated on either side of a given boundary, but could effectively function as one spotted owl population.

Where smaller areas are developed due to ecological or implementation constraints, we recommend these be closer together and multiple areas designed with the intent of encouraging exchange of spotted owls between these smaller areas.

Coordinate FMA locations with the spotted owl site management described above. Including recently occupied spotted owl sites in FMAs provides a potential core population for development of spotted owl populations once barred owl populations are reduced. Recommendations on priorities for defining and selecting Focal Management Areas within the South Oregon West Cascades GMA are listed in Appendix 4-5.

10.5.2.3 Mount Hood West GMA - Priority C

The Mount Hood West GMA is located in the northernmost portion of the Oregon West Cascades Province and nearly spans the province from west to east. It is primarily made up of Federal lands on the Mount Hood National Forest, but also includes of BLM lands associated with the Northwest Oregon District. Additionally, the GMA includes small areas of municipal lands and private lands, where these are adjacent to or interspersed with the Federal lands described above. Notably, the GMA includes the Bull Run watershed, which is located mainly on National Forest lands and provides most of the municipal drinking water supply for the City of Portland. It includes 87 percent Federal lands (National Forests and BLM) and the remainder primarily in private ownership.



Reason for selecting this area:
This GMA includes the northern extent of spotted owl distribution in the Oregon West Cascades and includes large concentrations of spotted owl habitat. This area provides many opportunities for

connectivity to the Oregon East Cascades Province, and some limited potential for connectivity to the Washington West Cascades Province to the north. Although historical and current patterns of spotted owl dispersal across the Columbia River are not well understood, there is some possibility that it would occur here, given the relatively narrow width of open water southwest of Cascade Locks, and the presence of spotted owl habitat on both sides of the river, albeit at lower concentrations than farther east.

Focal Management Area (FMA) designation.

In this GMA, we recommend developing FMAs large enough to support as many spotted owl pair sites as possible, up to 50 pair sites per FMA. It may be beneficial to designate FMAs that span the boundary between the Mount Hood West and Mount Hood East GMAs.

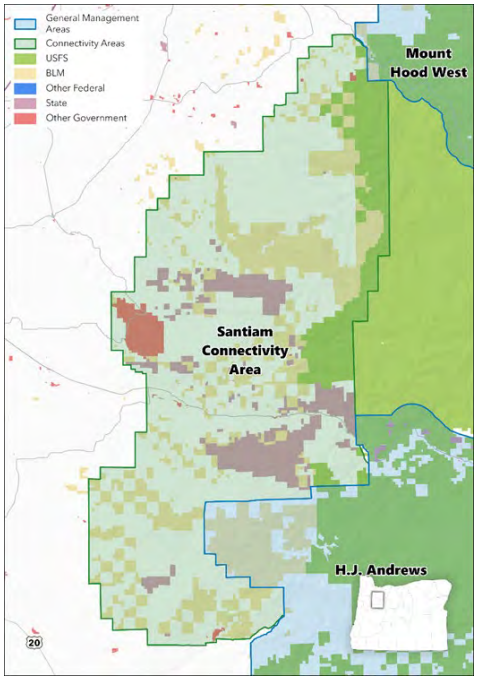
Where smaller areas are developed due to ecological or implementation constraints, we recommend these be closer together and multiple areas designed with the intent of encouraging exchange of spotted owls between these smaller areas.

Coordinate FMA locations with the spotted owl site management described above. Including recently occupied spotted owl sites in FMAs provides a potential core population for development of spotted owl populations once barred owl populations are reduced. In areas where habitat connectivity is limited, spotted owl site management may help to provide connectivity between smaller FMAs. Recommendations on priorities for defining and selecting Focal Management Areas within the Mount Hood West GMA are listed in Appendix 4-5.

10.5.3 Special Designated Areas:

10.5.3.1 Santiam Connectivity Area - Priority D

The Santiam Connectivity Area is located in the northern portion of the Oregon West Cascades Province, at lower elevations along the boundary with the Willamette Valley Province and including some small adjacent areas of the Willamette Valley Province. It includes 32 percent Federal lands, including the southwestern corner of the Mount Hood National Forest, the northeastern corner of the Willamette National Forest, and BLM lands associated with the Northwest Oregon District; 9 percent State lands, including the Santiam State Forest and Silver Falls State Park; some small areas of county lands; and the remainder in private ownership.



Reason for selecting this area:
The large and severe Beachie Creek and Lionshead fires of 2020 constricted north-south connectivity between the northern and central portions of the Oregon West Cascades Province. The area within this Connectivity

Area can provide a low-elevation pathway connecting these two portions of the province. While recent survey data is limited, this area contains historical spotted owl activity centers and some concentrations of habitat, although habitat is sparser here than in many other portions of the province.

Management within the Connectivity Area.

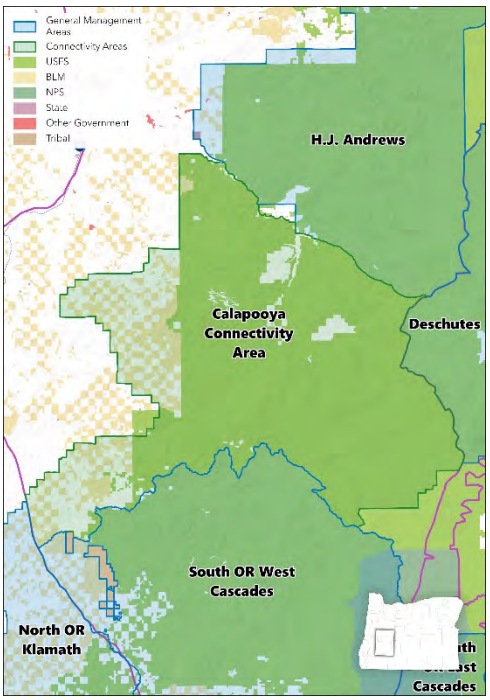
The short-term focus for management in this area is to identify remaining occupied spotted owl sites and conduct barred owl management to protect these remaining sites. Longer term, focus on creating smaller blocks of habitat allowing for spotted owl populations to connect across this area and reducing overall barred owl population density to support spotted owl connections across this area.

Initially, we recommend conducting surveys of historical spotted owl sites, and areas with high quality spotted owl habitat without historical spotted owl data. If occupied spotted owl sites are found, manage all these sites using the spotted owl site management described above, with at least 11,581 acres (2 home range radii), and preferably larger.

In the longer term, we recommend developing barred owl management areas around the occupied and historic spotted owl sites, with a focus on scattered small blocks across the entire connectivity area to provide for connection. In addition, general barred owl removal in this area, designed to reduce barred owl densities, may provide opportunities for successful dispersal of spotted owls. This is not anticipated to be as intense or continuous at that within management blocks.

Recommendations for selecting spotted owl sites and small blocks for management within the Santiam Connectivity Area are listed in Appendix 4-5.

10.5.3.2 Calapooya Connectivity Area - Priority D



The Calapooya Connectivity Area is located in the south-central portion of the Oregon West Cascades Province and spans the province from west to east. It is situated between the H.J. Andrews and South Oregon West Cascades GMAs and borders the North Oregon Klamath GMA to the southwest and the Deschutes GMA to the northeast. It includes 85 percent Federal lands, including portions of the Willamette and Umpqua National Forests, and BLM lands associated with the Northwest Oregon and Roseburg Districts. It also includes adjacent and interspersed areas of private ownership.

Reason for selecting this area:
The area lies between the H.J. Andrews and South Oregon West GMAs to the north and south, respectively, and between the North Oregon Klamath GMA to the west and the Deschutes GMA to the east, respectively. It is intended to facilitate connectivity between all of these areas.

Management within the Connectivity Area.

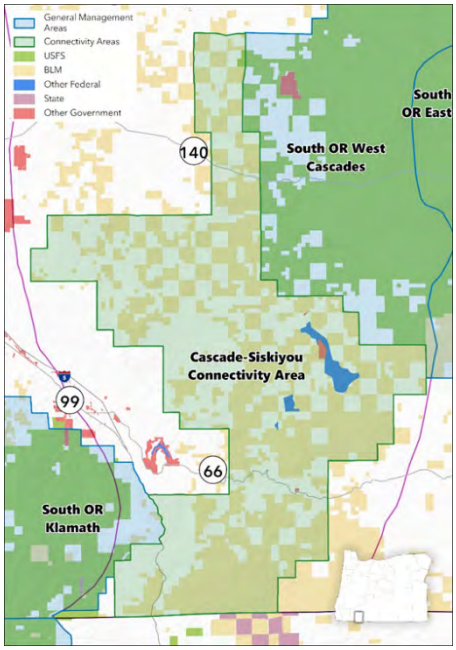
The short-term focus for management in this area is to identify remaining occupied spotted owl sites and conduct barred owl management to protect these remaining sites. Longer term, focus on creating smaller blocks of habitat allowing for spotted owl populations to connect across this area and reducing overall barred owl population density to support spotted owl connections across this area.

Initially, we recommend conducting surveys of historical spotted owl sites, and areas with high quality spotted owl habitat without historical spotted owl data. If occupied spotted owl sites are found, manage all these sites using the spotted owl site management described above, with at least 11,581 acres (2 home range radii), and preferably larger.

In the longer term, we recommend developing barred owl management areas around the occupied and historic spotted owl sites, with a focus on scattered small blocks across the entire connectivity area to provide for connection. In addition, general barred owl removal in this area, designed to reduce barred owl densities, may provide opportunities for successful dispersal of spotted owls. This is not anticipated to be as intense or continuous at that within management blocks.

Recommendations for selecting spotted owl sites and small blocks for management within the Calapooya Connectivity Area are listed in Appendix 4-5.

10.5.3.3 Cascade-Siskiyou Connectivity Area - Priority D



The Cascade-Siskiyou Connectivity Area is located in the southernmost portion of the Oregon West Cascades Province and spans the province from west to east. It is situated between the South Oregon West Cascades and the South Oregon Klamath GMAs. It includes 51 percent Federal lands, mostly within the Cascade-Siskiyou National Monument, as well as other BLM lands associated with the Medford District. It includes a very small area of the Rogue River Siskiyou National Forest, as well as a county park, and adjacent and interspersed areas of private ownership.

Reason for selecting this area:
This Connectivity Area provides another avenue for connectivity between the Oregon West Cascades and Oregon Klamath Provinces. The Connectivity Area is located near, but not quite bordering, both the South Oregon East Cascades and the North California Klamath GMA, and may facilitate connection across four provinces: Oregon East and West Cascades, and Oregon and California Klamath.

Management within the Connectivity Area.

The short-term focus for management in this area is to identify remaining occupied spotted owl sites and conduct barred owl management to protect these remaining sites. Longer term, focus on creating smaller blocks of habitat allowing for spotted owl populations to connect across this area and reducing overall barred owl population density to support spotted owl connections across this area.

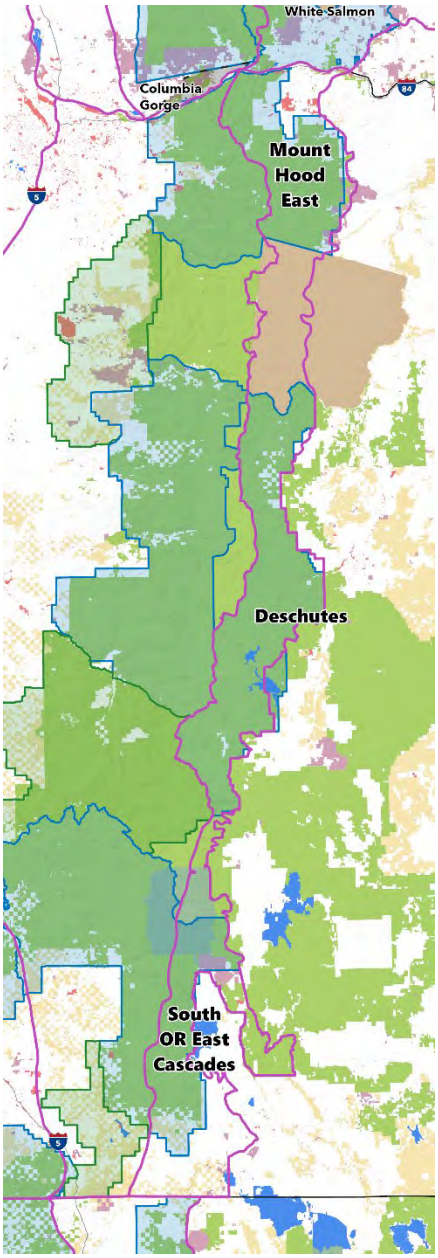
Initially, we recommend conducting surveys of historical spotted owl sites, and areas with high quality spotted owl habitat without historical spotted owl data. If occupied spotted owl sites are found, manage all these sites using the spotted owl site management described above, with at least 11,581 acres (2 home range radii), and preferably larger.

In the longer term, we recommend developing barred owl management areas around the occupied and historical sites, with a focus on scattered small blocks across the entire connectivity area to provide for connection. In addition, general barred owl removal in this area, designed to reduce barred owl densities, may provide opportunities for successful dispersal of spotted owls. This is not anticipated to be as intense or continuous at that within management blocks.

Recommendations for selecting spotted owl sites and small blocks for management within the Cascade-Siskiyou Connectivity Area are listed in Appendix 4-5.

10.6 Eastern Oregon Cascades Province

The following is a summary of recommended management in the Eastern Oregon Cascades Province. Additional details are found in Appendix 4-6.



10.6.1 Spotted Owl Site Management

Given the limited number of spotted owls in this province, it is crucial to protect the remaining spotted owls through barred owl management. Managing recently occupied spotted owl sites will help to reduce the rate of spotted owl population decline as quickly as possible and prevent extinction/extirpation of the spotted owl in the province.

Maintaining spotted owl sites distributed across the province, whether within block management areas or not, will reduce the risk of loss of spotted owls in the province from catastrophic events, such as wildfire, by spreading sites across the area. Managing spotted owl sites also provides the opportunity for maintaining spotted owls in areas where block management is not feasible or recommended. This approach applies across the entire province, whether or not the locations are within a GMA.

10.6.1.1 Spotted Owl Site Management Priorities:

Priority	Spotted Owl Site Condition
A	Sites that have been occupied by resident spotted owls (pair or single) in the past five years, or where there have been detections of spotted owls (not reaching resident status), in the past five years
C	Sites that were occupied by resident spotted owls between five and ten years ago, with or without recent surveys, but without detections in the last five years, as well as historical spotted owl sites and other areas with sufficient high-quality habitat to support a spotted owl site, and no recent surveys.
D	Historical spotted owl sites last known to be occupied by resident spotted owls more than ten years ago, with recent surveys and no recent detections.
E	Historically unsurveyed areas with sufficient high-quality habitat to support a spotted owl site, with recent surveys but no recent detections.

Other considerations for selection of spotted owl sites for management:

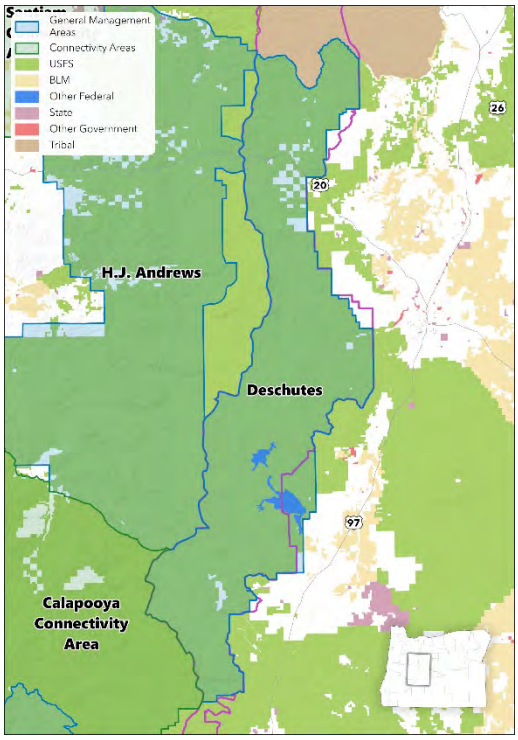
- If spotted owl site management cannot be initiated on all sites, we recommend the following be considered in selecting the specific spotted owl sites for management.
- Select spotted owl sites with the most recent detections. Focus first on known territorial pairs or singles, then on other detections and on spotted owl sites with the best recent demographic performance.
- Where historical survey information is available, focus first on spotted owl sites with a steady recent history of occupancy, and next on historical sites with a long history of pair occupancy, including reproduction. Prioritize areas with known recent occupancy over areas without recent surveys, but prioritize areas without recent surveys over areas that were recently surveyed without any recent detections.
- Consider the condition of habitat in the area. Select spotted owl sites with abundant high-quality habitat.
- Choose spotted owl sites within GMAs, near GMAs, or creating stepping-stone connectivity between GMAs.
- Where possible, choose spotted owl sites with lower risk of habitat disturbance, for example, areas with lower fire risk.

Additional Management Recommendations:

In addition to the general recommendations in Section 9.4.1.2., larger management buffers would be appropriate in portions of the Deschutes GMA where connectivity is lacking and on the Ya Whee Plateau. There may be additional areas, especially outside of GMAs, where larger buffers are appropriate, or may become appropriate in the future following habitat losses due to wildfire, insect damage, drought mortality, or other factors.

10.6.2 General Management Areas

10.6.2.1 Deschutes GMA - Priority A



The Deschutes GMA is located in the central portion of the Oregon East Cascades Province, spans the province from west to east, and includes some adjacent areas immediately to the east outside of the range of the northern spotted owl. It generally coincides with the portion of the Deschutes National Forest that is within the range of the northern spotted owl. It includes 99 percent Federal lands (National Forests) and the remainder primarily in private ownership.

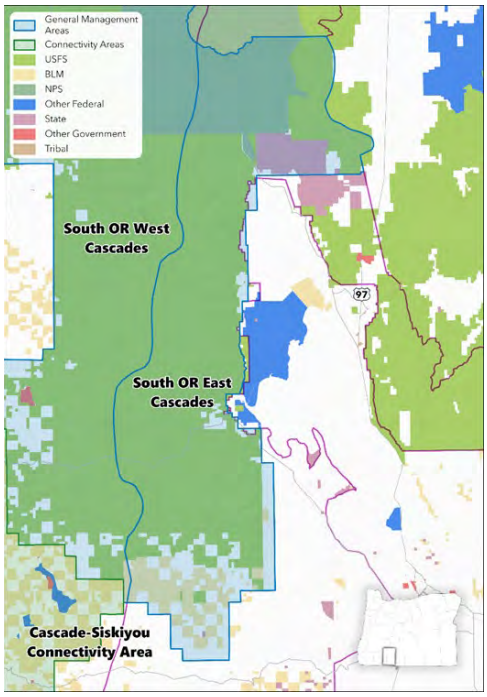
Primary reasons for selecting this area:
This GMA encompasses the central portion of the spotted owl range within this province and occurs primarily on the Deschutes National Forest. The Forest has a relatively consistent history of surveys for northern spotted owls, which shows that spotted owls remain present in some areas but are not detected at many historical spotted owl sites. Although we lack demographic information for the GMA, we expect that, like other dry portions of the northern spotted owl range, there is a potential for high fecundity here if the negative influence of barred owls can be reduced.

Focal Management Areas (FMAs)

In this GMA, we recommend developing FMAs large enough to support as many spotted owl pair sites as possible. The maximum practicable size of FMAs is likely to be much smaller than 50 pairs in this GMA, and some portions of the GMA, thus management of small clusters of spotted owl sites may be more reasonable than block management. Generally, larger blocky areas provide a smaller edge-to-area ratio, and this may help reduce the influx of barred owls from outside the FMA in the future, so even smaller blocks are preferable to scattered spotted owl sites and these should be closer together. and include multiple areas designed with the intent of encouraging exchange of spotted owls between these smaller areas.

Coordinate FMA locations with the spotted owl site management described above. Including recently occupied spotted owl sites in FMAs provides a potential core population for development of spotted owl populations once barred owl populations are reduced. In areas where habitat connectivity is limited, spotted owl site management may help to provide connectivity between smaller FMAs. Recommendation son priorities for defining and selecting Focal Management Areas within the Deschutes GMA are listed in Appendix 4-6.

10.6.2.2 South Oregon East Cascades GMA - Priority A



The South Oregon East Cascades GMA is located in the southern portion of the Oregon East Cascades Province and spans the province from west to east. It is primarily made up of Federal lands, including portions of Crater Lake National Park, Fremont Winema National Forest, and BLM lands associated with the Klamath Falls Field Office of the Lakeview District. It includes 85 percent Federal lands (National Forests and BLM), 4 percent State land and the remainder primarily in private ownership.

Primary reasons for selecting this area:
This area allows for connectivity to the Oregon West Cascades Province, and from there, to the Oregon Klamath Province and beyond. It includes the largest concentrations of spotted owl habitat in the southern portion of the province. A portion of the area overlaps the South Cascades Demographic Study Area, with its historical and recent spotted owl data. Demographic data from the South Cascades study area, as well as other dry portions of the northern spotted owl range, indicates that spotted owls here have a potential for high fecundity here if the negative influence of barred owls can be reduced.

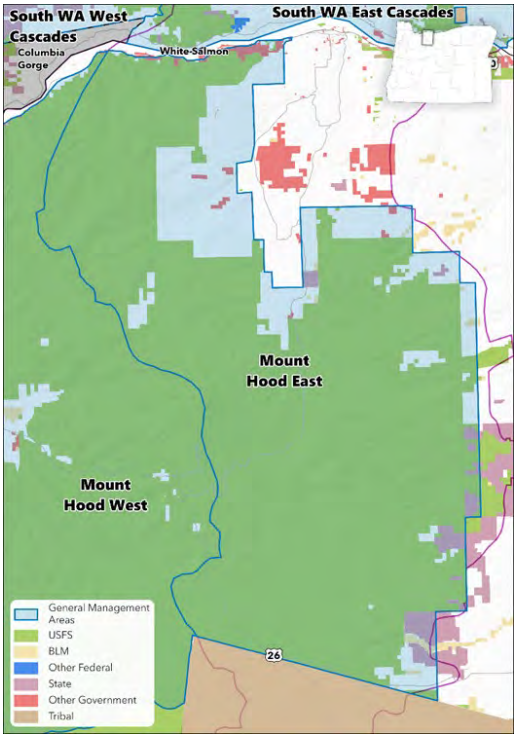
Focal Management Areas (FMAs)

In this GMA, we recommend developing FMAs large enough to support as many spotted owl pair sites as possible, up to 50 pair sites per FMA. Due to the configuration of habitat in this GMA, however, it may be more practicable to develop long, thin FMAs. In this case, we still recommend including enough habitat to support as many spotted owl pair sites as possible. It may be beneficial to develop FMAs that span the boundary between the South Oregon East Cascades and South Oregon West Cascades GMAs. Alternatively, separate FMAs could be placed in neighboring areas of each GMA, and these could be smaller areas since they may essentially function as one spotted owl population.

Where smaller areas are developed due to ecological and implementation constraints, we recommend these be closer together and multiple areas designed with the intent of encouraging exchange of spotted owls between these smaller areas.

Coordinate FMA locations with the spotted owl site management described above. Including recently occupied spotted owl sites in FMAs provides a potential core population for development of spotted owl populations once barred owl populations are reduced. In areas where habitat connectivity is limited, spotted owl site management may help to provide connectivity between smaller FMAs. Recommendations on priorities for defining and selecting Focal Management Areas within the South Oregon East Cascades GMA are listed in Appendix 4-6.

10.6.2.3 Mount Hood East GMA - Priority C



The Mount Hood East GMA is located in the northernmost portion of the Oregon East Cascades Province and spans the province from west to east. It is primarily made up of Federal lands on the Mount Hood National Forest, but also includes small parcels of BLM lands associated with the Deschutes Resource Area of the Prineville District. Additionally, the GMA includes small areas of State lands, municipal lands, and private lands. It includes 82 percent Federal lands (National Forests), 2 percent State land and the remainder primarily in private ownership.

Reason for selecting this area:
The GMA includes the northern extent of spotted owl distribution in the Oregon East Cascades, with the largest concentrations of spotted owl habitat in the Oregon East Cascades province. The density of spotted owl habitat is higher here than in other parts of the province. This area provides many opportunities for connectivity to the Oregon West Cascades Province, and the potential for connectivity to the Washington East Cascades Province to the north. Although historical and current patterns of spotted owl dispersal across the Columbia River are not well understood, this GMA is likely in the best location for such dispersal events, due to concentrations of spotted owl habitat on both sides of the river, and places where the expanse of open water is narrower than in many other nearby portions of the river.

Spotted owl habitat within the GMA appears to be at lower risk of natural disturbances, for example, wildfires, than spotted owl habitat in other areas of the province. Although demographic data from this area is not available, we assume that, similar to other dry portions of the northern spotted owl range, spotted owls here have a potential for high fecundity if the negative influence of barred owls can be reduced.

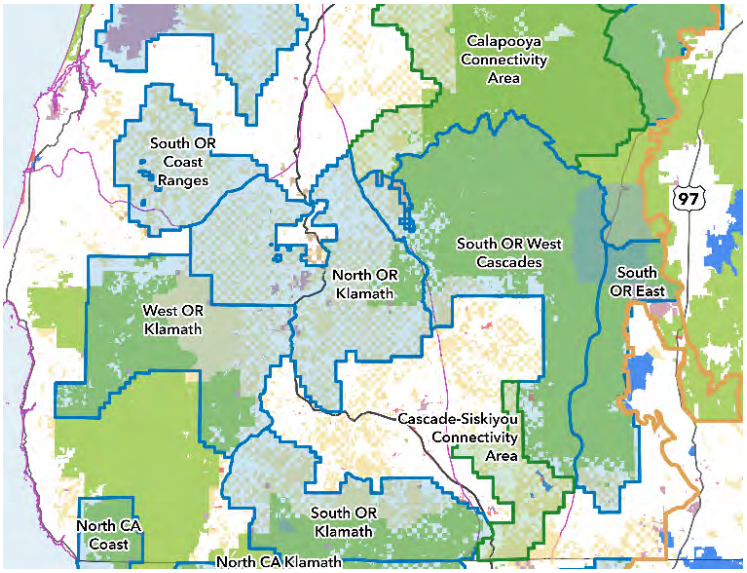
Focal Management Areas (FMAs)

In this GMA, we recommend developing FMAs large enough to support as many spotted owl pair sites as possible, up to 50 pair sites per FMA. It may be beneficial to designate FMAs that span the boundary between the Mount Hood East and Mount Hood West GMAs. Where smaller areas are developed due to ecological or implementation constraints, we recommend these be closer together and multiple areas designed with the intent of encouraging exchange of spotted owls between these smaller areas. Coordinate FMA locations with the spotted owl site management described above. Including recently occupied spotted owl sites in FMAs provides a potential core population for development of spotted owl populations once barred owl populations are reduced. In areas where habitat connectivity is limited, spotted owl site

management may help to provide connectivity between smaller FMAs. Recommendations on priorities for defining and selecting Focal Management Areas within the Mount Hood East GMA are listed in Appendix 4-7.

10.7 Oregon Klamath Province

The following is a summary of recommended management in the Oregon Klamath Province. Additional details are found in Appendix 4-7.



10.7.1 Spotted Owl Site Management

Maintaining the existing spotted owl population to the maximum extent possible will provide for greater potential for recruitment and population expansion by retaining the existing population and increasing the potential for reproduction and recruitment of young into the population. Spotted owl site management allows for spotted owl sites distributed across the province, spreading the risk of loss to catastrophic events such as wildfire and allow for potential connectivity between management blocks. This is particularly important in the northern portion of this province where connection to the Western Oregon Cascades and Oregon Coast Ranges provinces. Although greatly reduced from historical numbers, the Oregon Klamath Province retains a comparatively large number of occupied spotted owl territories. The primary focus of spotted owl site management in this province is on active, or recently active sites, where recolonization of sites after barred owl removal is more likely.

10.7.1.1 Spotted Owl Site Management Priorities:

Priority	Spotted Owl Site Condition
A	Sites that have are currently occupied by resident spotted owls (pair or single), or where there have been detections of spotted owls (not reaching resident status).
B	Sites that are not currently occupied by resident spotted owls (pair or single) but have been in the past five.
C	Sites with spotted owl occupancy between five to ten years ago, whether or not they have been surveyed recently.
D	Areas with sufficient high-quality habitat to support a spotted owl site, whether surveyed recently or not.

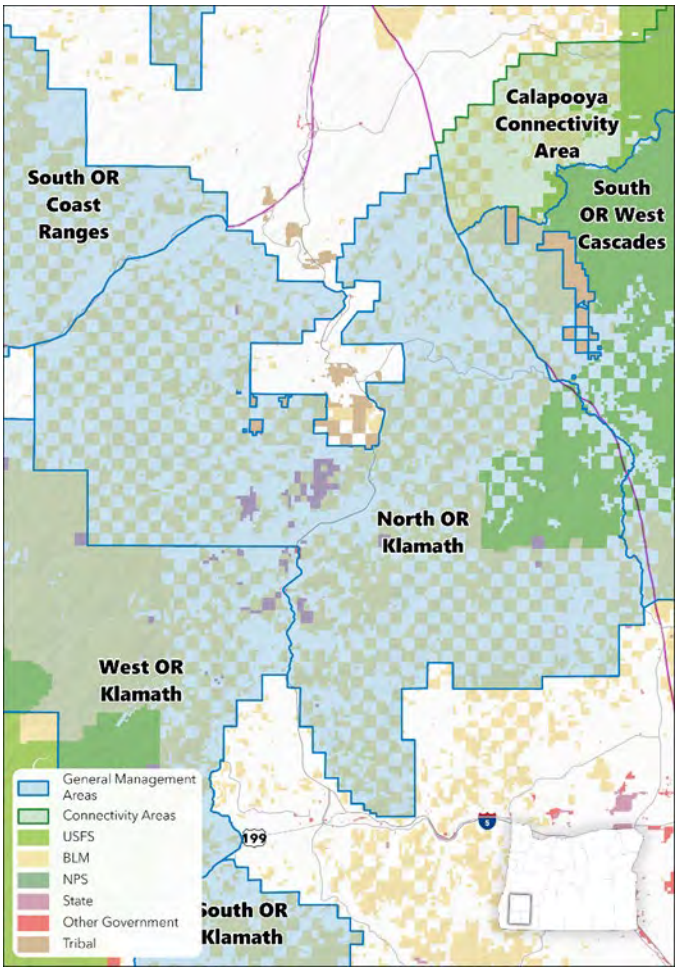
Other considerations for selection of spotted owl sites for management:
If spotted owl site management cannot be initiated on all sites, we recommend the following be considered in selecting the specific spotted owl sites for management.

- Focus first on spotted owl sites with recent occupancy by pairs, then singles, then detections.
- Consider past reproductive history of the spotted owl site. Select sites with a history of reproduction on the site where surveys are available.
- Consider the condition of habitat in the area, particularly loss of habitat to fire or other actions since the last surveys. Spotted owl sites where much of the habitat has been removed, from high severity fire or timber harvest, would be a lower priority.

10.7.2 General Management Areas

10.7.2.1 North Oregon Klamath GMA - Priority A

The North Oregon Klamath GMA is in the northern part of the province straddling I-5 and bounded by the Oregon coast Range province to the west and the West Cascades Province to the east. The GMA includes approximately 755,500 acres of forest land, of which up to 50 percent could be under barred owl management at any one time. It includes 45 percent Federal lands (BLM and National Forests), 1 percent State land and the remainder primarily in private ownership.



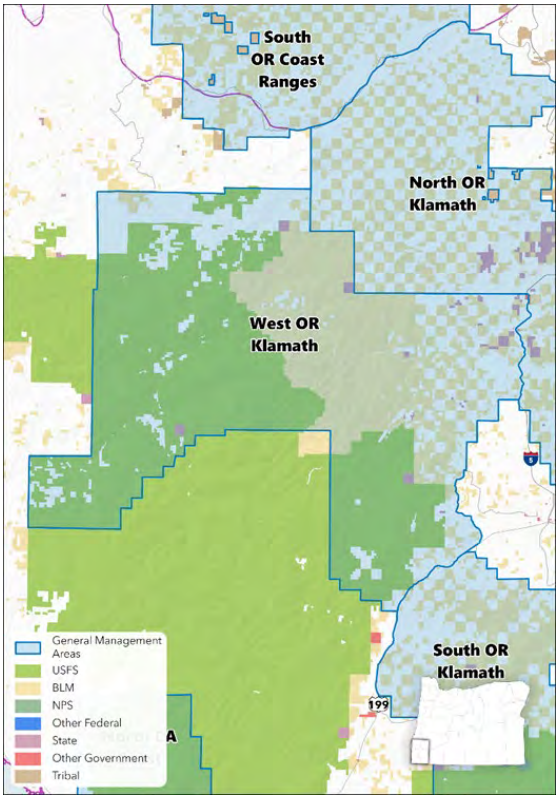
Reason for selecting this area:
This GMA connects to the Oregon Coast Ranges and Western Oregon Cascades provinces, providing the potential for inter-provincial movement of spotted owls. The GMA includes a comparatively large population of remaining spotted owls and includes the Klamath Spotted Owl Demography Study Area. This area would receive a higher level of monitoring which would assist in monitoring effects to spotted and barred owls.

Focal Management Areas

In this GMA, we recommend developing FMAs large enough to potentially support 50 spotted owl pair sites and generally spaced no further than 12 to 15 miles apart when feasible. However, where the landscape or forest conditions do not allow this, smaller or more sinuous areas may be appropriate, particularly when considering fire refugia locations. Where smaller areas are developed due to ecological or implementation constraints, we recommend these be closer together and multiple areas designed with the intent of encouraging exchange of spotted owls between these smaller areas. The Oregon Klamath province is considered a mixed-severity, frequent fire regime, so we recommend considering the location of fire refugia and uncharacteristic fuel conditions in order to include areas more likely to retain forest cover conditions associated with spotted owl habitat.

Recommendations on priorities for defining and selecting Focal Management Areas within the North Oregon Klamath GMA are listed in Appendix 4-7.

10.7.2.2 West Oregon Klamath GMA – Priority B



The West Oregon Klamath GMA occupies the central portion of the province, bounded by I-5 along the west. The GMA includes approximately 660,000 acres of forest land, of which up to 35 percent could be under barred owl management at any one time in the first decade, and 50 percent in the following two decades. It includes 79 percent Federal lands (National Forest and BLM), 1 percent State land and the remainder primarily in private ownership.

Reason for selecting this area:
The GMA includes large contiguous blocks of National Forest and BLM lands and large patches of older forest cover. This GMA provides the only forested connection between provinces to the north and south. Spotted owl populations have a lower rate of decline than in provinces to the north.

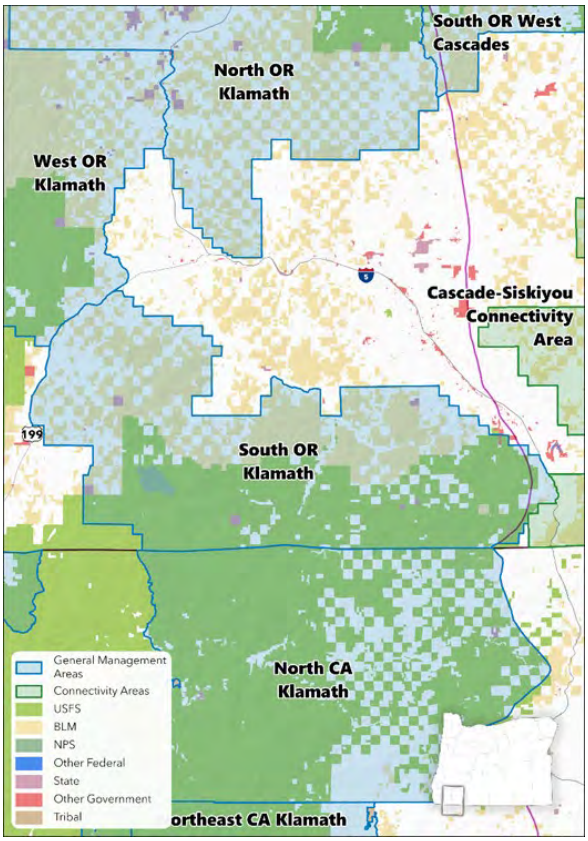
Focal Management Areas

In this GMA, we recommend developing FMAs large enough to potentially support 50 spotted owl pair sites and generally spaced no further than 12 to 15 miles from another FMA when feasible. Where the landscape or forest conditions do not allow this, smaller or more sinuous areas may be appropriate; particularly when considering fire refugia locations. Where smaller areas are developed due to ecological or implementation constraints, we recommend these be closer together and multiple areas designed with the intent of encouraging exchange of spotted owls between these smaller areas. Particularly in the western

portion of the GMA consider access (roads and trails) as this includes areas with limited accessibility. The Oregon Klamath province is considered a mixed-severity, frequent fire regime, so we recommend considering the location of fire refugia and uncharacteristic fuel conditions in order to include areas more likely to retain forest cover conditions associated with spotted owl habitat. Recommendations on priorities for defining and selecting Focal Management Areas within the West Oregon Klamath GMA are listed in Appendix 4-7.

10.7.2.3 South Oregon Klamath South GMA – Priority B

The South Oregon Klamath GMA extends south from the West Oregon Klamath GMA to the Oregon/California border. The GMA includes approximately 516,200 acres of forest land, 73 percent Federal lands (National Forest and BLM), 1 percent State land and the remainder primarily in private ownership.



Reason for selecting this area:
This GMA connects to the California Klamath and Cascades provinces, providing the potential for inter-provincial movement of spotted owls. The GMA includes some contiguous blocks of National Forest and BLM lands. This GMA provides the only forested connection between provinces to the north and south.

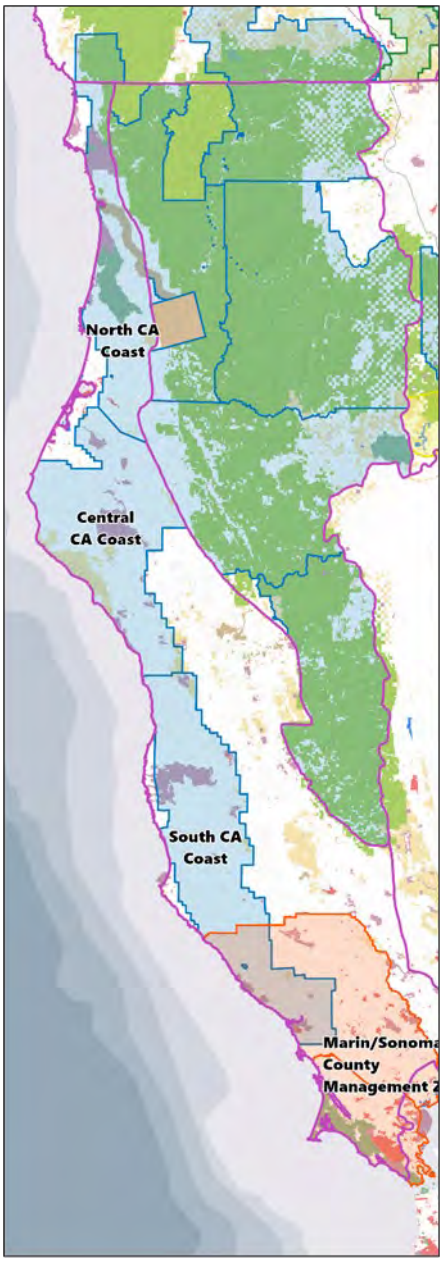
Focal Management Areas

In this GMA, we recommend developing FMAs large enough to potentially support 50 spotted owl pair sites and generally spaced no further than 12 to 15 miles apart when feasible.

Where the landscape or forest conditions do not allow this, smaller or more sinuous areas may be appropriate, particularly when considering fire refugia locations. Where smaller areas are developed due to ecological or implementation constraints, we recommend these be closer together and multiple areas designed with the intent of encouraging exchange of spotted owls between these smaller areas. The Oregon Klamath province is considered a mixed-severity, frequent fire regime, so we recommend considering the location of fire refugia and uncharacteristic fuel conditions in order to include areas more likely to retain forest cover conditions associated with spotted owl habitat. Recommendations on priorities for defining and selecting Focal Management Areas within the Oregon Klamath South GMA are listed in Appendix 4-7.

10.8 California Coast Province

The following is a summary of recommended management in the California Coast Province. Additional details are found in Appendix 4-8.



10.8.1 Spotted Owl Site Management

Maintaining the existing spotted owl population to the maximum extent possible will provide for greater potential for recruitment and population expansion. In addition, preventing establishment of a barred owl population in Sonoma and Marin Counties will support the maintenance of spotted owl populations there and should be more effective than waiting to control barred owls until they have a measurable effect on spotted owl populations (See Sonoma and Marin Special Management Area below).

Maintaining spotted owl sites distributed across the province, whether within block management areas or not, will reduce the risk of loss of spotted owls in the province from catastrophic events, such as wildfire, by spreading spotted owl sites across the area. Managing spotted owl sites also provides the opportunity for maintaining spotted owls in areas where block management is not feasible or recommended. This approach applies across the entire province, whether or not the locations are within a GMA or other mapped designation.

10.8.1.1 Spotted Owl Site Management Priorities:

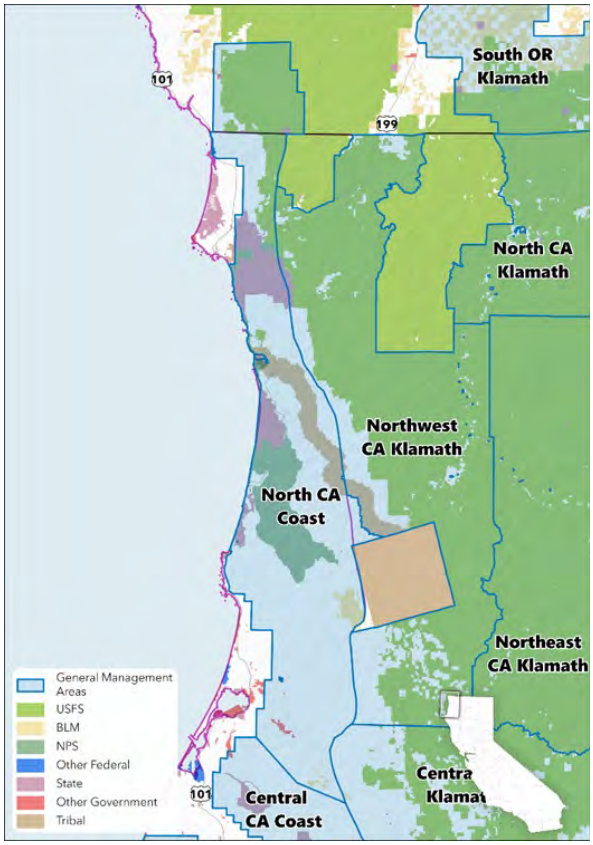
<u>Other considerations for selection of spotted owl sites for management:</u>

If spotted owl site management cannot be initiated on all sites, we recommend the following be considered in selecting the specific spotted owl sites for management.

- Focus first on spotted owl sites with recent occupancy by pairs, then singles, then detections.
- Consider past reproductive history of the spotted owl site. Select sites with a history of reproduction on the site where surveys are available.
- Consider the condition of habitat in the area, particularly loss of habitat to fire or other actions since the last surveys. Spotted owl sites where much of the habitat has been removed, from high severity fire or timber harvest would be a lower priority.

10.8.2 General Management Areas

10.8.2.1 North California Coast GMA- Priority A



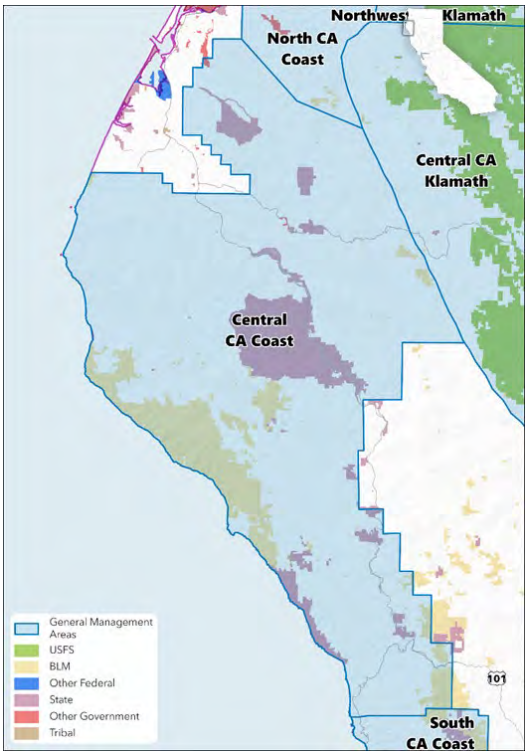
This GMA includes a small portion of the Oregon Klamath province that is otherwise isolated from other large forest patches. The GMA is bounded by the California Coastal range along the east, the Pacific Ocean along the west, and extends to just south of Arcata. It includes 27 percent Federal forest lands primarily National Park Service and National Forest, 8 percent State land, 5 percent Tribal lands, and the remainder primarily in private ownership. Although dominated by private ownership, this GMA includes the largest areas of Federal lands in the California Coast Province, including Redwood National Park. It also includes several large California State Parks.

Primary reasons for selecting this area:
This GMA is considered an important area for inter-provincial movement of spotted owls between the Oregon Klamath, California Klamath, and California Coast. The presence of reserved lands in the National and State Parks provide a core of Federal lands. This includes portions of the Green Diamond Demography Study Area which are managed under an HCP. This area includes historic and ongoing experimental barred owl research on Green Diamond Resources Company lands and includes Yurok Tribal lands where barred owl research is underway.

Focal Management Areas (FMAs)

In this GMA, we recommend developing FMAs large enough to potentially support at least 50 spotted owl pair sites and spaced no further than 12 to 15 miles from another FMA when feasible. Where the landscape or forest conditions do not allow this, smaller or more sinuous areas may be appropriate; particularly when considering fire refugia locations. Where smaller areas are developed due to ecological or implementation constraints, we recommend these be closer together and multiple areas designed with the intent of encouraging exchange of spotted owls between these smaller areas. Recommendations on priorities for defining and selecting Focal Management Areas within the North California Coast GMA are listed in Appendix 4-7.

10.8.2.2 Central California Coast – Priority B



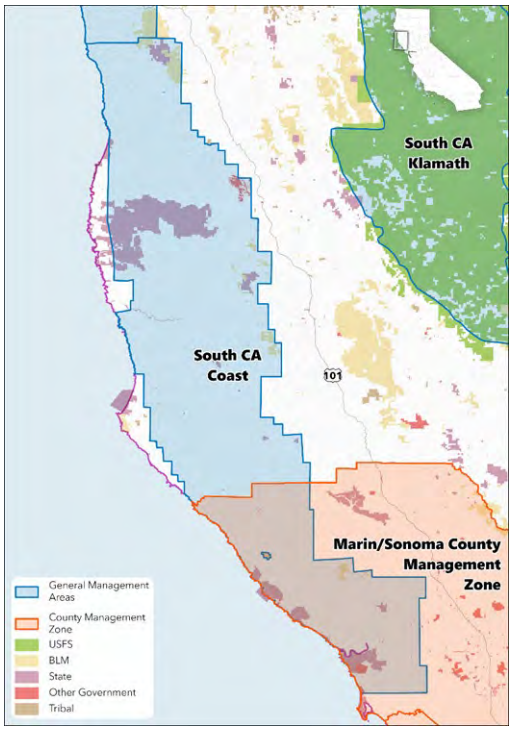
This GMA is contiguous with the North California GMA on the north, bounded by the California Coastal range along the east, the Pacific Ocean along the west and is contiguous with the south California coast GMA. Land ownership in the area is predominantly private with 10 percent Federal (BLM) and 9 percent State lands.

Primary reasons for selecting this area:
This GMA provides east-west connection to the forested areas in the California Klamath Province and north/south connection between GMAs in the Province. It includes relatively contiguous large patches of older forest cover.

Focal Management Areas (FMAs)

In this GMA, we recommend developing FMAs large enough to potentially support at least 50 spotted owl pair sites and spaced no further than 12 to 15 miles from another FMA when feasible. Where the landscape or forest conditions do not allow this, smaller or more sinuous areas may be appropriate; particularly when considering fire refugia locations. Where smaller areas are developed due to ecological or implementation constraints, we recommend these be closer together and multiple areas designed with the intent of encouraging exchange of spotted owls between these smaller areas. Consider the availability of access (roads and trails), particularly on the western portion of the GMA. Recommendations on priorities for defining and selecting Focal Management Areas within the Central California Coast GMA are listed in Appendix 4-8.

10.8.2.3 South California Coast GMA – Priority C



The South California Coast GMA is contiguous with the Central California Coast GMA in the north to approximately the southern extent of Sonoma County. There is very little Federal, State, or local government managed land in this GMA. Approximately 82% of the GMA is in private ownership. It includes 1 percent Federal lands and 7 percent State land.

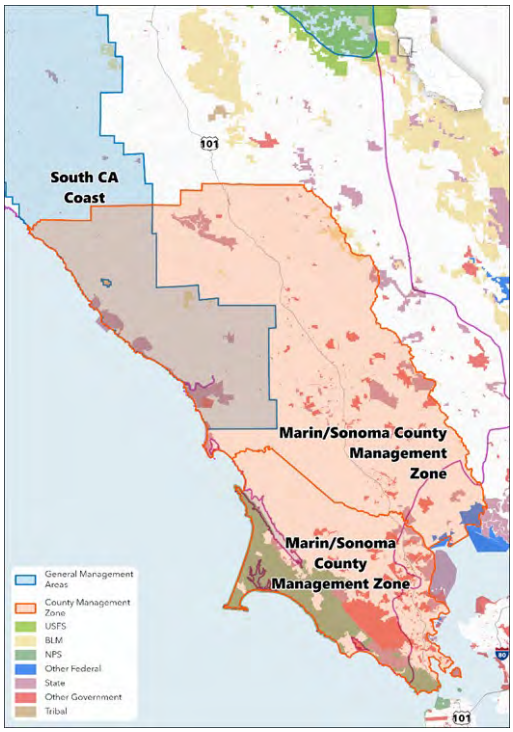
Reason for selecting this area:
The GMA contains heterogenous forest cover and mixed patch sizes, which limited the ability to draw a large GMA of adequate. We attempted to maximize the density of current habitat within forested areas. We excluded non-forest areas and developed areas when practical while minimizing edge-to-area ratios. This GMA contributes to the North-South connectivity of management areas in this province.

Focal Management Areas (FMAs)

In this GMA, we recommend developing FMAs large enough to potentially support 50 spotted owl pair sites and generally spaced no further than 12 to 15 miles from another FMA when feasible. Where the landscape or forest conditions do not allow this, smaller or more sinuous areas may be appropriate; particularly when considering fire refugia locations. Where smaller areas are developed due to ecological or implementation constraints, we recommend these be closer together and multiple areas spaced to encourage exchange of spotted owls between these smaller areas. Recommendations on priorities for defining and selecting Focal Management Areas within the South California Coast GMA are listed in Appendix 4-8.

10.8.3 Special Designated Areas:

10.8.3.1 Marin/Sonoma County Management Zone - Priority A



The Marin/Sonoma County Management Zone includes all lands within the named counties. Conditions in Marin and Sonoma County are substantially different than the rest of the northern spotted owl range. This is the only portion of the northern spotted owl range where barred owls are very uncommon. It includes seven percent Federal lands, five percent State land and the remainder primarily in private ownership.

Reason for selecting this area:
Barred owls are present in small numbers and have not yet established significant populations in these counties. The remaining spotted owl habitat is found in blocks of limited size managed by different agencies and landowners.

Management within the Marin/Sonoma County Management Zone

Management focus in this area is on preventing barred owls from becoming established and displacing the remaining spotted owls. Therefore, barred owls should be removed from the land of willing landowners and land managers anywhere within these counties when they are detected, regardless of presence of northern spotted owls or historic use of an area.

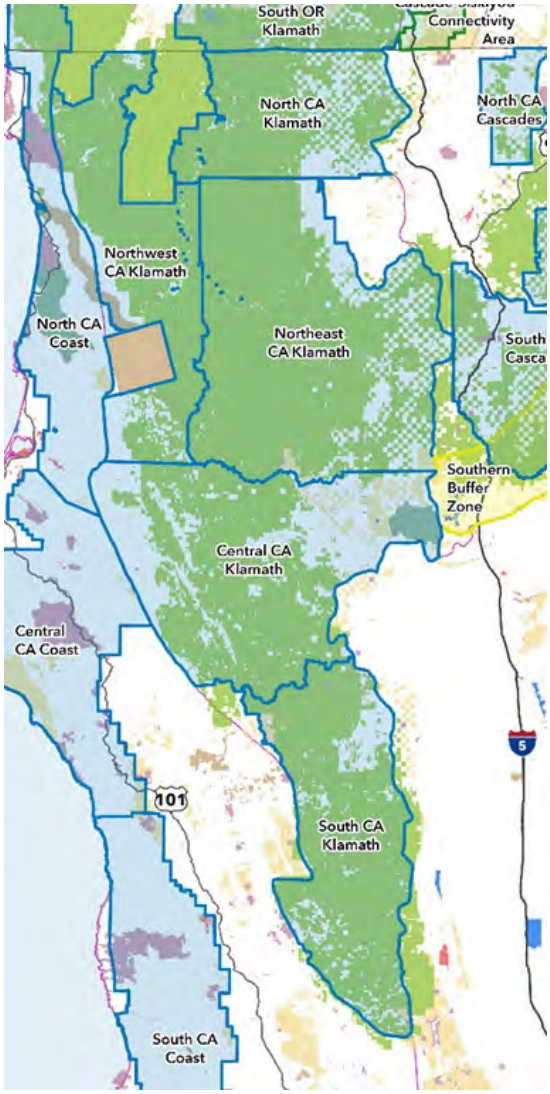
10.9 California Klamath Province

The following is a summary of recommended management in the California Klamath Province. Additional details are found in Appendix 4-9.

10.9.1 Spotted Owl Site Management

Maintaining the existing spotted owl population to the maximum extent possible will provide for greater potential for recruitment and population expansion. These sites can form the core population for establishing an FMA. Managed spotted owl sites can promote connectivity within and between GMAs, and across provincial boundaries with the California Coast and Cascades provinces.

Maintaining spotted owl sites distributed across the province, whether within block management areas or not, will reduce the risk of loss of spotted owls in the province from catastrophic events, such as wildfire, by spreading spotted owl sites across the area. Managing spotted owl sites also provides the opportunity for maintaining spotted owls in areas where block management is not feasible or recommended. This approach applies across the entire province, whether or not the locations are within a GMA or other mapped designation.



10.9.1.1 Spotted Owl Site Management Priorities:

Priority	Spotted Owl Site Condition
A	Spotted owl sites that have been occupied by resident spotted owls (pair or single) in the last five years, or where there have been detections of spotted owls (not reaching resident status).
B	Spotted owl sites that are not currently occupied by resident spotted owls (pair or single) but have been in the past five years.
C	Spotted owl sites with spotted owl occupancy between five to ten years ago, whether or not they have been surveyed recently.
D	Areas with sufficient high-quality habitat to support a spotted owl site, whether surveyed recently or not.

Other considerations for selection of spotted owl sites for management:

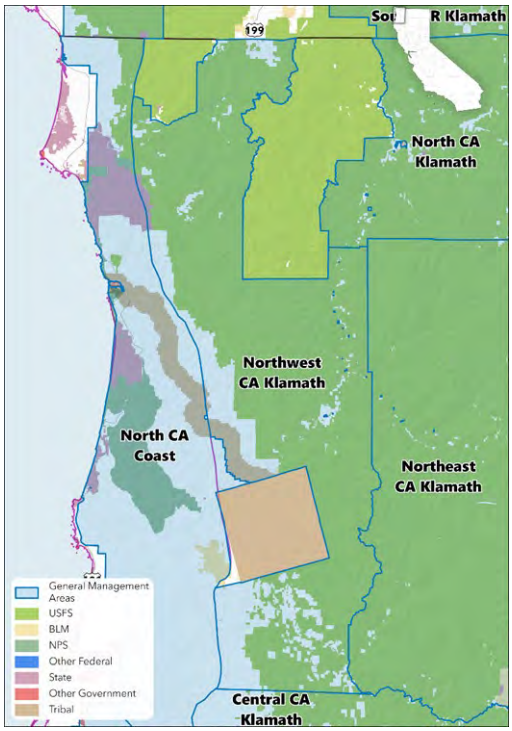
If spotted owl site management cannot be initiated on all sites, we recommend the following be considered in selecting the specific spotted owl sites for management.

- Focus first on spotted owl sites with recent occupancy by pairs, then singles, then detections.
- Consider past reproductive history of the spotted owl site. Select spotted owl sites with a history of reproduction on the site where surveys are available.
- Consider the condition of habitat in the area, particularly loss of habitat to fire or other actions since the last surveys. Spotted owl sites where much of the habitat has been removed, from high severity fire or timber harvest, would be a lower priority.

10.9.2 General Management Areas

10.9.2.1 Northwest California Klamath GMA - Priority A

The Northwest California Klamath GMA is located in the northwestern extent of the province, adjacent to the California Coast province to the west and the Oregon Klamath province to the north. It includes 82 percent Federal lands (BLM and National Forests), 2 percent Yurok Tribal land and the remainder primarily in private ownership.

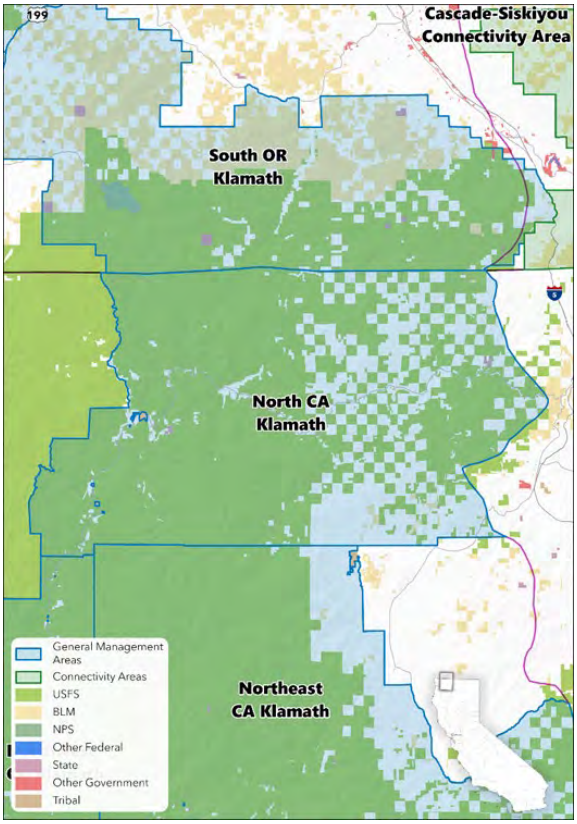


Primary reasons for selecting this area:
This GMA contains a robust northern spotted owl population and recent information on which to base management. Ongoing barred owl research provides additional data and a potential anchor for management. The Six Rivers National Forest was identified as the highest priority for barred owl removal in the interim removal strategy developed by the California Department of Fish and Wildlife's Barred Owl Science Team.

Focal Management Areas (FMAs)

In the Northwest California Klamath GMA, we recommend developing FMAs large enough to potentially support 50 spotted owl pair sites and spaced no further than 12 to 15 miles from another FMA when feasible. Where the landscape or forest conditions do not allow this, smaller or more sinuous areas may be appropriate. Where smaller areas are developed due to ecological or implementation constraints, we recommend these be closer together and multiple areas spaced so as to encourage exchange of spotted owls between these smaller areas. Consider the availability of access (roads and trails), particularly on the western portion of the GMA. Recommendations on priorities for defining and selecting Focal Management Areas within the Central California Coast GMA are listed in Appendix 4-9.

10.9.2.2 North California Klamath GMA – Priority B



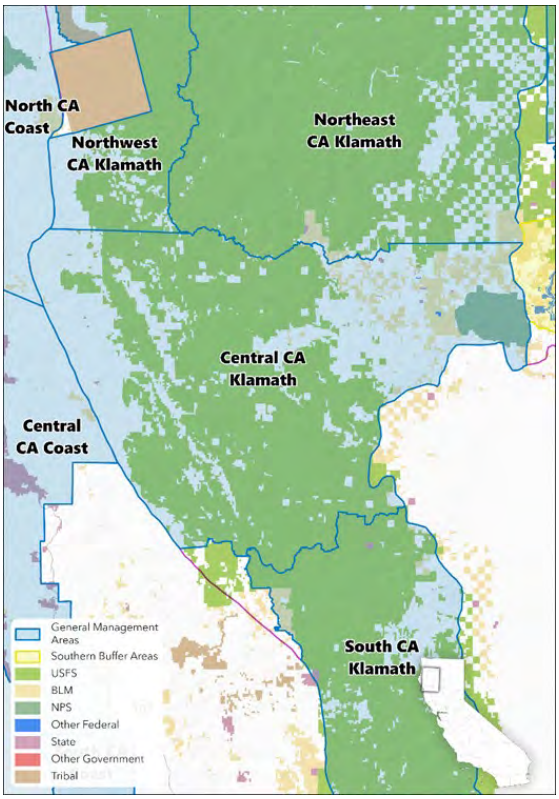
The North California Klamath GMA is located in the northern part of the province west of Interstate 5 and bounded by the Oregon Klamath province to the north and the California Cascades province to the east. It includes 76 percent Federal lands (BLM and National Forests) and the remainder primarily in private ownership.

Primary reasons for selecting this area:
This GMA contains a relatively robust northern spotted owl population and provides potential connection across and within province and to north Oregon Klamath Province. Stabilization of spotted owl populations here could provide larger nexus with control efforts in the adjacent GMA to west on Green Diamond Resource Company lands and the Hoopa Valley Reservation.

Focal Management Areas (FMAs)

In the North California Klamath GMA, we recommend developing FMAs large enough to potentially support 50 spotted owl pair sites and generally spaced no further than 12 to 15 miles from another FMA when feasible. Where the landscape or forest conditions do not allow this, smaller or more sinuous areas may be appropriate; particularly when considering fire refugia locations. Where smaller FMAs are developed due to ecological or implementation constraints, topography, we recommend these be closer together and multiple areas designed with the intent of encouraging exchange of spotted owls between these smaller areas. Given that this GMA is in a mixed-severity, frequent fire regime, we recommend FMA locations take fire refugia and uncharacteristic fuel conditions into account to include areas more likely to retain forest cover conditions associated with northern spotted owl habitat.

10.9.2.3 Central California Klamath GMA – Priority B



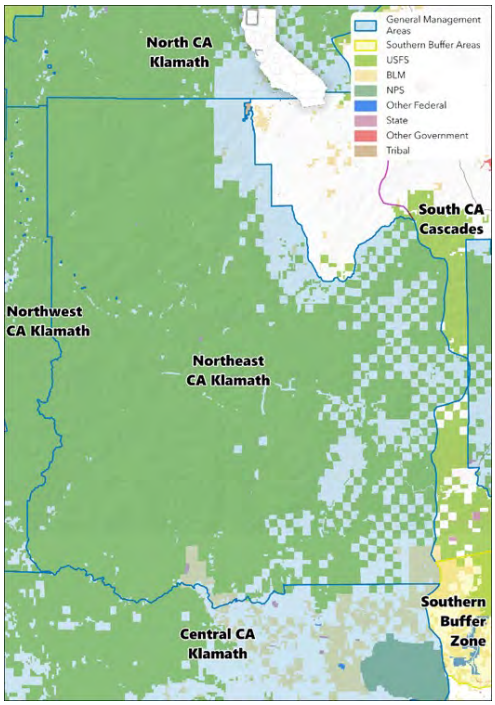
The Central California Klamath GMA is located in the central extent of the province between Eureka and Redding. It is bounded to the west by the California Coast province and to the northeast by the California Cascades province. It includes 66 percent Federal lands (BLM and National Forests) and the remainder primarily in private ownership.

Primary reasons for selecting this area:
This GMA includes areas affected by large and repeated wildfires, resulting in conditions where spotted owl site management may provide equal or better population and connectivity benefits for northern spotted owls. Barred owl management in this province has the potential to slow the southward invasion of barred owls and thereby delay the need for more intensive barred owl management.

Focal Management Areas (FMAs)

While spotted owl site management is a viable option for GMA management in this the Central California Klamath GMA, the creation of FMAs is still an option. We recommend developing FMAs large enough to potentially support 50 spotted owl pair sites and generally spaced no further than 12 to 15 miles from another FMA when feasible. Where the landscape or forest conditions do not allow this, smaller or more sinuous areas may be appropriate; particularly when considering fire refugia locations. Where smaller FMAs are developed due to ecological or implementation constraints, topography, we recommend these be closer together and multiple areas designed with the intent of encouraging exchange of spotted owls between these smaller areas. Given that this GMA is in a mixed-severity, frequent fire regime, we recommend FMA locations take fire refugia and uncharacteristic fuel conditions into account to include areas more likely to retain forest cover conditions associated with northern spotted owl habitat.

10.9.2.4 Northeast California Klamath GMA – Priority C



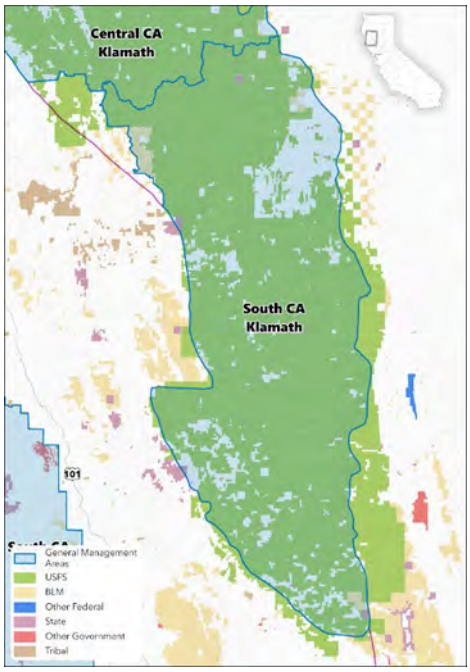
The Northeast California Klamath GMA is the largest GMA in the province, located in the northcentral portion with Interstate 5 to the east and the California Cascades province. It includes 84 percent Federal lands (BLM and Forest Service) and the remainder primarily in private ownership.

Primary reasons for selecting this area:
This GMA includes areas affected by large and repeated wildfires, leaving habitat patchy but well distributed. This GMA includes lands owned by Sierra Pacific Industries where barred owl removal research is ongoing under an HCP. The GMA includes extensive wilderness with limited access, a consideration in developing FMAs.

Focal Management Areas (FMAs)

In the Northeast California Klamath GMA, we recommend developing FMAs large enough to potentially support 50 spotted owl pair sites and generally spaced no further than 12 to 15 miles from another FMA when feasible. Where the landscape or forest conditions do not allow this, smaller or more sinuous areas may be appropriate, particularly when considering fire refugia locations. This may be an option where accessible lands are limited and habitat is patchily distributed. Where smaller FMAs are developed due to ecological or implementation constraints, topography, we recommend these be closer together and multiple areas designed with the intent of encouraging exchange of spotted owls between these smaller areas. Given that this GMA is in a mixed-severity, frequent fire regime, we recommend FMA locations take fire refugia and uncharacteristic fuel conditions into account to include areas more likely to retain forest cover conditions associated with northern spotted owl habitat.

10.9.2.5 South California Klamath GMA - Priority C



The South California Klamath GMA is a narrow, linear GMA with little to no habitat or connectivity to the west or east. It includes 86 percent Federal lands (BLM and Forest Service) and the remainder primarily in private ownership.

Primary reasons for selecting this area:
This GMA may have more importance as a removal area for barred owls to reduce the rate of southward migration than for northern spotted owl population recovery. The area has been affected by large and repeat fires, resulting in a very low spotted owl habitat density.

Focal Management Areas (FMAs)

In the South California Klamath GMA, we recommend establishing FMAs in the northern portions which are focused on population management. In the southern extent, FMAs or other management areas should be established to focus efforts on limiting barred owl expansion into the Sierra Nevada and California spotted owl range as well as south into Sonoma and Marin Counties where barred owls are still in very low numbers.

In the northern portion of the South California Klamath GMA, we recommend developing FMAs large enough to potentially support 50 spotted owl pair sites and generally spaced no further than 12 to 15 miles from another FMA when feasible. Where the landscape or forest conditions do not allow this, smaller or more sinuous areas may be appropriate, particularly when considering fire refugia locations. Where smaller FMAs are developed due to ecological or implementation constraints, we recommend these be closer together and multiple areas places closer together to encouraging exchange of spotted owls between these smaller areas.

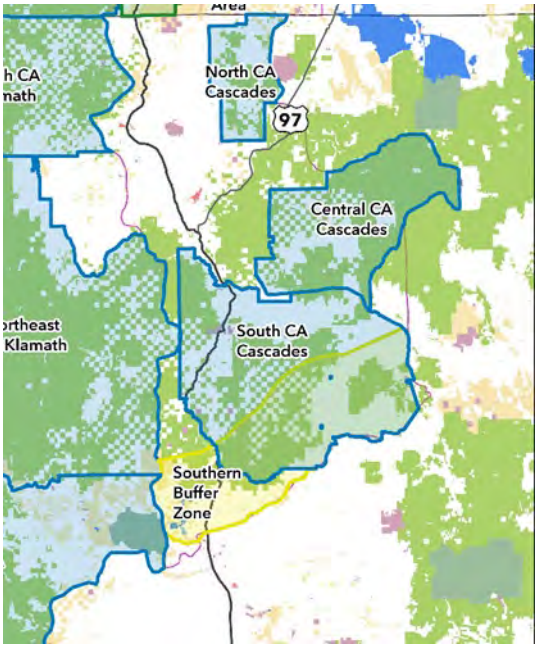
As described in the background section, the California Klamath province is considered a mixed-severity, frequent fire regime. We recommend FMA locations take fire refugia and uncharacteristic fuel conditions into account to include areas more likely to retain forest cover conditions associated with northern spotted owl habitat.

In the southern extent of the South California Klamath GMA, FMAs or other management areas of similar or smaller size are still recommended but placed to limit southward and eastward movements of barred owls.

10.10 California Cascades Province

The following is a summary of recommended management in the California Cascades Province. Additional details are found in Appendix 4-10.

10.10.1 Spotted Owl Site Management



Maintaining the existing spotted owl population to the maximum extent possible will provide for greater potential for recruitment and population expansion. These sites can form the core population for establishing an FMA and an option for maintaining spotted owls where a block management area approach is not feasible. Managed spotted owl sites can promote connectivity within and between GMAs, and across provincial boundaries with the California Coast and Cascades provinces.

Maintaining spotted owl sites distributed across the province, whether within block management areas or not, will reduce the risk of loss of spotted owls in the province from catastrophic events, such as wildfire, by spreading spotted owl sites across the area. Managing spotted owl sites also provides the opportunity for maintaining spotted owls in areas where block management is not feasible or recommended. This approach applies across the entire province, whether or not the locations are within a GMA or other mapped designation.

10.10.1.1 Spotted Owl Site Management Priorities:

Priority	Spotted Owl Site Condition
A	Spotted owl sites that are occupied by resident spotted owls (pair or single), or where there have been detections of spotted owls (not reaching resident status).
B	Spotted owl sites that are not currently occupied by resident spotted owls (pair or single) but have been in the past five years.
C	Spotted owl sites with spotted owl occupancy between five to ten years ago, whether or not they have been surveyed recently.
D	Areas with sufficient high-quality habitat to support a spotted owl site, whether surveyed recently or not.

Other considerations for selection of spotted owl sites for management:

If site management cannot be initiated on all sites, we recommend the following be considered in selecting the specific spotted owl sites for management.

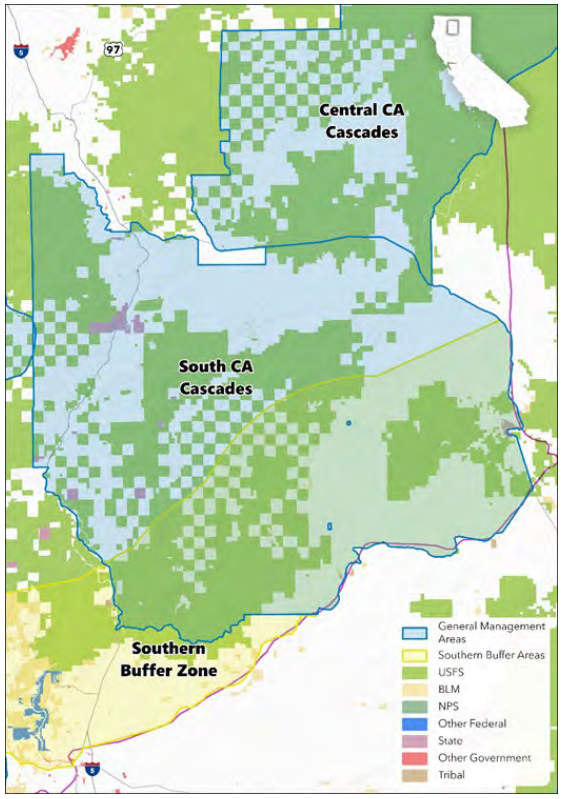
- Focus first on spotted owl sites with recent occupancy by pairs, then singles, then detections.

- Consider past reproductive history of the spotted owl site. Select spotted owl sites with a history of reproduction on the site where surveys are available.
- Consider the condition of habitat in the area, particularly loss of habitat to fire or other actions since the last surveys. Spotted owl sites where much of the habitat has been removed, from high severity fire or timber harvest, would be a lower priority.

10.10.2. General Management Areas

10.10.2.1 South California Cascades GMA – Priority B

The South California Cascades GMA is located in the southcentral portion extending from Highway 89 in the north to south past the Pit River. Approximately 45 percent of this GMA is under Federal land management by the Shasta-Trinity National Forest, with about 5 percent in State lands and the remainder primarily in private ownership.

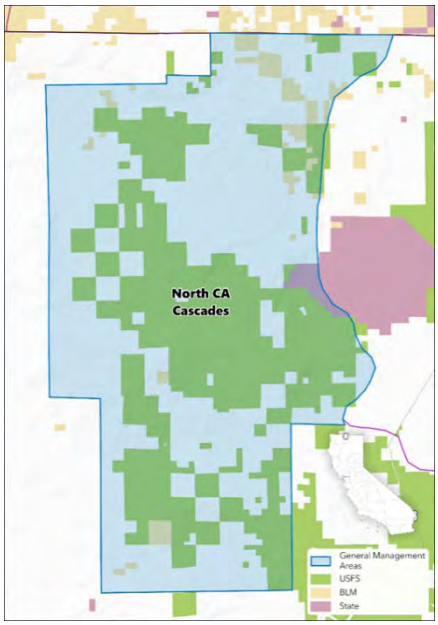


Primary reasons for selecting this area:
This GMA includes the densest concentration of spotted owl habitat in the California Cascades Province and the southernmost extent of the northern spotted owl range. This area is important as the hybridization zones with the California spotted owl and provides connectivity to the Sierra Nevada. For barred owls, this is the most likely primary invasion pathway into the California spotted owl range (see 10.10.3. Special Designated Areas).

Focal Management Areas (FMAs)

Because of the patchy and limited distribution of spotted owl habitat in this GMA, we do not recommend developing large FMAs. Rather, we recommend focusing on site management or small clusters of sites where possible. Clusters of two or more sites in close proximity are likely to be more stable and provide more efficient management efforts.

10.10.2.2 North California Cascades – Priority C



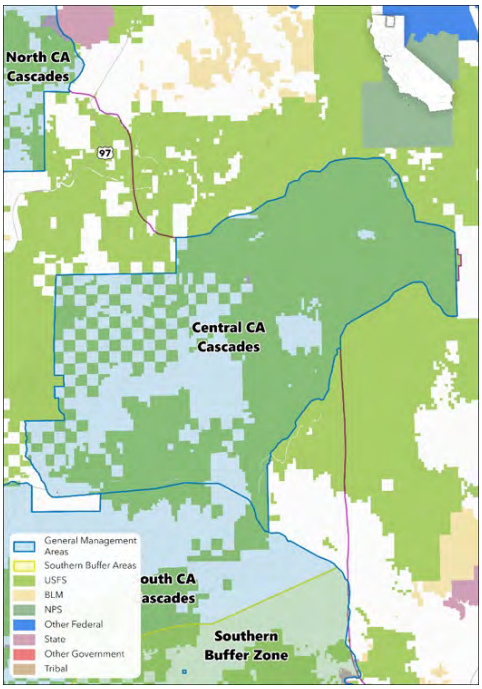
The North California Cascades GMA includes approximately 155,053 acres. It is located at the northern extent of the province, northeast of State Highway 97. The Oregon Klamath province and Cascade-Siskiyou Connectivity Area are to the north. Approximately 43 percent of this GMA is under Federal land management by the BLM and Forest Service, 1 percent State, and the remainder primarily is under private ownership.

Primary reasons for selecting this area:
This GMA is important for providing connectivity northwest to the Oregon Klamath and north to the East Cascades. The presence of some spotted owl sites in this area may provide for generational dispersal. Habitat and sites are generally isolated, which may make barred owl removal or exclusion possible.

Focal Management Areas (FMAs)

Because of the patchy and limited distribution of spotted owl habitat in this GMA, we do not recommend developing large FMAs. Rather, we recommend focusing on site management or small clusters of sites where possible. Clusters of two or more sites in close proximity are likely to be more stable and provide more efficient management efforts.

10.10.2.3 Central California Cascades – Priority C



The Central California Cascades GMA is located in the northeastern part of the province south of Highway 97 and north of Highway 89. This GMA was the most impacted by the 2021 Antelope Fire, but still contains occupied sites as of 2023 and well-dispersed nesting, roosting, foraging, and dispersal habitat. Approximately 71 percent of this GMA is under Federal land management by Forest Service with the remainder primarily in private ownership.

Primary reasons for selecting this area:
The limited spotted owl habitat in this FMA was further reduced by the 2021 Antelope Fire. Fortunately, owls in the California Cascades tend to nest in lower quality foraging habitat and occupied northern spotted owl sites remain. This GMA is important for providing connectivity to the north and southwest.

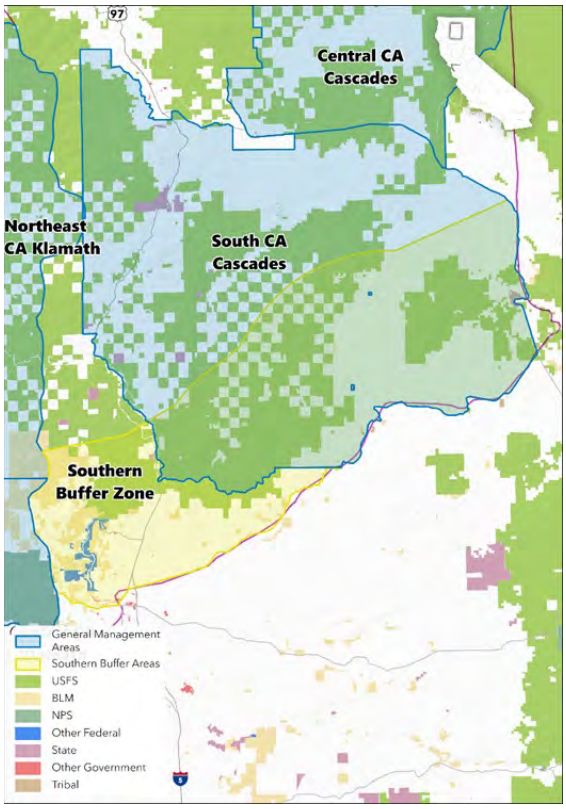
Focal Management Areas (FMAs)

Because of the patchy and limited distribution of spotted owl habitat in this GMA, we do not recommend developing large FMAs. Rather, we recommend focusing on site management or small clusters of sites where possible. Clusters of two or more sites in close proximity are likely to be more stable and provide more efficient management efforts.

10.10.3 Special Designated Areas.

10.10.3.1 Southern Buffer Zone – Priority A

The Southern Buffer Zone is a 50-mile-wide zone that includes approximately 540,758 acres. It is located near and along the Pit River in the hybridization zone for the northern spotted owl and California spotted owl. Approximately 47 percent is under Federal land management (BLM and Forest Service) and the remainder primarily in private ownership. This area overlaps with the South California Cascades GMA.



Primary reasons for selecting this area:
This is the transition zone between the Northern spotted owl and the California spotted owl. Barred owl management in this area would help prevent or slow the southward movement of barred owls, a critical component of maintaining California spotted owl populations.

Management Recommendations for the Southern Buffer Zone

There are a variety of approaches to managing barred owls in the Southern Buffer Zone to reduce the potential invasion of barred owls from the California Cascades Province and areas farther north. The removal of barred owls in this area would create empty spotted owl territories that may attract invading barred owls and cause them to settle rather than continue long-distance movement into the California spotted owl range.

If resources are available, we recommend extensive survey and monitoring across this area and immediate removal of barred owls that are located. Alternatively, intensive survey and removal activity could be focused on the southern portion of the buffer zone initially, and moved north as areas are “cleared” of barred owls.

11. California Spotted Owl Range

The purpose of the Strategy in the California spotted owl range is to limit the invasion of barred owls into the range of the subspecies and respond quickly to reduce barred owl populations that may become established. While California spotted owls have not yet experienced substantial declines as a result of barred owl competition, the southward invasion of the barred owl has reached their range, and future impacts to California spotted owl populations are expected to be inevitable without barred owl management. Therefore, the Strategy focuses on limiting the invasion of barred owls into the California spotted owl range. If barred owl populations do become established, the Strategy allows for early intervention to prevent adverse effects of barred owls on California spotted owl populations.

In the range of the California spotted owl, we developed the Strategy based on the population described in the proposed listing of the subspecies - the Sierra Nevada and the Coastal-Southern California populations (88 FR 11600). In addition, the Strategy addresses the potential invasion pathways for barred owls into the Sierra Nevada or Coastal-Southern California populations.

In recent years, barred owls have penetrated the range of the California spotted owl in the Sierra Nevada Mountains, although their population remains low and scattered in most of the California spotted owl range at this time. A rapidly expanding population of barred owls was established in the northern Sierra Nevada by 2018 (Wood et al. 2020, p. 5). The bulk of those barred owls, and associated spotted x barred owl hybrids were removed during a research study between 2018 and 2020 (Hofstadter et al. 2022, p. 5).

While barred owls have not substantially impacted California spotted owl populations in the Sierra Nevada to date, the establishment of a rapidly growing population in the northern Sierra Nevada, and the history of the invasion and impacts on northern spotted owls following such expansion, supports the assumption that, unless the barred owl populations can be managed, barred owls will continue to invade southward until the barred owls threaten the California spotted owl. As barred owls continue moving south into the California spotted owl's range, the northern portion of the Sierra Nevada population will likely experience the earliest impact and a greater magnitude of this threat, and earlier in time (88 FR 11600, at 11623).

Barred owls have not reached the Coastal-Southern California population yet, so competition with barred owls is not yet considered a current threat within this population. (88 FR 11600, at 11625). However, as barred owls continue to move south, it is likely they will reach this population in the absence of barred owl management.

Given the continued threat of barred owl invasion, the Strategy focuses not only on the California spotted owl range, but also the potential invasion pathways into their range. For the Sierra Nevada population, the most likely invasion pathway into the province is through the Shasta-Trinity and Modoc National Forests and surrounding forested areas to the immediate north of the province. Given their ability to use a wide variety of forest conditions, barred owls could potentially move through the riparian forests of the Central Valley of California.

Barred owls may be able to colonize the Coastal-Southern California spotted owl's range because of the barred owl's ability to use a variety of forest conditions. There are two potential invasion pathways, one in the forests between the Coastal-Southern California and the Sierra Nevada populations, should barred owls become established in the Sierra Nevada. The other is along the central coast between the northern spotted owl range in the southern end of the California Coast province and the Coastal portion of this population. Detections of barred owls in coastal forests in the Santa Cruz Mountains in San Mateo County, California, an area without known occurrences of the California spotted owl, suggests a pathway towards connectivity to the coastal portion of the California spotted owl's range (88 FR 11618).

11.1 Common Elements Across All Populations and Areas

There are two primary elements in the Strategy for the California spotted owl range: (1) survey, inventory, and monitoring for invading barred owls and (2) removal of any barred owls that are located. The application of these varies by population based on the current barred owl presence and general habitat conditions.

11.1.1 Prioritization

All actions described in the Strategy are prioritized within each area to provide focus and recommendations to implementing entities. The priorities are non-binding and any action described by the Strategy would be allowed at any time. That is, we do not need to implement all Priority A items before starting on Priority B items. In some cases, a landowner that wants to participate in barred owl management may only have Priority C option on their lands. This allows them to implement such management even though it is not the highest priority. Within the California spotted owl range, the Strategy uses a 3-level prioritization system (A to C), applied at the population level. See Appendix 3 for more details.

Priority A: Actions that should be implemented as soon as possible to prevent barred owls from establishing populations where they are not yet established, particularly in areas where the risk of population establishment is high.

Priority B: Actions that should be implemented in the near future to prevent barred owl populations from expanding and establishing populations where they do not currently exist.

Priority C: Actions that may be implemented over time and would help to prevent barred owl populations from expanding and establishing populations.

12. Summary of the Strategy by Population in the California Spotted Owl Range

The following provides a summary of the Strategy components by California Spotted Owl Distinct Population Segment, including (1) survey, inventory, and monitoring for invading barred owls and (2) removal of any barred owls that are located. The application of these varies by population based on the current barred owl presence and general habitat conditions.

12.1 Sierra Nevada Population

12.1.1 Specific Provincial Goals for Barred Owl Management

1. Prevent colonization and population establishment of barred owl or hybrids across the Sierra Nevada, with the goal of maintaining barred owls at such low numbers they do not become a population-level threat to California spotted owls in the Sierra Nevada Province.

2. Focus specific attention on the key dispersal pathway in the northern Sierra Nevada from the Shasta-Trinity and Modoc National Forests and surrounding areas.

3. Respond quickly to reduce barred owl populations that may become established.

12.1.2 Management Strategy in the Sierra Nevada and Associated Invasion Pathways

The following is a summary of the management recommendations and priorities for the Sierra Nevada area. For more details, see Appendix 4-11.

1. <u>Inventory and monitoring for barred owls</u>

    a. Monitor all information sources for barred owl detection across the Sierra Nevada, including broad-scale systematic sampling, such as the ongoing Passive Acoustic Monitoring (PAM) effort, focal monitoring at sentinel spotted owl research sites, and detections recorded during short-term project-level surveys and anecdotal observations. Maintain and continue established monitoring network for the detection of barred and spotted owls across the Sierra Nevada. **Priority A**

    b. Develop an interactive database and rapid-response system to collate all barred owl detections that are identified through ongoing demographic and research projects, project-level management surveys and anecdotal observations within both the Sierra Nevada province and the key dispersal pathway areas. This includes development of a web-based portal where individuals outside of

agencies may voluntarily provide data on locations of barred owls in this area. **Priority A**

c. Develop a sampling design to inventory barred owls in areas that function as invasion pathways into the Sierra Nevada. Establish an extensive survey network across the region of the Shasta-Trinity dispersal corridor and in suitable habitat across the Modoc National Forest and other nearby forest lands. **Priority A**

d. Expand inventory and monitoring in select Great Basin mountain ranges with suitable habitat to the north and east of the Sierra Nevada (e.g., Warner Mountains). This is a potential invasion pathway, though not currently of primary concern. **Priority C.**

e. Expand initial inventory and monitoring efforts to include lands not included in initial survey efforts:

   i. Develop an enhanced sampling design to monitor barred owl detections and occupancy in the northern Sierra Nevada, the area at highest risk for barred owl invasion. **Priority A**

   ii. Develop an enhanced sampling design to monitor barred owl detections and occupancy in the central and southern Sierra Nevada. These areas are more removed from the potential invasion source and pathway, though barred owls may disperse long distances and reach these areas. Remove all barred owls detected from the lands of willing landowners. **Priority B**

   iii. Monitor all sources of information on barred owl detections within the Central Valley, an alternative source for barred owl dispersal into the Sierra Nevada. Remove any territorial barred owls identified. If the number of barred owl reports increases, establish additional monitoring to locate territorial barred owls. **Priority C**

2. <u>Lethal removal of detected barred owls</u>

   a. Conduct lethal removal of all barred owls located on surveys or otherwise identified in the Sierra Nevada population range and potential invasion pathways described above as soon as practicable from the lands of willing landowners. Non-lethal removal may be used where lethal removal is not possible, though barred owls should not be released back into the wild. **Priority A**

   b. Establish and maintain response team capacity to follow-up on barred owl detections and conduct lethal removal of all barred owls. Support a rapid response capacity so that follow-up surveys and lethal removals can be conducted as soon as possible following reports of barred owl detections. **Priority A**

3. Response to the establishment of barred owl populations

    a. The goal in the Sierra Nevada is to prevent self-sustaining barred owl populations from becoming established and creating a source of additional barred owls to colonize within the California spotted owl range. However, it may not be possible to detect and remove all barred owls.

    b. Using current and future research results, establish an occupancy level trigger that indicates barred owl populations are becoming self-sustaining and impacts to California spotted owls are eminent. Based on research in the northern Sierra Nevada, we recommend a starting threshold occupancy value of 0.10, though this would be modified as new information becomes available. Use systematic regional monitoring results to track the occupancy level.

    c. If annual surveys or inventory in the Sierra Nevada indicate that barred owl occupancy has increase beyond the occupancy trigger within the Sierra Nevada or the invasion pathways described above, intensify survey/monitoring and removal efforts within the province and in the surrounding dispersal pathways. **Priority A**

12.2 Coastal-Southern California Population

12.2.1 Specific Area Goals for Barred Owl Management

1. Prevent declines in California spotted owls in the Coastal-Southern California area from barred owl competition.

2. Limit the invasion of barred owls into the Coastal-Southern California portion of the range of the subspecies.

3. Respond quickly to reduce barred owl populations that may become established.

12.2.2 Management Strategy in the Coastal-Southern California and Associated Invasion Pathways

The following is a summary of the management recommendations and priorities for the Sierra Nevada area. For more detail, see Appendix 4-12.

1. Inventory and monitoring for barred owls

    a. Leverage all information sources to monitor for barred owl detections across the Coastal-Southern California range, and within potential invasion pathways. Monitor all sources of information on barred owl detections, including broad-scale systematic sampling, focal monitoring at sentinel spotted owl research

sites, and barred owl detections recorded during short-term project-level surveys and anecdotal observations. **Priority A**

b. Conduct an extensive initial inventory of barred owl status and distribution in the Coastal-Southern California population across the area on all public, and willing private lands, to establish baseline of current barred owl status and distribution across area. Include the current range of the subspecies, and the likely invasion pathways between the Coastal-Southern California and Sierra Nevada California spotted owl ranges as well as the coastal forests south of San Francisco. **Priority A**

c. Extend initial inventory efforts to all suitable barred owl habitat in the southern California mountains and throughout the rest of the area, including lands of all willing landowners and managers. **Priority B**

d. Develop an interactive database and rapid-response system to collate all barred owl detections that are identified through ongoing demographic and research projects, project-level management surveys and anecdotal observations. Provide opportunities for the public to provide locations. Develop an interagency database where records can be submitted that can facilitate a rapid-response follow-up to any detection. **Priority A**

e. Develop focused long-term monitoring, with particular emphasis on early detection surveys in areas along any potential barred owl dispersal and invasion corridors into the northern portion of the area along the border closest to the Sierra Nevada province and in the central coast near the border with the southern end of the California Coast province. **Priority B**

2. <u>Lethal removal of detected barred owls</u>

a. Conduct lethal removal of all barred owls located on surveys or otherwise identified in the Coastal-Southern California population range and potential invasion pathways described above. These should be conducted as soon as practicable from the lands of willing landowners. Non-lethal removal may be used where lethal removal is not possible, though barred owls should not be released back into the wild. **Priority A**

b. Establish and maintain response team capacity to follow-up on barred owl detections and conduct lethal removal of all barred owls. Support a rapid response capacity so that follow-up surveys and lethal removals can be conducted as soon as possible following reports of barred owl detections. **Priority B**

13. Monitoring

Monitoring of both barred and spotted owl responses to the management are a requirement for the issuance of the MBTA Special Purpose permit. Monitoring would also provide information on the effectiveness of barred owl management. Appendix 5 contains the Implementation and Effectiveness Monitoring Plan. For both types of monitoring, the Service, as the permit-holder, would be responsible for assembling data contributed by any designated entities.

Implementation monitoring would be focused on documenting that actions are consistent with the Strategy and any additional terms and conditions of the MBTA permit. Implementation monitoring requirements include information on the qualifications of the removal specialists, the location of management activities, and the barred or hybrid owls removed on an annual basis (see Appendix 5 for additional details).

Effectiveness monitoring would be focused on assessing the success of the management effort and providing information on the effectiveness of management under different conditions across the range of the northern and California spotted owls. This information could be used for future modifications of the approaches and would allow us to determine when barred owl management was no longer required (Appendix 5).

Monitoring would address effects of management to both barred and spotted owls. Monitoring requirements would be focused on answering specific questions.

For spotted owls, these questions include:

- Has the Strategy implementation met the goal of slowing or stopping population declines (or increasing the annual population growth rate) of northern spotted owls relative to population status in the same area prior to management, or in comparable areas without management?
- What is the status and trend in abundance, site occupancy/site use, or local (site or territory) colonization/extinction rates of spotted owls in managed areas relative to conditions prior to management or in comparable areas without management?

For barred owls, the questions include:

- Has the Strategy implementation reduced the abundance of, or site use by, barred owls, thereby providing habitats for northern spotted owls with reduced competition from barred owls?
- Has the Strategy implementation limited the colonization and establishment of barred owls into the range of California spotted owls?
- What is the status and trend in abundance, site occupancy/site use, or colonization rates of barred owls in managed areas?

The monitoring plan recommends integration with monitoring of northern spotted owl populations and old forests on Federal lands under the Northwest Forest Plan Effectiveness Monitoring Plan where feasible. This approach could reduce costs and effort required for monitoring. However, integration with Federal monitoring would not be feasible in all areas

where barred owls may be managed. Additionally, some potentially willing landowners or managers may not wish to integrate monitoring on their lands with the Federal system. In these cases, we would accept monitoring data obtained by other means or by similar means not integrated with the Northwest Forest Plan Effectiveness Monitoring, as long as it provided the necessary information for evaluation.

Monitoring for the effect on barred owls would occur at multiple scales, including the individual northern spotted owl site (territory), management block, province or area, and range-wide (northern and California spotted owls). Individual site and management block monitoring would be part of the management action. Information would be summarized in annual reports. Periodic assessments of monitoring data for barred owls and spotted owls would occur annually to update selected population indicators for barred and spotted owls, and at five-year intervals. The five-year assessment would be conducted coincident with meta-analyses of northern spotted owl population trends under the Northwest Forest Plan Effectiveness Monitoring Plan, allowing for formal analyses of the effectiveness in meeting Strategy goals as management is implemented. Detecting changes in population trend requires multiple years of data, and a five-year interval has proven effective in analyzing northern spotted owl demographic performance on the demography study areas (Franklin et al. 2021) (See Appendix 4 for additional details).

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Draft Barred Owl Management Strategy Appendices

Appendix 1: The Barred Owl in Western North America – Invasive Species Evaluation for Barred Owl Management Strategy

The following analysis is specific to the appropriate characterization for the barred owl in the West, specifically within the ranges of the northern and California spotted owls. It should not be considered a policy decision or applied directly to other species or situations, as each situation is unique.

A1.1. Invasive Species Definitions

Direction: Executive Order 13112 was created to prevent the introduction of invasive species, to provide for their control, and to minimize the economic, ecological, and human health impacts that invasive species cause.

Question: Is the barred owl in the west an invasive species as defined under E.O. 13112? To determine the correct characterization under the E.O. 13112, we compare the components and definitions of the Executive Order to the situation with the barred owl in western North America.

Under E.O. 13112, ''Invasive species'' means an alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health (emphasis added). These terms are further defined as follows (emphasis added):

> ''**Alien species**'' means, with respect to a particular ecosystem, any species, including its seeds, eggs, spores, or other biological material capable of propagating that species, that is not native to that ecosystem *(hereafter referred to as non-native in this document)*.
>
> **''Ecosystem''** means the complex of a community of organisms and its environment.
>
> ''**Native species**'' means, with respect to a particular ecosystem, a species that, other than as a result of an introduction, historically occurred or currently occurs in that ecosystem.
>
> ''**Introduction**'' means the intentional or unintentional escape, release, dissemination, or placement of a species into an ecosystem as a result of human activity.

A1.2. Barred Owl History, Impact, and Range Expansion

Barred owls (*Strix varia*) are native to eastern North America and were historically found east of the Great Plains and south of the 49th parallel (Livezey 2009a p. 53), with a subspecies in central Mexico. Around the turn of the 20th century their range began to expand westward. The barred owl's arrival in the west is a relatively recent occurrence. Based on genetic studies, the spotted

and barred owls are distinct species, separated from a common ancestor for a very long time prior to this expansion (Haig et al. 2004, p. 1353 Hanna et al. 2017, p. 2537, 2539).

Spotted owls (*Strix occidentalis*) are native to western North America. The northern spotted owl subspecies (*Strix occidentalis caurina*) is found in British Columbia, Washington, Oregon, and northern California. The California spotted owl subspecies (*Strix occidentalis occidentalis*) is found in the Sierra Nevada mountains and the coastal mountains of southern California, and its historic range extends into northern Baja California, Mexico.

A1.2.1. Barred owl range expansion.

Barred owl populations began to expand westward in the early 1900s (Livezey 2009a, p. 50). The first record of barred owls within the range of the northern spotted owl was in 1959 in British Columbia, Canada. Barred owls established populations, subsequently spreading south (Grant 1966, p. 39). Barred owls were first located in western Washington within the range of the spotted owl in 1972 and the first breeding record was 1974 (Smith et al. 1997, p. 230). The first record in Oregon was from 1974 and California in 1976, with breeding documented by 1991 (Livezey 2009a, p. 40).

Barred and spotted owl are both forest owls, whose ranges were separated by the relatively treeless Great Plains and harsh conditions in the Northern Boreal Forest, both likely formidable barriers to expansion (Livezey 2009b, entire). Given the limited data and observations from that time period, the mechanism and route that facilitated westward expansion after so many millennia of separation are not documented. Theories point to changes in the conditions on the Great Plains and Northern Boreal Forest as probable explanations. These include anthropogenic impacts such as fire exclusion and suppression, bison and beaver extirpation, deer and elk overhunting, establishment of riparian forests, and extensive planting of trees and shelterbelts in the northern Great Plains and southern edges of Northern Boreal Forests, all of which may have contributed to tree and forest expansion (Livezey 2009b p. 334). In addition, Northern Boreal Forests experienced a continued increase in temperatures as CO_2 levels in the atmosphere rose, with short but pronounced warming periods in the early to mid 1900s (Campbell et al. 1993 entire; Gullett and Skinner 1992 entire; Schindler et al. 1998 entire).

Livezey (2009b, entire), using strength of evidence analysis, evaluated the plausibility of five ecological or behavioral changes proposed in the literature to have facilitated the range expansion. He concluded that the historical lack of trees in the Great Plains acted as a barrier to the range expansion and that increases in forest caused by European settlers excluding fires historically set by Native Americans and planting trees created conditions that allowed barred owls to expand across the previous barrier.

Two potential routes for expansion have been suggested, one across the northern Great Plains and the other through the southern portion of the Northern Boreal Forest in Canada. Each are affected by anthropogenic impacts, and both may have been factors in the expansion of barred owls.

Great Plains Potential Route

The changes brought to the Great Plains as a result of European settlement are a likely and reasonable explanation for the breakdown of the barrier (Livesey 2009b, p. 338).

Settlement and homesteading, resulting in the extensive planting and caring for trees (Livezey 2009b, pp. 333-4) including shelter belts around homes and communities and the establishment of woodlots and orchards as part of tree claims under the homestead laws, all leading to significant expansion of small, forested patches on the Great Plains. These patches were often associated with farming, and grain storage which in turn likely lead to an increase with potential barred owl prey in these forest patches. The U.S. Bureau of Forestry reported in 1890 that ‘‘every year the treeless belt becomes narrower through constant planting’’ (as recorded in Druze, 1977:16). In Manitoba, some 60 million trees were planted from 1901–1920 as a result of an anti-erosion shelterbelt program (Williams 1989, as cited in Livezey 2009b). With the consolidation and intensification of agriculture and the death of planted trees from age and stress, many of these have been lost in recent decades.

The removal of bison and beaver from the Great Plains occurred prior to the expansion of barred owls. Beaver were extensively trapped in the 1800s, including along the waterways that served as major transportation networks for moving hides to the Eastern markets. Beaver are very efficient at removing small and large trees alike, particularly in areas where this resource is limited, and could suppress the development of riparian forests along rivers in the Great Plains. Ungulates, including bison, previously occurred in large numbers and may have reduced riparian forest development through mechanical damage and browsing by deer. These changes may have allowed the development of riparian forests along major waterways that cross the Great Plains, such as the Missouri River system. Cattle grazing and the slow return of beaver, along with the development of extensive reservoirs with highly variable water levels have greatly reduced these riparian forests in recent decades.

Fire reduction resulting from fire breaks created by fallow fields and agriculture, and the cessation of Aboriginal burning, may have allowed forests to develop or expand (Livezey 2009b, pp. 327-330), particularly in areas with sufficient rain to support trees.

Northern Boreal Forest Potential Route

Treeline along the southern edge of the Northern Boreal Forest was affected by the same factors listed above. Extensive tree planting/forest expansion and both direct and indirect fire exclusion/suppression by settlers occurred at the southern edge of Northern Boreal Forests in Canada (Livezy 2009b p. 327-336).

Conditions within the Northern Boreal Forest have likely changed with the early effects of climate change. There has been a general warming trend since at least 1860 in Canada, including in the Northern Boreal Forest. This warming trend may have begun at the end of the last mini-ice age, but likely increased as a result of anthropogenic factors resulting in an increase in greenhouse gases in the atmosphere (Campbell et al. 1993, Gullett and Skinner 1992, Schindler et al. 1998). The period from the late 1800s through the 1940s experienced a pronounced

warming trend in Central Canada especially in the Northern Boreal Forest and Canadian prairie, with the 1930s to 1940s being particularly warm. (Shindler et al. 1998 p. 157-158; Gullett and Skinner 1992, entire). While the Northern Boreal Forest structure did not substantially change as a result of climate changes in the past 100-150 years (Campbell et al. 1993, p. 336-337), small changes in the general or extreme temperatures may have allowed barred owls to survive and reproduce in the southern portion of the Northern Boreal Forest where they had not previously existed.

Current Range of Barred Owls

Barred owls now occur throughout virtually all of the northern spotted owl range, and in high to very high densities throughout most of the range throughout most of the northern spotted owl range (Wiens et al. 2021, p. 7). Within the California spotted owl range, barred owls have been documented as individuals and small populations in the Sierra Nevada mountains (Keane et al. 2018, p. 5).

A1.2.2. Impact of Barred Owls on Western North American Biota.

Competition from barred owls had been identified as one of primary threats to the survival of the northern spotted owl, with increasing urgency (USFWS 2004, p. 43; USFWS 2011, p. II-4, III-62; Franklin et al. 2021, p. 13). Most recently, authors have concluded that failure to reduce barred owl populations will likely lead the extirpation of the northern spotted owls in the near future (Franklin et al. 2021, p. 19; Wiens et al. 2021, pp. 7-8). Competition from barred owls has been identified as a significant threat to the California spotted owl and is expected to increase in magnitude without management of invading barred owls (88 FR 11600, at 11619).

Barred owls are generalists, consume a much wider variety of prey than spotted owls, and can develop higher density populations (Baumbusch 2023, entire). Therefore, they are not an ecological replacement for spotted owls. The increasing populations of barred owls are likely impacting native species that are evolutionarily naïve to its presence, through predation or competition for prey (Baumbusch 2023, pp. 135, 137; Holm et al. 2016, entire;). Unfortunately, we do not have sufficient monitoring data for these species to verify species-specific effects in most cases. Data on the diet of barred owls in the West includes groups that contain at-risk or listed species (Baumbusch 2023, p. 23), including, but not limited to, small mammals, amphibians, reptiles and other birds (Baumbusch 2023, pp. 135, 137). Studies have documented predation on red tree voles, a candidate for listing under the Endangered Species Act (Baumbusch 2023, p. 23-25), and heavy predation on amphibians, a group that includes several at-risk endemic species. Additional groups found in barred owl prey studies that contain some listed and protected species or populations include mountain beaver, crayfish and birds.

Even for prey species not currently at risk, the density and high energetic requirements of barred owls may lead to significantly greater pressure on these species and potentially unsustainable levels of predation (Baumbusch 2023, p. 30-31, 135). Scientists have expressed concern that the barred owl's breadth of prey and intensity of use could lead to cascading effects on the ecosystem and its food webs (Holm et al. 2016, entire). This could affect not only spotted owls, but entire ecosystems.

A1.3. Barred Owls in the Western US and the Invasive Species Definition

Under E.O. 13112, ''Invasive species'' means an alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health (emphasis added).

Alien Species: *means, with respect to a particular ecosystem, any species, including its seeds, eggs, spores, or other biological material capable of propagating that species, that is not native to that ecosystem.* To address this we must define the ecosystem and examine whether barred owls are native to the ecosystem described above.

> **Ecosystem:** For the purposes of this analysis, we are addressing the presence of barred owls in the ecosystems defined by the ranges of the northern and California spotted owls. These include the forests of western Washington, western Oregon, and California.
>
> **Native Species:** *means a species that, other than as a result of an introduction, historically occurred or currently occurs in that ecosystem.*
>
> Barred owls did not historically occur in the western US. They were historically found in eastern North America, generally east of the Mississippi River, with a subspecies in central Mexico, separated from the western US by the Great Plains and arid parts of the American southwest and northwestern Mexico. Barred owls were first reported in the range of the northern spotted owl around 1959 in British Columbia.
>
> Barred owls have long been one of the most common, easily recognizable and vocal owl species in the eastern forests of North America, with a distinctive 'who-cooks-for-you' call that carries over long distances in the forest. They have an easily identifiable appearance, and are conspicuous and territorial, even to humans. It is very unlikely that barred owls had been overlooked in the west prior to the turn of the 20th century or in the range of northern spotted owl in the mid to late 1900s. Given the apparent rapid and recent impact of barred owls on northern spotted owl population demographics over the last few decades, there is little chance that barred owls have been in contact with northern spotted owls for much more than 50 to 70 years.
>
> The definition of a native species specifically excludes occurrence of that species as a result of an introduction.

Introduction: *means the intentional or unintentional escape, release, dissemination, or placement of a species into an ecosystem as a result of human activity.*

An introduction does not require the intention to move a species to a new ecosystem. It can be the result of creating the habitat or conditions necessary that allows a species to move or expand across what was previously a barrier to such movement. For example, building a bridge between two islands, thereby allowing terrestrial species to cross the pervious water barrier.

The expansion of barred owls into the West is likely the result of a breakdown of the barrier previously established and maintained by conditions in relatively treeless conditions in the northern Great Plains and harsh weather of Northern Boreal Forest, as described above. Therefore, this expansion represents release or escape from previously range limitations created by the above barriers, allowing barred owls to spread into the forests of the West.

Human actions, in particular changes brought to the Great Plains and Northern Boreal Forest as a result of European settlement and potential effects of early climate change on winter conditions in these areas are the most likely and reasonable explanations for the breakdown of the barrier, as described above.

Invasive species: are defined, in part, as a species that *causes or is likely to cause environmental harm.*

Barred owls have been identified as one of the two primary threats to the survival of the northern spotted owl. (USFWS 2011, p. II-4, III-62) and a significant threat to the persistence of California spotted owls (USFWS 2023, p. 11619). There is a high potential for other species being adversely affected by this new predator through direct predation or competition for prey, including other listed species or species at risk. Barred owl have the ability to exist in dense populations, which increased the impact on even common species.

A1.4. Conclusion

Based on the summarized information above, we conclude that the barred owl in western North America meets the definition of an invasive species in E.O. 13112. The barred owl is an alien species, not native to the range of the northern and California spotted owls. Barred owls were introduced unintentionally through dissemination across the previous barriers to movement of this forest owl created by the generally treeless conditions of the Great Plains and harsh conditions of the Northern Boreal Forest. This movement was made possible by human-caused changes to the Great Plains and Northern Boreal Forest. Barred owls are causing significant environmental harm to northern spotted owls, a subspecies listed as threatened under the ESA, and are likely to cause significant harm to California spotted owls as barred owl populations continue to expand. They are likely harming other species on which they prey and are considered a risk to create a trophic cascade in some forest systems.

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Appendix 2: Methodology for the Removal of Barred Owls from the Draft Barred Owl Management Strategy

The following is the protocol developed for removal under the draft Barred Owl Management Strategy, including documentation requirements for designation as an implementer and removal specialist. This would apply to all implementers involved in lethal removal under the Strategy as well as the capture and euthanize option.

The U.S. Fish and Wildlife Service (Service) intends that any removal of barred owls for purposes of this Barred Owl Management Strategy and associated MBTA permit would be conducted in a professional manner using methods that are safe, humane, and effective while meeting the need to reduce barred owl populations in treatment areas. We adopt the following guidelines and protocols to ensure that barred owl removal meets this intent through appropriate consideration of methods, timing, and safety. Removal methods would ensure humane treatment of all affected barred owls. Every effort would be made to minimize the risk of unnecessary injury or trauma to barred owls or non-target species.

Barred/spotted owl hybrids may also be removed, as they have the same impact on spotted owls as barred owls. Because visual identification of hybrids is more difficult, particularly at night, there is a specific protocol for the identification of hybrids prior to removal (See Section A2.3.3).

Minor changes to this methodology may occur during the implementation of the Strategy if information and experience justify changes to make removal safer or more effective, while maintaining the intended high standards for humane and ethical treatment of affected animals. Any proposed changes would require approval by the Service prior to their adoption and implementation. These guidelines, as presented here, apply specifically to actions conducted under the Strategy, but may be used or adapted to other projects following any needed environmental review of those future projects.

A2.1. Requirements for designation as an implementer.

To receive designation as an implementer for actions under the Strategy, requesting entities must provide the following information.

A2.1.1 Information for specific removal efforts:

For barred owl removal in the range of the northern spotted owl (excluding Marin and Sonoma County), before beginning barred owl removals, each individual or group authorized to implement the Strategy would submit the following information:

- Maps of the approximate area where barred owls will be removed, preferably in the form of geospatial data (e.g., a geodatabase), but paper or electronic maps would also be acceptable, as long as the maps provide adequate reference points. These maps should also include locations of primary human dwellings, established open campgrounds, and other locations

with regular human use, showing the 0.25 mile no-shooting buffer zone around these areas, and locations of known spotted owl sites.
- A list of veterinary resources and wildlife rehabilitation facilities and specialists to be contacted in case of accidental injury of non-target wildlife.
- A list of requested individuals to be designated as removal specialists. These individuals must be approved by the Service as the permit-holder, prior to any removal work.

For barred owl removal in Sonoma or Marin County, or within the California spotted owl range or potential invasion pathways:

- A general map or description of the areas where barred owl removal may occur. This can be at a regional or county scale.
- A list of veterinary resources and wildlife rehabilitation facilities and specialists to be contacted in case of accidental injury of non-target wildlife.
- A list of requested individuals to be designated as removal specialists. These individuals must be approved by the Service as the permit-holder, prior to any removal work..

Any changes to the above information should be submitted with the annual report. Changes in in the boundaries of the barred owl removal area may be updated at any time, but must be approved by the Service prior to implementation.

A2.1.2 Information required for designation as a removal specialist:

Prior to being designated as a removal specialist authorized to remove barred owls under this Strategy, each individual requesting authorization will provide documentation of training or experience in the following areas. The Service will review the request and may ask for additional information. The Service reserves the right to determine who would be designated as a removal specialist under the Service MBTA permit.

- Barred owl and spotted owl identification, using visual and auditory means.
- Firearm skill and accuracy.
- Understanding of the methods for removing barred owls with firearms.
- Barred owl handling and human field euthanasia methods.
- Experience with barred owl removal.

Experienced removal specialists should ensure that their documentation includes:

- Total number of years and dates of previous removal experience.
- Number of barred owls removed.
- Number of barred owls injured and not recovered.
- Any injury to non-target wildlife.
- To demonstrate understanding of the protocol, describe at least one situation where they decided not to shoot the target bird, or if that situation has not occurred, a hypothetical situation in which they would not shoot an owl.

Individuals who have received training but have not yet conducted independent barred owl removal should ensure that their documentation includes:

- The name of the trainer who provided training in barred owl removal methodology.
- Dates on which they observed at least three separate successful barred owl removals by the trainer.
- Dates on which they identified and successfully removed at least four barred owls under the supervision of the approved trainer.
- Documentation that the trainer has certified them as being ready for independent removal.

Changes in personnel wishing to be designated may be updated at any time by requesting addition or removal of individuals as removal specialists and submitting the above information. The Service must approve the request before the individual is authorized to remove barred owls

A2.2. Considerations Prior to Conducting Removal Activities

Prior to initiating removal, any preliminary monitoring required for the permit should be completed (See Appendix MONITORING PLAN, A5.1.1).

Removal of barred owls may occur at any time of the year. However, we recommend focusing activities before and during the barred owl nesting season (early spring through mid-summer), and in the fall. Past studies have demonstrated that barred owls are easier to locate and remove during these periods.

A2.2.1. Identification of Barred Owls Prior to Removal

Positive identification of barred owls prior to removal would be confirmed by either two individuals (removal specialist and a trained observer) or by a single removal specialist ideally identifying the bird by both visual and auditory cues. In the absence of auditory cues, barred owls may be removed by visual identification only if an experienced removal specialist has a clear and unobstructed view of the owl and is able to detect multiple components of the species' characteristics. Note that barred owls in the West may exhibit muted visual characteristics such as the extent of barring on the front. If there is any doubt about the species identification, no removal attempt should occur, and a new attempt conducted at a later time. Persons participating in removal activities must be able to accurately identify spotted owls and barred owls using both visual and auditory means, and confidently distinguish between the two species. Those not experienced with such identification should receive training and testing in owl identification prior to removal activities (see training section below).

A2.2.2. Preparation for Accidental Injury of Barred Owls or Non-Target Species

While the protocol is designed to avoid injury to non-target species, such injury may still occur. Prior to conducting barred owl removal activities, parties responsible for removal should identify veterinary resources and wildlife rehabilitation facilities and specialists within reasonable transport distance of the removal sites. Those involved in removal should have contact information available during field work. Removal specialists should be aware of

appropriate handling techniques for safe and humane transport of injured animals to rehab facilities and have any needed equipment (e.g., carriers).

Any barred owls wounded, but not killed, during removal would be humanely euthanized. All people involved in removal should be trained in effective, humane methods of field euthanasia and have all the necessary material available at all times during removal.

A2.3. Guidelines and Precautions for Lethal Removal

The following guidelines are designed to minimize the risk of nonlethal injury or suffering of barred owls, or the injury or death of non-target species, during lethal barred owl removal, while ensuring the safety of field personnel and the public.

A2.3.1 Lethal Removal Methods

When setting up the location for barred owl removal, reasonable effort should be made to limit the shooting distance to no more than 30 yards to minimize the risk of nonlethal injury or prolonged death. Removal specialists should seek a removal location that offers multiple unobstructed perch sites with clear shooting opportunities within the preferred distance of 20 to 30 yards prior to attempting to attract the barred owl into shooting range.

Barred owls will be lured to the removal specialist using an amplified megaphone, or similar device, to broadcast digitally recorded barred owl calls, alternating with listening for responses. The calls and mix of calls are at the discretion of the removal specialist, but generally include single-note hoot, 2-phrase hoot, ascending hoot, and pair duet calls. Generally, removal specialists will call for about 15 minutes at a location before moving on if no barred owls are heard. However, conditions or topography may require a longer period, at the discretion of the specialist. If barred owls are heard, calling may continue intermittently as long as there is some potential for the barred owl to be lured in. The specialist may also relocate to better access the barred owl.

For area-based removal, calling stations should be located about ¼ to ½ mile apart, taking advantage of topographical features to cover the forest lands within the area. For efforts to locate and remove previously reported barred owls, multiple calling stations may be required to find the barred owls for removal.

Before any removal, there should be positive identification of the barred owl, confirmed by either two observers or by a single individual identifying the bird by both visual and auditory cues. Barred owls may be removed in the absence of vocalizations, but only if the observer has a clear and unobstructed view of the front of the owl and is able to detect multiple components of the species' characteristics.

If spotted owls are detected in the immediate vicinity of barred owls, it may become difficult to "track" individual birds, especially during agonistic encounters between the two species. Unless the barred owl can be "pulled" at least one-half mile away from the spotted owls,

lethal removal at that location should be postponed to a later date to minimize the risk of accidental injury or death of a spotted owl, either from removal or inter-species encounters. If a second observer is available who can keep track of the spotted owl, the removal effort can continue.

To avoid disturbing nesting spotted owls, removal should generally not occur within 300 yards of a known active spotted owl nest during the critical breeding period for northern spotted owls (March 1 to July 31, or as established locally). To avoid drawing barred owls close to an active spotted owl nest, we recommend that any barred owl removal location be at least 0.25 miles from known active spotted owl nests, and in a direction that would not pull the barred owls towards the spotted owl nest.

Lethal removal should be done by shotgun of 20 gauge or larger bore, using non-toxic lead-substitute shot **(**e.g., Hevi-shot, steel). Lead shot may not be used. Rifles, pistols, or other firearms or methods are not authorized under this protocol. "Quiet" shotguns (e.g. www.quietgun.com) may be used to reduce impacts to wildlife or humans, if allowed under State or local agency rules and regulations. Before initiating removal efforts, and periodically during the season, removal specialists should test the pattern and distance characteristics of their gun to ensure they know the capabilities of the gun and loads. We recommend that shotguns be equipped with an attached night scope or other gunsight designed specifically for night use for accurate and precise aiming in dark or low light conditions (e.g., red dot sight mount).

All shots must be directed at barred owls which are stationary on an unobstructed perch and present a full, frontal and unobstructed view. On-the-wing shots are not authorized under this protocol.

If barred owls are wounded, but not killed, every reasonable effort should be made to locate any injured barred owls and euthanize it quickly and humanely. All personnel should be trained in field euthanasia and carry the needed equipment at all times during any removal attempt.

Any injury or death of a non-target species should be immediately reported to the designated Service contact. Any injured animals other than barred owls should be transported to a licensed rehabilitation facility. In addition to the immediate reporting to the Service contact, the circumstances surrounding such unintended injury or death should be described in a written incident report sent to the designated Service contact within 3 business days of the incident; this information should also be included in the annual report. If the non-target species is a listed threatened or endangered species (e.g., spotted owl) no further removal activities may be conducted until the Service reviews the incident report and authorizes such activities to resume.

In situations where firearms cannot be used or their use is inadvisable due to safety concerns, local regulations, or the density of human habitation, removal specialists may capture and euthanize barred owls. Capture should be accomplished using techniques that minimize the risk of injury and stress to barred owls yet prove effective in capture. Any technique should be

designed to secure the barred owl quickly and with the minimum potential for injury. Any captured animal should be removed immediately from the capture device. Personnel responsible for barred owl capture should be trained and experienced with the capture technique. When deployed, capture devices must be attended at all times by a person trained in the employed capture method. Euthanasia may be conducted immediately upon capture, or barred owls may be moved to a better spot for euthanasia, as long as this occurs as quickly as possible after capture.

Carcass Recovery: Reasonable effort should be made to retrieve barred owl carcasses immediately after the shot while allowing for safety considerations, particularly at night in rough terrain. If the carcass cannot be located at the time of shooting, the removal specialist should return to the site as early as feasible the next day to resume the search. If the carcass cannot be located within a reasonable time, the removal specialist will describe the situation on the data card, including any information regarding the likelihood that the shot may have missed, or that the bird was injured and escaped. Any such incident reports will be appended to the annual report for the project.

The following data must be recorded for each carcass:

> Removal date and time, removal specialist's name, specific location (Universal Transverse Mercator (UTM) coordinates are recommended), name of other persons assisting or observing, and permit number under which the specimen was collected.
>
> To improve our understanding of barred owl populations, the following physical measurements should be taken from the carcass if possible: body mass, foot-pad length, and sex (if known) (see Baumbush et al. 2023). This information allows estimation of the body condition of the barred owl.
>
> For each carcass recovered, three photographs of the carcass are required – 1) the front – including head, chest, and tail, including a clear view of the lower abdomen; 2) the underside of the tail, flared out; and 3) the underside of the spread wings to allow aging of the specimen. If a carcass could not be safely recovered, this should be noted on the data form.
>
> Once the data and photographs are collected, the carcass may be buried on site or transmitted to an entity that has indicated interest and holds the appropriate MBTA and state permits to receive or dispose of the specimen.

A2.3.2 Safety

Lethal removal involving firearms is inherently dangerous; more so under the evening or darkness conditions likely to be optimal for barred owl removal. The safety of the public and the persons involved in the activities is of utmost importance. Therefore, the following measures should be employed to ensure the safety of all involved.

All personnel involved in lethal removal will receive specific training and must demonstrate

knowledge of proper firearm safety prior to conducting removal activities. They should also demonstrate skill and accuracy with the shotgun to be used. Accuracy is critical to avoid wounding barred owls. Training should cover shotgun use and protocol, along with the ethical, logistical, and safety considerations of conducting the removal.

Removal specialists are responsible for obtaining all applicable state and federal licenses and permits necessary for possession and use of firearms, and for their transport to and from the study area. Removal specialists are responsible for meeting all safety and operational requirements pertaining to those permits.

Removal specialists must observe all laws, regulations, ordinances, (including state and local) and site- specific requirements regarding use of firearms on public lands, near human habitation, within parks, etc. At a minimum, we require a no-shooting buffer zone of 0.25 mile around occupied dwellings, established open campgrounds, and other locations with regular human use. Prior to and during removals, the area will be assessed for potential human presence (homes, tents, vehicles) and appropriate buffers will be applied.

Individual landowners or managers may establish other requirements based on their knowledge of particular conditions or areas within the study area. Where conflicts with other human uses may occur, the removal specialists should attempt to draw the barred owls away from such situations to favorable removal locations through well-planned calling. A "silent" shotgun may be used in areas where people may be disturbed if allowed under state and local laws or with the appropriate permits.

Appropriate local law enforcement, and agency law enforcement for the lands on which removals will occur, should be contacted prior to field work to minimize public concerns over nighttime discharge of firearms, or their use in areas where they are generally prohibited (e.g., parks), thus avoiding unnecessary law enforcement response. Coordinate with State and Federal agency biologists for the area where the removal will occur. Consider contacting local landowners to minimize public concern.

A2.3.3 Lethal Removal of Hybrids

Hybrids between barred owls and spotted owls are generally rare and obvious hybrids are not commonly encountered. Hybrids are not specifically the target of this Strategy but have the same effect on spotted owl populations and can be removed under this Strategy and protocol. Many first-generation hybrids (one parent of each species) do exhibit physical or vocal characteristics (or both) intermediate to the parent stock, but even these characteristics may be difficult to identify under removal conditions. Second or third generation back-cross individuals (e.g., cross between a hybrid and a barred owl) are very difficult to detect even in hand and usually closely resemble the non-hybrid parent.

Since the prescribed method for lethal removal does not provide an opportunity to inspect the individual "in hand" prior to the commitment to remove, identification will rely on a reasonable consideration of observational evidence under field conditions. If in doubt, removal specialists should not remove the individual until additional follow up can verify its

identification as a hybrid. If an owl is identified as a hybrid based on field characteristics, it may be removed with appropriate protocols ensuring the identity of the individual. We anticipate that most second-generation and later-generation hybrids that back-cross with barred owls will appear in the field as barred owls and will be removed as such.

Given the difficulty in identifying hybrids, inadvertent lethal removal of even a first-generation hybrid may occur and the hybrid characteristics may not be evident until the specimen is in hand. If an owl carcass appears to be a hybrid once in hand, the specimen should be tagged for future analysis. All confirmed incidences of the removal of hybrids should be reported to the Service as part of required annual reports. These are not considered a take of spotted owls.

A2.3.3.1. Identification of Hybrid Owls Prior to Removal

Identification of hybrid owls requires both visual and auditory observations. If there is any doubt that it could be a spotted owl, the bird should not be removed. The following identification protocol is specific to the removal of suspected hybrid owls. It is focused on insuring that spotted owls are not removed by accident but accepts a higher risk for barred owls to be removed, even if initially identified as hybrids. Hybrids are very uncommon in most areas, and removal specialists may have little experience with their identification. Therefore, we require two individuals (removal specialist and a trained observer) make a positive identification prior to removal. It may be worth waiting until an expert with experience of hybrid owls can verify the identification.

Visual identification of hybrids in the field can be very difficult, particularly at night when most removal occurs, so visual identification alone is not adequate for removal of suspected hybrid owls. The defining visual features for hybrids vary across specimens and are understandably more subtle in nature than the difference between the two species. The focus of this identification is to ensure that spotted owls are not identified as hybrids. While visual identification alone of a free ranging owl is often insufficient to positively verify a hybrid individual, it is still an important part of the identification protocol. Before removal, the shooters must observe a frontal view of the bird to eliminate the possibility that the targeted bird may be a spotted owl.

To ensure the suspected hybrid owls are correctly identified, the observers must hear the bird use a territorial defense song (e.g. 8-note hoot or descending hoot of the barred owl) numerous times (at least 6). The observer must hear multiple complete calls before making a decision to remove the hybrid.

If a suspected hybrid uses a standard barred owl territorial defense song eight-note hoot (sometimes called two-phrase-hoot = who-cooks-for-you who-cooks-for-you-too) and shows some definitive evidence of barred owl plumage characteristics, it can be removed per the barred owl removal protocol. Examine the specimen in hand and if there is any question, note this in the records.

If a bird **<u>at any time</u>** uses a typical spotted owl territorial defense song (4-note - hoot, hoot-hoot hoooooot) in its repertoire, then it may be a spotted owl. It is critical to realize that individual spotted owls do not always use the complete standard hoot. For example, individuals have been

known to consistently drop the first note or add a tag note at the end, and different parts of the call attenuate at different rates over distance. If there is any question as to whether the bird may be a spotted owl, no removal should occur.

If a bird gives multiple complete territorial defense song calls while visible, none of which can be clearly classified as typical spotted owl calls, the calls sound like a mix of barred and spotted owl characteristics, and the bird shows some definitive evidence of barred owl plumage characteristics, the bird may be removed. Examine the bird in hand for hybrid features.

All suspected hybrids should be recorded prior to removal, if it can be done without interfering with the positive identification of targeted owls in the field. While this is not required, it will assist in developing more definitive methods for identifying hybrid owls. All other aspects and requirements of barred owl removal apply to removal of hybrid owls.

A2.3.3.2. Hybrid Owl Carcasses

We recommend that all suspected hybrids be submitted for genetic testing to confirm their hybrid status. Retain all carcasses and check with the Service contract for a decision on testing.

Given the difficulty in identifying hybrids, inadvertent lethal removal of even a first-generation hybrid may occur and the hybrid characteristics may not be evident until the specimen is in hand. If an owl carcass appears to be a hybrid once in hand, the specimen should be tagged for future analysis. All confirmed incidences of the removal of hybrids should be reported to the Service as part of required annual reports. These are not considered a take of spotted owls.

A2.4. Guidelines and Precautions for Nonlethal Removal

While most removal will involve lethal removal in the field, there may be occasional situations where firearms cannot be used. In those cases, the owls can be captured and euthanized. We do not recommend this as a primary removal method as it includes added stress for the barred owls.

The following guidelines and precautions apply specifically during nonlethal removal of barred owls. They are designed to minimize the risk of injury, excessive stress, or suffering of barred owls during capture or the injury or death of non-target species.

A2.4.1. Live Capture Methods

Capture should be accomplished using techniques that minimize the risk of injury or mortality to barred owls, yet prove effective in capture. Any technique should be designed to secure the barred owl quickly and with the minimum potential for injury. Any captured animal should be removed immediately from the capture device. Personnel responsible for barred owl capture should be trained and experienced with the capture technique. When deployed, capture devices must be attended at all times by a person trained in the employed capture method. Euthanasia may be conducted immediately upon capture, or barred owls may be moved to a better spot for euthanasia, as long as this occurs as quickly as possible after capture.

Any non-target species inadvertently or incidentally captured during the attempted capture of a barred owl should be inspected for injury and, if uninjured, released immediately at the capture site. Injured animals should be transported to a licensed rehabilitation facility immediately. Any injury or death of a non-target species should be immediately reported to the designated Service contact and a written incident report sent to the designated Service contact within 3 business days of the incident; this information should also be included in the annual report. If the non-target species is a listed threatened or endangered species (e.g., northern spotted owl) no further removal activities may be conducted by the permittee until the Service authorizes such activities to resume.

A2.5. Training Requirements and qualifications.

All individuals conducting removal under the Strategy will be required to provide documentation of their experience or training to the Service or the Service's designated representative and the Service's approval. This should cover the following areas:

1. Barred and spotted owl identification, using visual and auditory means.
2. Firearm skill and accuracy.
3. Understanding of the methods for removing barred owls with firearms
4. Barred owl handling and humane field euthanasia methods
5. Experience with barred owl removal.

For individuals experienced with the removal of barred owls, the above information will be sufficient. This should include the number of years (and dates) of removal experience, number of barred owls removed and of any barred owls injured and not recovered, and any injury to non-target wildlife. To evaluate the individual's understanding of the protocol, they must describe at least one situation where they decided not to shoot the target bird or if a real-life example is not available, describe a hypothetical situation in which this might take place.

For individuals not experienced with the removal of barred owls, please include documentation of the following training:

1. Barred and spotted owl identification. This will be part of the field training and may include a visual and auditory owl identification test.
2. Firearm use, including shooting from various distances, and angles, shots taken at 20 to 25 yards, and using a target the size and shape of a Barred Owl with identified kill zones.
3. Training in the ethics of conducting lethal removal, including when to walk away and skill in the use of rapid and approved euthanasia methods for barred owls.
4. Understanding of the removal protocol and equipment, including
    a. equipment requirements and safety check;
    b. assessing surroundings and potential nearby human presence prior to any collection activity at a given location (i.e. dwellings, hiking trails, tent campers);
    c. determining if spotted owls may be nearby;
    d. selection of favorable removal locations, placement of callers, and call sequences
    e. criteria for taking a shot or deciding when to walk away
    f. data collection, including use of equipment and information/photos required.

All inexperienced personnel requesting barred owl removal authorization must obtain experience with identification and removal of barred owls in the field under the direct supervision of an approved trainer experienced in barred owl removal methodology. This includes:

- Observe at least 3 separate successful barred owl removals by an approved trainer.
- Correctly identify and successfully remove at least 4 barred owls under supervision of an agency-approved trainer.
- Be certified by the trainer as ready for independent removal. The trainer may require more removals for a particular trainee if the trainer feel the trainee needs more experience to effectively and carefully conduct the activity.

The Service retains the right to require additional training or documentation, and to refuse to include individuals under the Service MBTA permit.

Literature Cited

Baumbusch, R. C. 2023. Foraging Ecology of Barred Owls where they are Outcompeting the Threatened Northern Spotted Owl. Oregon State University. Dissertation. 173 pp.

Appendix 3: Prioritization of Actions in the Northern and California Spotted Owl Range

All actions described in the Barred Owl Management Strategy (Strategy) are prioritized within each province or area to provide focus and recommendations to implementing entities, though it is non-binding and any action described by the Strategy would be allowed at any time.

A3.1. Northern spotted owl

Within the northern spotted owl range, the strategy used a 5-level prioritization system (A to E), applied at the province level, ranging from actions that should be implemented immediately to those that are not urgent but that could still assist in stabilizing or providing additional support to spotted owl populations.

Priority A defines actions that should, and can, be implemented immediately to prevent extinction or extirpation of spotted owls in the province or significant areas in the province, particularly in areas with very low spotted owl populations. This focuses actions on the highest risk areas and actions with the highest urgency in each province.

Additionally, in areas where spotted owl populations are not critically low, this defines actions needed to secure key areas with remaining populations as anchors to eventual expansion. This focuses actions on areas with remaining spotted owl populations in provinces where extirpation is not imminent, to secure and improve spotted owl populations, thereby creating refuge populations that may serve as sources of natural or human-facilitated expansion to other areas where barred owl populations have been reduced.

Priority B defines actions that should be implemented as soon as possible to slow spotted owl population declines. This is intended to reduce ongoing population declines in at least some areas within the province (e.g., management areas) that if unchecked could lead to extirpation or extinction all or a significant portion of the province. This focuses on avoiding declines in spotted owl populations to the degree that the populations are incapable of recovering without human intervention, such as augmentation through translocation or captive breeding.

Priority C defines actions that should be implemented in the near future to establish areas for spotted owl populations to stabilize and increase to sustainable levels. This includes efforts to stop ongoing population loss in management areas and provide opportunities for recolonization. This focuses on creating landscapes for the stabilization and increase in spotted owl populations, building beyond the current populations where they exist, or providing areas for potential augmentation. This is a focus on creating viable populations, likely at the management block level. This is still focused on the near future, but not as urgent as Priority A and B elements.

Priority D defines action that, if implemented, would further assist in stabilizing or increasing spotted owl populations. Some have value in the near future, while some will

provide their greatest value later in time, when nearby areas develop spotted owl populations. This allows for identification of actions that, while not urgent, could be important to the recovery of spotted owls over the intermediate or longer term. This could include actions focused, and providing t.

Priority E defines actions that, if implemented, would provide additional support to spotted owl populations. This allows for actions that are not priority or urgent but could still contribute to the recovery of the spotted owl. These may be focused on actions that provide their value later in time.

A3.2. California Spotted Owl

Within the California spotted owl range, the strategy used a 3-level prioritization system (A to C), applied individually for the two populations, Sierra Nevada and southern California. These range from actions that should be implemented as soon as possible to prevent successful invasion of the California spotted owl range in areas of highest risk to those that are not urgent but that could still assist in limiting the barred owl invasion.

Priority A: Actions that should be implemented as soon as possible to prevent barred owls from establishing populations where they are not yet established or building on existing populations, particularly in areas where the risk of population establishment is high. The focus of this priority is on elements and actions that need to be implemented in the very near future to prevent barred owls from establishing reproductive populations that could further feed barred owl population establishment in the California spotted owl range. This would generally be focused on areas at highest risk for the establishment of barred owl populations.

Priority B: Actions that should be implemented in the near future to prevent barred owl populations from expanding and establishing populations where they do not currently exist. The focus of this priority is on elements and actions that should be implemented in the near future to better ensure we prevent barred owls from developing populations and increasing. These may represent areas more removed from the risk of the establishment of barred owl populations.

Priority C: Actions that may be implemented over time and that would help to prevent barred owl populations from expanding and establishing populations. The focus is on securing the remaining areas, often more remote from the source of barred owls, or added monitoring/inventory that may further efforts to ensure barred owls do not manage to develop reproductive populations.

Appendix 4. Barred Owl Management Strategy by Province or Area

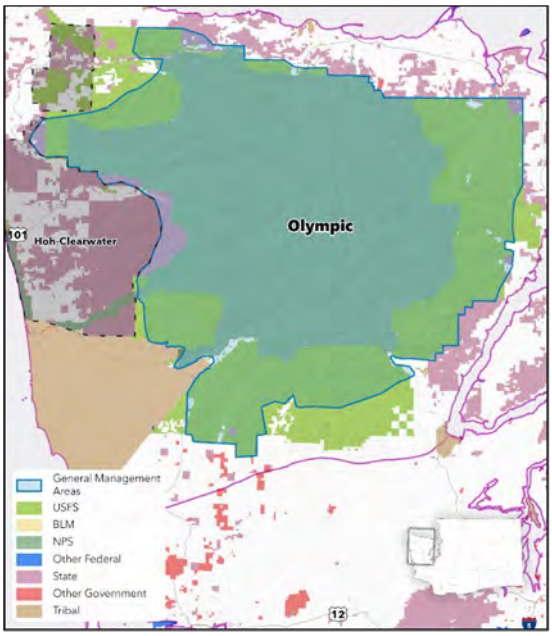
The following appendices describe the details on the Barred Owl Management Strategy (Strategy) by Physiographic Province for the northern spotted owl and area for the California spotted owl. They contain information on the spotted owl site management including recommendations and prioritization for implementation. For management area, they describe the reasons for selecting each area, the recommendations for management, and suggested priorities for implementation. For GMAs, we discuss recommendations for the size and factors to consider in placing FMAs. For special designation areas, we describe recommended management approaches.

We recommend that anyone wishing to implement actions under this Strategy use the information in these appendices to assist in the design of barred owl management.

A4.1 Olympic Peninsula Province

A4.1.A Background

A4.1.A.1 Spotted Owl condition in the Olympic Peninsula Province:



The Olympic Peninsula Province includes a large portion of National Park lands, with some Forest Service lands. The province includes 51 percent of the area in Federal lands, 13 percent comprised of State lands, 8 percent Tribal lands, and the remainder generally private land. Federal lands in the province include approximately 724,379 acres of spotted owl NRF (suitable) habitat.

The Olympic Peninsula Province is characterized by high rainfall and cool to moderate temperatures at low to mid elevations. High elevations and cold temperatures occur in the interior portions of the Olympic Peninsula, but spotted owls in this area are limited to the lower elevations (<2952 feet). Topographic variation in elevation between valley bottoms and ridges is high in the Olympic range, with many high-elevation areas supporting permanent snowfields and glaciers, creating conditions favorable for development of non-contiguous, fjord-like tracts of habitat at higher elevations, and more contiguous forests at lower elevations. Douglas-fir and western hemlock dominate forests used by northern spotted owls in this zone. Root diseases and wind-throw are important natural disturbance mechanisms that form gaps in forested areas. Flying squirrels (*Glaucomys spp.*) are the dominant prey, with voles and mice also representing important items in the northern spotted owl's diet. Because Douglas-fir dwarf mistletoe is unusual in this region, spotted owl nesting habitat consists of stands providing

very large trees with cavities or deformities. A few nests are associated with western hemlock dwarf mistletoe.

Within the Washington Olympic Province, monitoring efforts on the Olympic Demographic Study Area indicate that spotted owl occupancy at historic territories have declined substantially. Spotted owl occupancy dropped to 12 percent by 2017 (from 77 percent in 1993) (Franklin et al. 2021, Davis et al. 2022). In 2020, spotted owls were detected in 13 percent of the surveyed portion of the Olympic Demographic Study Area as detected by autonomous recording units (ARUs), with only 16 percent of the surveyed land area with spotted owl detections as detected by ARUs in 2018, and 27 percent of the surveyed land area in 2022 had spotted owl detections (Lesmeister et al. 2022, 2023). The highest rates of decline, around 9 percent per year from 1995 through 2016, have been observed in Washington at the Cle Elum and Olympic study areas (Franklin et al. 2021, pp. 11-13). Where spotted owls persist on the Olympic Province is mostly in the areas with lowest barred owl density, in the relatively higher elevation areas (within their range of habitat), at the backs of fjord-like valleys of habitat, surrounded by high elevation ridges without habitat.

A4.1.A.2 Barred Owl condition in the Olympic Peninsula Province:

Barred owls have been at high densities in Washington for longer periods of time compared to areas further south in the northern spotted owl range. In the Olympic Demographic Study Area, barred owls occupied 81 percent of the of the surveyed area in 2020 as detected by autonomous recording units. (Lesmeister et al. 2022, 2023). Barred owl populations are denser at lower elevation, more contiguous forests of the Olympic Province, and are less dense at higher elevation, less contiguous forests, particularly in the backs of long, narrow valleys of forested habitat, separated by high elevation ridges without forests.

A4.1.B Management Strategy

A4.1.B.1 Spotted owl site management in Olympic Peninsula Province

A4.1.B.1.a Background:

Given the limited northern spotted owls in this province, it is crucial to protect the remaining spotted owls through barred owl management at spotted owl sites.

- Managing recently occupied spotted owl sites will help to reduce the rate of spotted owl population decline as quickly as possible and prevent extinction/extirpation of the spotted owl in the province.
- Protected spotted owl sites, if occupied, or reoccupied, by spotted owls, and reproducing, may provide a source of young for colonization of management blocks. Where these occur in or near the GMA, reproductively-active spotted owl sites, or sites that may become reproductively active, can provide demographic support to block management areas.
- Where spotted owl site management occurs within a GMA, these spotted owl sites may serve as focal points for the development of focal management areas, now and in the future. Site management may be expanded into block management over time.
- Maintaining spotted owl sites distributed across the province, whether within block management areas or not, will reduce the risk of loss of spotted owls in the province from

catastrophic events, such as wildfire, by spreading sites across the area. Managing spotted owl sites also provides the opportunity for maintaining spotted owls in areas where block management is not feasible or recommended. This approach applies across the entire province, whether or not the locations are within a GMA or other mapped designation.

- Provide a potential source of spotted owl individuals for direct augmentation of block management areas in the future should such management action be necessary. These spotted owl sites may serve as key points for the development of focal management areas, now and in the future.
- These sites may serve to increase potential connectivity between and within block management areas, and provide sites in the vicinity of blocked management areas that can interact at a demographic level with those management areas.
- Spotted owl site management, due to its smaller size when compared to block management, provides a wider range of options for landowner contribution to barred owl managements, particularly for smaller landowners, or areas where there are not large amounts of suitable habitat due to terrain, or extensive loss of habitat from wildfires or harvest.

Selection of spotted owl sites for management in Olympic Peninsula Province

The primary focus of spotted owl site management in this province is on active, or recently active sites where recolonization of sites after barred owl removal is more likely. This is reflected in the priorities for site management. However, because many areas have not been surveyed consistently in recent years, or at all, older data and habitat condition are also considered in establishing site management areas. We recommend any historically active sites, particularly those active regularly over the past 10 years, be surveyed for activity. In the Olympic Peninsula Province, the highest priority is start with individual site management within and around known spotted owl sites to prevent local extirpation in the province and provide source population for GMA.

Spotted Owl Site Management Priorities

Priority	Spotted Owl Site Condition
A	Sites that have been occupied by resident spotted owls (pair or single) in the past five years, or where there have been detections of spotted owls (not reaching resident status) in the past five years.
B	Sites that were occupied by resident spotted owls (pair or single) between 5 and 10 years ago
C	Sites that were occupied by resident spotted owls (pair or single) more than 10 years ago, whether or not they have been surveyed recently.
D	Areas with sufficient high-quality habitat to support a spotted owl site, whether surveyed recently or not.

Other considerations for selection of spotted owl sites for management:

If spotted owl site management cannot be initiated on all sites, we recommend the following be considered in selecting the specific spotted owl sites for management.

- Select spotted owl sites with the most recent occupancy, particularly if surveys have been conducted on these areas in recent years. Do not discount sites as unoccupied based on lack of recent surveys.
- Focus first on spotted owl sites with recent occupancy by pairs, then singles, then detections.
- Consider past reproductive history of the spotted owl site. Select sites with a history of reproduction on the site where surveys are available.
- Consider the condition of habitat in the area, particularly loss of habitat to fire or other actions since the last surveys. Spotted owl sites where much of the habitat has been removed, from high severity fire or timber harvest would be a lower priority.

A4.1.B.1.b Management Recommendations:

Within each individual spotted owl site, remove barred owls from an area between 14,657 and 26,058 acres. This represents the area in a circle of 1.5 and 2 home range radii (Table 1). This can be distributed in a circle around the core area, or implementers can use local knowledge, topography, and habitat condition to design an area of the appropriate size that provides the best conditions for barred owl management. In areas where spotted owl sites are isolated, and particularly for sites in Priority A condition (see table above), we recommend a larger management area, up to 58,630 acres (3 home range radii).

A4.1.B.2 General Management Areas in Olympic Peninsula Province

A4.1.B.2.a Olympic GMA- Priority A

The Olympic GMA lies on the Olympic Peninsula and includes most of the Olympic National Park (except the coastal strip), and much of the Olympic National Forest, particularly where there has been more recent presence of northern spotted owl. The GMA includes a small amount of State forest in the Hoh Clearwater Spotted Owl Special Emphasis area, adjacent to the Olympic National Forest, on the west side of the Olympic Peninsula. Very few private lands are included in this GMA. It includes 97 percent Federal lands (National Park and National Forests), 3 percent State land and the remainder in private ownership.

This GMA was mapped for the following reasons:

- It contains the most current/recent known pair activity in the Olympic Peninsula Physiographic province.
- It is the only GMA in the Province and includes a large portion of the high-quality habitat in the province.
- The GMA includes Olympic Demography Study Area, with its historic and recent spotted owl data. This area is already slated for higher level monitoring (20 percent ARU-based), providing additional future data on both spotted and barred owls. This provides opportunity

for long term monitoring and research of success of barred owl management strategy. This portion of the GMA is well known and accessible, allowing for quicker implementation.

Description of the elements considered in mapping: In mapping the boundaries of the Olympic GMA we used information on the following elements.

Spotted Owl Data:

- Historic spotted owl activity centers, recent spotted owl presence documented from the Olympic Demography Study Area and acoustic monitoring efforts in the southern portion of the Olympic Peninsula which was not included in the Demography Study Area.
- Areas with relatively large amount of high-quality habitat and activity centers from which to select focused management areas large enough to support northern spotted owl populations. This includes Northwest Forest Plan modeling efforts that show a high likelihood of habitat capable of supporting viable populations of spotted owls in this GMA. This GMA contains areas that have an estimated habitat carrying capacity to support clusters of 20 or more pairs.
- We did not try to exclude high elevation areas without habitat. This can be considered during development of the FMA boundaries.

Conditions:

- Availability of access via roads and trails in most of this area. The diversity of topography and fjord-like habitat within the area presents more access challenges, but selected areas are accessible via trails and some roads.
- The presence of SOSEAs with habitat and activity centers. Including these areas allows for incentives for management.
- GMA includes all of Olympic National Park except for the coastal strip.
    - Most of Olympic National Park not at high elevations is suitable habitat.
- The GMA includes most of the Olympic National Forest
- The GMA included a small amount of State forest in the Hoh Clearwater SOSEA.
    - Included parts of the SOSEA with some of the highest proportion of modeled spotted owl habitat and was adjacent to high-quality habitat on Olympic National Park and Olympic National Forest.
    - This area has relatively fragmented northern spotted owl habitat, but better road access than adjacent Federal lands.
    - Although it is managed to provide dispersal habitat and demographic support at the province level, the Hoh Clearwater SOSEA does not currently have a large amount of suitable northern spotted owl habitat.

Other Considerations:

- The coastal strip was excluded because it is not likely to support northern spotted owl currently due to isolation and fragmentation. This area has lower likelihood of successful barred owl management resulting in spotted owl recovery than the core Federal lands in the Olympic Peninsula.
- Excluded lowest elevation areas and coastal areas where there is much less habitat to support northern spotted owl residency and populations.

- The parts of the Hoh Clearwater SOSEA not included in this GMA will be considered in the strategy as a separate classification of management area.

Focal Management Areas (FMAs)
In this GMA, we recommend developing FMAs large enough to potentially support 50 spotted owl pair sites where possible. Generally, larger blocky areas provide a smaller edge-to-area ratio, and this may help reduce the influx of barred owls from outside the FMA in the future. However, where the landscape or forest conditions do not allow this, smaller or more sinuous areas may be appropriate. For example, in higher elevation areas where habitat is confined to valley bottoms, large blocky FMAs may not be reasonable or effective, and smaller, but still multiple pair areas, may be a practical option. These may be more sinuous in nature due to the habitat limitations.

Where smaller areas are developed due to topography, forest condition, access, funding limitations, or other reasons, we recommend these be closer together and multiple areas designed with the intent of encouraging exchange of spotted owls between these smaller areas. Where possible, when setting up smaller areas, design them such that they could be expanded in the future if funding becomes available.

Coordinate FMA locations with the spotted owl site management described above. Including recently occupied sites in FMAs provides a potential core population for development of spotted owl populations as barred owl populations are reduced.

Priorities: The following is our recommended priorities for defining and selecting FMAs within the Olympic GMA. The following are in general priority order, however, local expertise will be important in applying these to specific FMA boundary designs.

1. Build FMAs around current spotted owl sites with presence or occupancy of spotted owls. This provides a nucleus of spotted owls for the potential recolonization of sites within the FMA as barred owl numbers are reduced.

2. Place blocks allowing for the maximum number of spotted owls to be supported. Focus on areas with the potential for at least 20 spotted owl pairs, though 50 pair sized areas are the target where possible.

3. Include areas with high-quality historic spotted owl sites (sites with no confirmed occupancy in the last five years or more). These are areas that have been shown by past use to be attractive to spotted owls and therefore more likely to be reoccupied, especially as spotted owl populations increase.

4. Focus on areas with reasonable access, in terms of trail and road networks. Trail networks are available in most of the northern spotted owl habitat in the Olympic GMA. The Olympic GMA does not have as much road access as other GMAs, therefore, access will rely mostly on trails, with roads being used to a lesser extent. Closed roads may be used similar to a trail system if they can be safely walked. Trail systems can be used where roads do not exist, but roads are generally preferred where they exist to maximize operational efficiency. The highest priority for FMAs in the Olympic is spotted owl sites that are currently occupied by

spotted owls. Most of these occupied sites are now in relatively higher elevation areas, at the backs of valleys, only accessible by trail or helicopter. The priority would be to start at these occupied sites that are accessible by trail and expand management out, down the valleys.

5. Include lands of interested or willing landowners or land managers. A focus on areas where landowners have expressed interest in barred owl management and have the ability to assist with operations will speed the implementation of actual barred owl management and encourage involvement.

6. Consider the presence of areas already designated for spotted owl conservation, recovery and management, such as the Olympic Demography Study Area, Late Successional Reserves under the Northwest Forest Plan, SOSEAs and areas identified as high priorities in the Northern Spotted Owl Recovery Plan and final Critical Habitat rule. Including these areas provides support for spotted owls and limits impacts on other resources. Because many of these have been managed for older forest over the last decades, this is the likely location of some of the best habitat conditions.

7. Consider isolation from other northern spotted owl when selecting areas to include in FMAs, with the goal of reducing isolation of northern spotted owl through barred owl management. Due to the topography of the Olympic Peninsula, with fjord-like corridors of habitat being separated by long, high elevation ridges and highest densities of barred owl in the lower elevations, currently occupied northern spotted owl sites are likely isolated from other occupied sites. Consider including areas that will connect managed areas to reduce isolation of northern spotted owls.

8. Much of the habitat for spotted owls with current or recent presence exist in fjord-like valleys separated by high elevation ridges which form natural edges to the habitat and are barriers to spotted owl and barred owl movement. Consider taking advantage of these natural edges that would prevent or reduce barred owl incursion into focal management areas. The highest priorities for FMAs in the Olympic GMA are spotted owl sites that are currently or recently occupied by spotted owls, which are now mostly in relatively higher elevation areas, at the backs of valleys, defined by edges of non-habitat formed by ridges. Consider starting management in these occupied spotted owl sites that are often defined on two to three sides by edges and expand management from areas with relatively more spotted owls, and lower density of barred owls, working out and down the valleys into areas with higher barred owl densities in lower elevation areas. In this way, edges can be used as a management tool to reduce incursion of barred owls into focal management areas.

9. Consider including areas where there would be more efficient use of funding (such as targeting more accessible areas or including areas such as demographic study areas that already have past, ongoing and future monitoring funded). Including accessible areas can be used to maximize treatment efficacy at scale, and more efficiently reduce the impact of barred owls on northern spotted owl. Including areas that are already have long term baseline demographic and population monitoring conducted, and have it planned and funded for the future will improve efficiencies in monitoring success of strategy implementation. Given the availability of recent and ongoing data collection for the Olympic Demography

Study Area, and areas monitored with acoustic recording units in the Southern Olympics, the operational advantage of leveraging prior and future data is likely an important consideration in this GMA.

A4.1.B.3.b Spotted Owl Special Emphasis Areas – Priority E

The State of Washington identified 10 key landscapes, referred to as Spotted Owl Special Emphasis Areas (SOSEAs), where northern spotted owl conservation in the form of demographic and/or dispersal support was important on non-federal lands. In mapping the Strategy, some SOSEAs were included in mapped GMA. Where SOSEAs lie within GMA, barred owl management as described for those designations would apply. Where SOSEA lands fell outside of these designations, we mapped the areas as SOSEA special designation areas.

There is one SOSEA Special Designated Area in the Olympic Peninsula Province.

SOSEA	Forest Acres on Federal lands	Forest Acres on State Lands	Forest Acres on Private Lands	Maximum Forest Acres Under Management
Hoh-Clearwater SOSEA	49,359	182,776	121,791	89,852

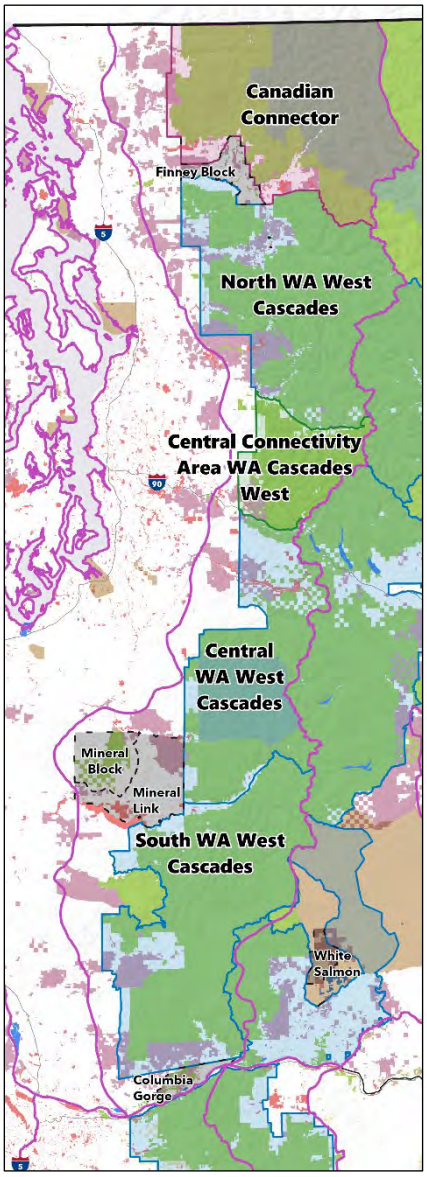
In the original designation by Washington, each SOSEA was described in terms of one or more conservation functions -- demographic support, dispersal support, and combination support. Demographic support meant that adequate amounts and arrangements of suitable habitat are maintained to support reproductive spotted owl pairs. Dispersal support is provided by a landscape that includes dispersal habitat at the stand level interspersed with areas of higher quality habitat. Combination support was defined as either maintaining suitable spotted owl habitat to protect the viability of the owls at a spotted owl site center or providing a variety of habitat conditions which in total are more than dispersal support and less than demographic support.

For the Strategy, barred owl management in the form of removal could be occur at any scale in a SOSEA. We recommend spotted owl site-based management as described in Section 8.4.1.2. of the Strategy and Section 4.1.B.1 above. Removal of barred owls around spotted owl sites can be applied anywhere within the province and is an appropriate small scale management effort in SOSEAs. Removing barred owls within and around occupied spotted owl sites retains the existing population, increases the potential for recruitment of young, and provides source populations for recolonization of areas where barred owl management occurs. Spotted owl site management can provide connectivity between larger block areas. Where feasible, clustering spotted owl site management into small blocks increases the functionality of this management.

A4.2 Washington West Cascades Province

A4.2.A Background

A4.2.A.1 Spotted owl condition in the Western Washington Cascades Province:



The Western Washington Cascades Province is one of four physiographic provinces in Washington. The province includes a large portion of Forest Service lands with 49 percent of the area, 13 percent comprised of National Park, 11 percent State lands, and the remainder county and private land. Federal lands in the province include approximately 1,350,891 acres of spotted owl NRF (suitable) habitat.

Western Washington Cascades Province extends from the U.S. - Canadian border south almost to the Columbia River in southern Washington, it extends east to the Cascade Crest. The northern portion of this province (north of Snoqualmie pass and I-90) is characterized by high mountainous terrain with extensive areas of glaciers and snowfields at higher elevation. The marine climate brings high precipitation (both annual and summer) but is modified by high elevations and low temperatures over much of the area. The resulting distribution of forest vegetation is dominated by subalpine species, mountain hemlock and silver fir; the western hemlock and Douglas-fir forests typically used by spotted owls are more limited to lower elevations and river valleys (spotted owls are rarely found at elevations greater than 4200 feet in this region) grading into the mesic Puget lowland to the west. South from Snoqualmie Pass to the Columbia River, differences in spotted owl habitat are characterized by relatively milder temperatures, lower elevations, and greater proportion of western hemlock/Douglas-fir forest and occurrence of noble fir to the south of Snoqualmie Pass. This region contains the Rainier Demography Study Area. Root pathogens like laminated root rot (*P. weirii*) are important gap formers in Western Washington Cascades. Because Douglas-fir dwarf mistletoe occurs rarely in Western Washington Cascades, spotted owl nests sites are limited to defects in large trees, and occasionally nests of other raptors. Diets of spotted owls in the northern part of Western Washington Cascades contain higher proportions of red-backed voles and deer mice than in southern portion of Western Washington Cascades, where flying squirrels are dominant.

Within the Western Washington Cascades Province, monitoring efforts on the Rainier Demographic Study Area indicate that spotted owl occupancy at historic territories have declined substantially. Spotted owl occupancy dropped to 11 percent by 2017 (from 85 percent in 1993) (Franklin et al. 2021, Davis et al. 2022). The highest rates of decline, around 9 percent per year

from 1995 through 2016, have been observed in Washington at the Cle Elum and Olympic study areas (Franklin et al. 2021, pp. 11-13). Comprehensive surveys in 2021 indicated one single male and one single female on the Rainier Demography Study Area (Rossi 2021, p. 5). On the Rainier study area northern spotted owl pairs have declined by 100 percent since 1992 with no known remaining pairs.

Outside of the Rainier DSA (Rossi 2021, Mitchell et al. 2022) there have not been recent surveys for most of the province with the exception of a recent survey using acoustic recording units on two percent of a survey area on the Gifford Pinchot National Forest and acoustic surveys of one project area in the southern portion of the Western Washington Cascades, both of which found no spotted owl detections (Lesmeister et al. 2023, J. Conner England pers. comm. 2023). Spotted owl habitat in the northern half of the Western Washington Cascades is very fjord-like in many areas, similar to on the Olympic study area and province. Where spotted owls persist on the Olympic Province is mostly in the areas with lowest barred owl density, in the relatively higher elevation areas (within their range of habitat), at the backs of fjord-like valleys of habitat, surrounded by high elevation ridges without habitat. Remaining spotted owls in the Western Washington Cascades may persist in more marginal habitats with relatively lower barred owl density similar to what has been observed in the Olympics. However, due to lack of recent surveys in most of the Western Washington Cascades it is unknown if this trend seen on the Olympic province also exists in the similar habitat of the Western Washington Cascades.

A4.2.A.2 Barred Owl condition in the GMAs in Western Washington Cascades Province:

Barred owls have been at high densities in Washington for longer periods of time compared to areas further south in the northern spotted owl range. On the Rainier Study area in the Western Washington Cascades Province, barred owls occupied 71 percent of the of the surveyed area in 2018 (Franklin et al. 2021). Barred owls tend to be at higher densities in low valleys with more contiguous large blocks of high-quality habitat and tend to be at lower densities further up slopes and in more marginal, less contiguous habitat.

A4.2.B Management Strategy

A4.2.B.1 Spotted owl site management in Western Washington Cascades Province

A4.2.B.1.a Background

Given the limited northern spotted owls in this province, it is crucial to protect the remaining spotted owls through barred owl management at spotted owl sites. This Province has very low survey effort outside of the Rainier Demography Study Area. Therefore, surveys are recommended to identify northern spotted owl presence and occupancy.

- Managing recently occupied spotted owl sites will help to reduce the rate of spotted owl population decline as quickly as possible and prevent extinction/extirpation of the spotted owl in the province.
- Protected spotted owl sites, if occupied, or reoccupied, by spotted owls, and reproducing, may provide a source of young for colonization of management blocks. Where these occur near GMAs, reproductively-active spotted owl sites, or sites that may become reproductively active, can provide demographic support to block management areas.

- Where spotted owl site management occurs within a GMA, these spotted owl sites may serve as focal points for the development of focal management areas, now and in the future. Spotted owl site management may be expanded into block management over time.
- Maintaining spotted owl sites distributed across the province, whether within block management areas or not, will reduce the risk of loss of spotted owls in the province from catastrophic events, such as wildfire, by spreading sites across the area. Managing spotted owl sites also provides the opportunity for maintaining spotted owls in areas where block management is not feasible or recommended. This approach applies across the entire province, whether or not the locations are within a GMA or other mapped designation.
- Provide a potential source of spotted owl individuals for direct augmentation of block management areas in the future should such management action be necessary. These spotted owl sites may serve as key points for the development of focal management areas, now and in the future.
- These spotted owl sites may serve to increase potential connectivity between and within block management areas, and provide sites in the vicinity of blocked management areas that can interact at a demographic level with those management areas.
- Spotted owl site management, due to its smaller size when compared to block management, provides a wider range of options for landowner contribution to barred owl managements, particularly for smaller landowners, or areas where there are not large amounts of suitable habitat due to terrain, or extensive loss of habitat from wildfires or harvest.
- Spotted owl site management may help to prevent genetic bottlenecks or reduction in genetic diversity, by conserving remaining northern spotted owl, and the genetic diversity they represent, across the province.
- Spotted owl site management may provide a source of individuals for creating a captive breeding population in the future should such management action be necessary. This could include young produced by reproductive pairs to be taken into captivity for short periods to increase survival rates, particularly over the winter after fledging when survival rates are low; or it could include individuals for future captive breeding programs (either young produced by reproductive pairs or adults).

Selection of spotted owl sites for management in Western Washington Cascades Province

Spotted owl sites that are known to be occupied are extremely limited in this province. There is extremely low occupancy in the province based on the occupancy rates of the Rainier Demography Study Area, but due to very low to no survey effort for most areas outside of the Demography Study Area, other areas in the province with current or recent spotted owl presence are unknown. The primary focus of spotted owl site management in this province is on sites that have been occupied by, or had detections of, spotted owls in the last five years. These areas are more likely to be recolonized by spotted owls after barred owl removal. Because many areas have not been surveyed consistently in recent years, or at all, older data and habitat condition are also considerations. Any historically active spotted owl sites, particularly those active regularly over the past 10 years, are recommended to be surveyed for activity. This is reflected in the priorities for site management.

Spotted Owl Site Management Priorities

Priority	Spotted Owl Site Condition
A	Sites that have been occupied by resident spotted owls (pair or single) in the past five years, or where there have been detections of spotted owls (not reaching resident status) in the past five years
B	Sites that were occupied by resident spotted owls (pair or single) between 5 and 10 years ago
C	Sites that were occupied by resident spotted owls (pairs or singles) more than 10 years ago, whether or not they have been surveyed recently.
D	Areas with sufficient high-quality habitat to support a spotted owl site, whether surveyed recently or not.

Other considerations for selection of spotted owl sites for management:

If spotted owl site management cannot be initiated on all sites, we recommend the following be considered in selecting the specific spotted owl sites for management.

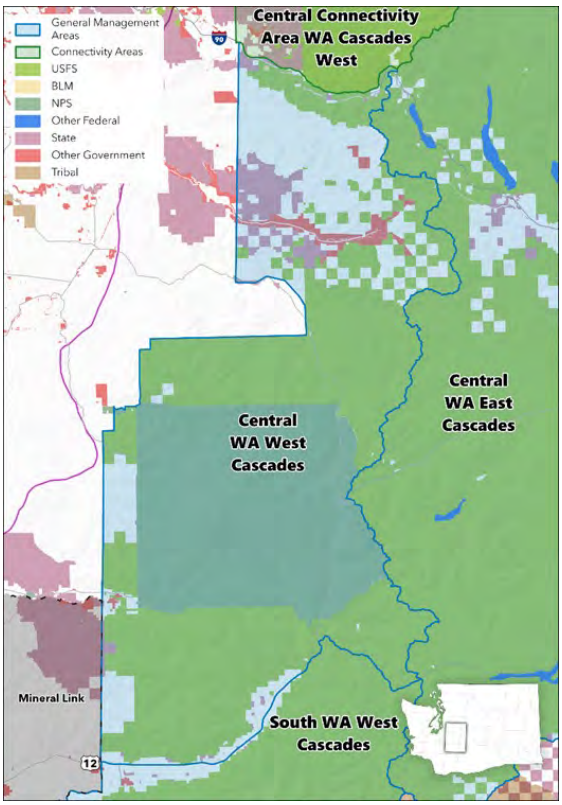
- Select spotted owl sites with the most recent occupancy, particularly if surveys have been conducted on these areas in recent years. Do not discount sites as unoccupied based on lack of recent surveys.
- Focus first on spotted owl sites with recent occupancy by pairs, then singles, then detections.
- Consider past reproductive history of the spotted owl site. Select sites with a history of reproduction on the site where surveys are available.
- Consider the condition of habitat in the area, particularly loss of habitat to fire or other actions since the last surveys. Spotted owl sites where much of the habitat has been removed, from high severity fire or timber harvest would be a lower priority.

A4.2.B.1.b Management Recommendations

Within each individual spotted owl site, remove barred owls from an area between 14,657 and 26,058 acres. This represents the area in a circle of 1.5 and 2 home range radii (Table 1). This can be distributed in a circle around the core area, or implementers can use local knowledge, topography, and habitat condition to design an area of the appropriate size that provides the best conditions for barred owl management. In areas where spotted owl sites are isolated, and particularly for sites in Priority A condition (see table above), we recommend a larger management area, up to 58,630 acres (3 home range radii).

A4.2.B.2 General Management Areas in Western Washington Cascades Province

A4.2.B.2.a Central Washington West Cascades GMA- Priority A



The Central Washington West Cascades GMA lies west of the Cascade Crest, south of Interstate 90 and extends south to Highway 12. It includes parts of the Snoqualmie District of the Mount Baker-Snoqualmie National Forest, Mount Rainier National Park, and parts of the Cowlitz Ranger District on the Gifford Pinchot National Forest, as well as State SOSEA lands and private lands. It includes 77 percent Federal lands (National Forests and National Parks), 3 percent State land and the remainder primarily in private ownership.

This GMA was mapped for the following reasons:

- It contains the most current/recent known spotted owl activity in the Washington West Cascades Physiographic province.
- The GMA includes Rainier Spotted Owl Demography Study Area, with its historic and recent spotted owl data. This area is already slated for higher level monitoring (20 percent ARU-based), providing additional future data on both spotted and barred owls. This also allows for higher levels of monitoring. This portion of the GMA is well known and accessible, allowing for quicker implementation.
- The GMA is centrally located, allowing for connectivity to GMAs to the north, south and west.
- In Western Washington Cascades there is very little information regarding recent occupancy or presence outside of the Rainier Demography Study Area. More surveys, including use of acoustic recording units, are recommended to determine where northern spotted owl presence is in Western Washington Cascades to inform priorities.

Description of the elements considered in mapping: In mapping the boundaries of the Central Washington West Cascades GMA we used information on the following elements.

Spotted Owl Data:

- Historic spotted owl activity centers, and recent spotted owl presence documented on the Rainier Demography study area.
- Areas with relatively large amount of high-quality habitat and activity centers from which to select focused management areas large enough to support northern spotted owl populations. This includes Northwest Forest Plan modeling efforts that show a high likelihood of habitat capable of supporting viable populations of spotted owls in this

GMA. This GMA contains areas that have an estimated habitat carrying capacity to support clusters of 20 or more pairs.
- We did not try to exclude high elevation areas without habitat, or areas where habitat has been lost to wildfire. This can be considered during development of the Focal Management Area boundaries.

Conditions:

- Availability of access via roads and trails in most of this area.
- The location of neighboring GMAs, and the ability of this GMA to provide connectivity to GMAs in the Eastern Washington Cascades, the West Cascades South GMA within the province, and the West Cascades Central Connectivity Area to the north.
- The presence of SOSEAs with habitat and activity centers. Including these areas allows for incentives for management.

Other Considerations:

- This GMA includes some areas with current and planned higher intensity monitoring of spotted owls (20% ARU monitoring of the Rainier Demography Study Area) provides opportunity for long term monitoring and research of success of barred owl management strategy.
- Areas to the west were excluded due to the presence of less habitat in these areas, no recent spotted owl occupancy, and more marginal habitat in these areas.
- A gap area to the north was excluded as a GMA, but was included as a connectivity area between GMAs because the West Cascades North and South GMAs met the limitations of an upper limit for maximum size of a GMA. Areas included as a GMA were modeled as having the most high-quality habitat and activity centers for supporting spotted owl populations to select from for placement of FMAs.
- The Mineral Block area was excluded due to isolation from other northern spotted owl habitat and activity centers.

Focal Management Areas (FMAs)

In this GMA, we recommend developing FMAs large enough to potentially support 50 spotted owl pair sites where possible. Generally, larger blocky areas provide a smaller edge-to-area ratio, and this may help reduce the influx of barred owls from outside the FMA in the future. However, where the landscape or forest conditions do not allow this, smaller or more sinuous areas may be appropriate. For example, in higher elevation areas where habitat is confined to valley bottoms, large blocky FMAs may not be reasonable or effective, and smaller, but still multiple pair areas, may be a practical option. These may be more sinuous in nature due to the habitat limitations.

Where smaller areas are developed due to topography, forest condition, access, funding limitations, or other reasons, we recommend these be closer together and multiple areas designed with the intent of encouraging exchange of spotted owls between these smaller areas. Where possible, when setting up smaller areas, design them such that they could be expanded in the future if funding becomes available.

Coordinate FMA locations with the spotted owl site management described above. Including

recently occupied sites in FMAs provides a potential core population for development of spotted owl populations as barred owl populations are reduced.

Priorities: The following is our recommended priorities for defining and selecting FMAs within the Central Washington West Cascades GMA. The following are in general priority order, however, local expertise will be important in applying these to specific FMA boundary designs.

1. Build FMAs around current spotted owl sites with presence or occupancy of spotted owls. This provides a nucleus of spotted owls for the potential recolonization of sites within the FMA as barred owl numbers are reduced.

2. Include areas with high-quality historic spotted owl sites (sites with no confirmed occupancy in the last five years or more). These are areas that have been shown by past use to be attractive to spotted owls and therefore more likely to be reoccupied, especially as spotted owl populations increase.

3. Select areas with the best spotted owl habitat in terms of total acreage or density of northern spotted owl habitat.

4. Place blocks allowing for the maximum number of spotted owls to be supported. Focus on areas with the potential for at least 20 spotted owl pairs, though 50 pair sized areas are the target where possible.

5. Include areas with the most high-quality habitat in large areas where possible. This high-quality habitat may be in historical spotted owl sites, or it may connect sites.

6. Consider the presence of areas already designated for spotted owl conservation, recovery and management, such as Late Successional Reserves under the Northwest Forest Plan, SOSEAs and areas identified as high priorities in the Northern Spotted Owl Recovery Plan and final Critical Habitat rule. Including these areas provides support for spotted owls and limits impacts on other resources. Because many of these have been managed for older forest over the last decades, this is the likely location of some of the best habitat conditions.

7. Focus on areas with reasonable access, in terms of road networks, which are available in most of the spotted owl habitat in these GMAs. Closed roads may be used similar to a trail system if they can be safely walked. Trail systems can be used where roads do not exist, but roads are generally preferred to maximize operational efficiency.

8. Include lands of interested or willing landowners or land managers. A focus on areas where landowners have expressed interest in barred owl management and may have the ability to assist with operations will speed the implementation of actual barred owl management and encourage involvement.

9. Consider the ratio of barred owls to northern spotted owls. There has been very little survey effort outside of the Rainier Demography Study Area in the Western Washington Cascades. Therefore, the ratio of barred owls to northern spotted owls is unknown for most areas.

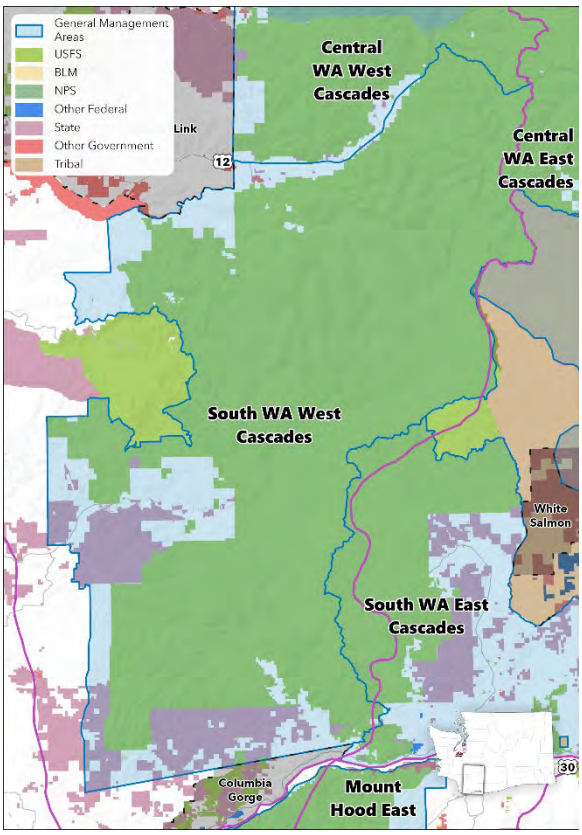
However, we do know based on surveys in demography study areas, that barred owls tend to be at higher densities in more contiguous, lower elevation, high-quality habitat and tend to be at lower densities in more marginal, less contiguous habitat, particularly in either drier marginal habitats or higher up slopes, or at the backs of fjord-like valleys. These more marginal areas where barred owls are at lower densities, tend to be the areas where spotted owls have persisted in areas that have had barred owl competition for long periods. We recommend conducting more surveys in the Western Washington Cascades Province and targeting areas with lower barred owl densities and expanding management out to include higher quality habitats where barred owls are typically at higher densities.

10. Consider the potential for connection to other FMAs in the GMA, to neighboring GMAs and spotted owl site management areas, and to habitat on the east side of the Cascade Crest with recent spotted owl presence. Placement of FMAs within close proximity to other managed areas, and where there is forest that may provide connection to the Eastern Washington Cascades through low passes, can connect populations in these areas.

11. Consider including areas where more efficient use of funding (such as targeting more accessible areas or areas where surveys are funded and planned) can be used to maximize treatment efficacy at scale, and more efficiently reduce the impact of barred owls on northern spotted owl.

A4.2.B.2.b South Washington West Cascades GMA- Priority B

The South Washington West Cascades GMA lies west of the Cascade Crest, south of Highway 12 and stretches south almost to the Columbia River. It includes the Mount Adams Ranger district and parts of the Cowlitz Ranger district on the Mount Baker Snoqualmie National Forest, most of the Mount Saint Helens National Volcanic Monument as well as State SOSEA lands and some private lands. It includes 78 percent Federal lands (National Forests and National Monument), 8 percent State land and the remainder primarily in private ownership.



This GMA was mapped for the following reasons:

- It contains historic northern spotted owl presence and pair activity, but recent occupancy and spotted owl presence is unknown due to very low survey effort in recent years.
- This GMA has a high amount and density of habitat capable of supporting northern spotted owl populations according to Northwest Forest Plan modeling.

- This GMA has connectivity to areas with high densities of northern spotted owl habitat and areas with recent northern spotted owl presence in the Central Western Washington Cascades GMA to the north, and connectivity to GMAs to the East and habitat on the Yakama Nation Reservation.

Description of the elements considered in mapping: In mapping the boundaries of the South Washington West Cascades GMA we used information on the following elements.

Spotted Owl Data:

- Historic spotted owl activity centers.
- Areas with relatively large amount of high-quality habitat and activity centers from which to select focused management areas large enough to support northern spotted owl populations. This includes Northwest Forest Plan modeling efforts that show a high likelihood of habitat capable of supporting viable populations of spotted owls in this GMA. This GMA contains areas that have an estimated habitat carrying capacity to support clusters of 20 or more pairs.

Conditions:

- Availability of access via roads and trails in most of this area.
- The location of neighboring GMAs, and the ability of this GMA to provide connectivity to GMAs in the Eastern Washington Cascades, the West Cascades Central GMA within the province and habitat on the Yakama Nation Reservation.
- The presence of SOSEAs with habitat and activity centers. Including these areas allows for incentives for management.

Other Considerations:

- Areas to the west were excluded due to the presence of less habitat in these areas, no recent spotted owl occupancy, and more marginal habitat in these areas.
- We did not try to exclude high elevation areas without habitat or areas where habitat has been lost to wildfire. This can be considered during development of the Focal Management Area boundaries.
- Areas with very little habitat on the Mount Saint Helens National Monument were excluded, and large tracts of private land with very little habitat and activity centers were excluded.

Focal Management Areas (FMAs)

In this GMA, we recommend developing FMAs large enough to potentially support 50 spotted owl pair sites where possible. Generally, larger blocky areas provide a smaller edge-to-area ratio, and this may help reduce the influx of barred owls from outside the FMA in the future. However, where the landscape or forest conditions do not allow this, smaller or more sinuous areas may be appropriate. For example, in higher elevation areas where habitat is confined to valley bottoms, large blocky FMAs may not be reasonable or effective, and smaller, but still multiple pair areas, may be a practical option. These may be more sinuous in nature due to the habitat limitations.

Where smaller areas are developed due to topography, forest condition, access, funding limitations, or other reasons, we recommend these be closer together and multiple areas designed with the intent of encouraging exchange of spotted owls between these smaller areas. Where possible, when setting up smaller areas, design them such that they could be expanded in the future if funding becomes available.

Coordinate FMA locations with the spotted owl site management described above. Including recently occupied sites in FMAs provides a potential core population for development of spotted owl populations as barred owl populations are reduced.

Priorities: The following are our recommended priorities for defining and selecting FMAs within the South Washington West Cascades GMA. The following are in general priority order, however, local expertise will be important in applying these to specific FMA boundary designs.

1. Build FMAs around current spotted owl sites with presence or occupancy of spotted owls. This provides a nucleus of spotted owls for the potential recolonization of sites within the FMA as barred owl numbers are reduced.

2. Include areas with high-quality historic spotted owl sites (sites with no confirmed occupancy in the last five years or more). These are areas that have been shown by past use to be attractive to spotted owls and therefore more likely to be reoccupied, especially as spotted owl populations increase.

3. Select areas with the best spotted owl habitat in terms of total acreage or density of northern spotted owl habitat.

4. Place blocks allowing for the maximum number of spotted owls to be supported. Focus on areas with the potential for at least 20 spotted owl pairs, though 50 pair sized areas are the target where possible.

5. Include areas with the most high-quality habitat in large areas where possible. This high-quality habitat may be in historical spotted owl sites, or it may connect sites.

6. Consider the presence of areas already designated for spotted owl conservation, recovery and management, such as Late Successional Reserves under the Northwest Forest Plan, SOSEAs and areas identified as high priorities in the Northern Spotted Owl Recovery Plan and final Critical Habitat rule. Including these areas provides support for spotted owls and limits impacts on other resources. Because many of these have been managed for older forest over the last decades, this is the likely location of some of the best habitat conditions.

7. Focus on areas with reasonable access, in terms of road networks, which are available in most of the spotted owl habitat in these GMAs. Closed roads may be used similar to a trail system if they can be safely walked. Trail systems can be used where roads do not exist, but roads are generally preferred to maximize operational efficiency.

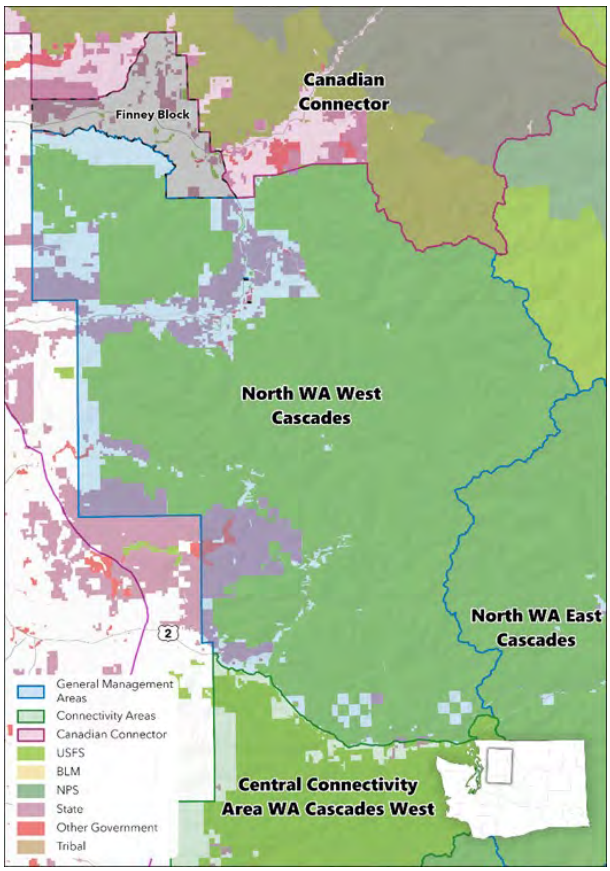
8. Include lands of interested or willing landowners or land managers. A focus on areas where landowners have expressed interest in barred owl management and may have the ability to assist with operations will speed the implementation of actual barred owl management and encourage involvement.

9. Consider the ratio of barred owls to northern spotted owls. There has been very little survey effort outside of the Rainier Demography Study Area in the Western Washington Cascades. Therefore, the ratio of barred owls to northern spotted owls is unknown for most areas. However, we do know based on surveys in demography study areas, that barred owls tend to be at higher densities in more contiguous, lower elevation, high-quality habitat and tend to be at lower densities in more marginal, less contiguous habitat, particularly in either drier marginal habitats or higher up slopes, or at the backs of fjord-like valleys. These more marginal areas where barred owls are at lower densities, tend to be the areas where spotted owls have persisted in areas that have had barred owl competition for long periods. We recommend conducting more surveys in the Western Washington Cascades Province and targeting areas with lower barred owl densities and expanding management out to include higher quality habitats where barred owls are typically at higher densities.

10. Consider the potential for connection to other FMAs in the GMA, to neighboring GMAs and spotted owl site management areas, and to habitat on the east side of the Cascade Crest with recent spotted owl presence. Placement of FMAs within close proximity to other managed areas, and where there is forest that may provide connection to the Eastern Washington Cascades through low passes, can connect populations in these areas.

11. Consider including areas where more efficient use of funding (such as targeting more accessible areas or areas where surveys are funded and planned) can be used to maximize treatment efficacy at scale, and more efficiently reduce the impact of barred owls on northern spotted owl.

A4.2.B.2.c North Washington West Cascades GMA - Priority C



The North Washington West Cascades GMA lies south of Highway 20 and west of the Cascade Crest and includes parts of the Mount Baker Snoqualmie National Forest (including most of the Darrington Ranger district, and southern parts of the Mount Baker Ranger District) as well as State lands, SOSEA lands and some private lands. It includes 80 percent Federal lands (National Forests), 10 percent State land and the remainder primarily in private ownership.

This GMA was mapped for the following reasons:

- It contains historic activity centers, but has no recent survey information and recent presence is unknown, which contributed to it being ranked as priority C.
- This GMA has a large amount of high-quality habitat and historic activity centers capable of supporting northern spotted owl populations according to Northwest Forest Plan modeling. Compared to the two GMAs further south in the Province, it has a lower density of habitat capable of supporting northern spotted owl populations according to Northwest Forest Plan monitoring, which contributed to it being ranked as priority C.
- This GMA has connectivity to areas with high densities of northern spotted owl habitat, is adjacent to connectivity areas to the north and south, and to habitat and GMAs in the Washington East Cascades province.
- Much of the GMA is accessible, allowing for implementation.

Description of the elements considered in mapping: In mapping the boundaries of the North Washington West Cascades GMA we used information on the following elements.

Spotted Owl Data: Historic spotted owl activity centers, and presence.

- Areas with relatively large amount of high-quality habitat and historic activity centers from which to select focused management areas large enough to support northern spotted owl populations. This includes Northwest Forest Plan modeling efforts that show a high likelihood of habitat capable of supporting viable populations of spotted owls in this GMA. This GMA contains areas that have an estimated habitat carrying capacity to support clusters of 20 or more pairs.

Conditions:

- Availability of access via roads and trails in most of this area.
- The location of neighboring connectivity areas, the ability of this GMA to provide connectivity to habitat and GMAs in the Washington East Cascades.
- The presence of SOSEAs with habitat and activity centers. Including these areas allows for incentives for management.

Other Considerations:

- Areas to the west were excluded due to the presence of less habitat in these areas, no recent spotted owl occupancy, and very little to no historical occupancy, and more marginal habitat in these areas.
- We did not try to exclude high elevation areas without habitat, or areas where habitat has been lost to wildfire. This can be considered during development of the FMA boundaries.
- A gap area to the south was not included as a GMA because we had reached the size of the GMA that would allow for a reasonable number of focal areas. We instead selected a large area with habitat and activity centers to choose from for focused management areas. Habitat in the West Cascades North area met the limitations of an upper limit for a GMA.
- The area between the West Cascades North and West Cascades Central was identified as a connectivity area.
- The habitat further the north was not included as a GMA due to historically having lower owl presence. This area was added as a connectivity area with potential management areas in Canada and also provides connectivity to habitat with recent presence in the Washington North Cascades on the east side of the Cascade Crest.

Focal Management Areas (FMAs)

In South Washington East Cascades GMA, we recommend developing FMAs large enough to potentially support 50 spotted owl pair sites where possible. Generally, larger blocky areas provide a smaller edge-to-area ratio, and this may help reduce the influx of barred owls from outside the FMA in the future. However, where the landscape or forest conditions do not allow this, smaller or more sinuous areas may be appropriate. For example, in higher elevation areas where habitat is confined to valley bottoms, large blocky FMAs may not be reasonable or effective, and smaller, but still multiple pair areas, may be a practical option. These may be more sinuous in nature due to the habitat limitations.

Where smaller areas are developed due to topography, forest condition, access, funding limitations, or other reasons, we recommend these be closer together and multiple areas designed with the intent of encouraging exchange of spotted owls between these smaller areas. Where possible, when setting up smaller areas, design them such that they could be expanded in the future if funding becomes available.

Coordinate FMA locations with the spotted owl site management described above. Including recently occupied sites in FMAs provides a potential core population for development of spotted owl populations as barred owl populations are reduced.

Priorities: The following is our recommended priorities for defining and selecting FMAs within the North Washington West Cascades GMA. The following are in general priority order, however, local expertise will be important in applying these to specific FMA boundary designs.

1. Build FMAs around current spotted owl sites with presence or occupancy of spotted owls. This provides a nucleus of spotted owls for the potential recolonization of sites within the FMA as barred owl numbers are reduced.

2. Include areas with high-quality historic spotted owl sites (sites with no confirmed occupancy in the last five years or more). These are areas that have been shown by past use to be attractive to spotted owls and therefore more likely to be reoccupied, especially as spotted owl populations increase.

3. Select areas with the best spotted owl habitat in terms of total acreage or density of northern spotted owl habitat.

4. Place blocks allowing for the maximum number of spotted owls to be supported. Focus on areas with the potential for at least 20 spotted owl pairs, though 50 pair sized areas are the target where possible.

5. Include areas with the most high-quality habitat in large areas where possible. This high-quality habitat may be in historical spotted owl sites, or it may connect sites.

6. Consider the presence of areas already designated for spotted owl conservation, recovery and management, such as Late Successional Reserves under the Northwest Forest Plan, SOSEAs and areas identified as high priorities in the Northern Spotted Owl Recovery Plan and final Critical Habitat rule. Including these areas provides support for spotted owls and limits impacts on other resources. Because many of these have been managed for older forest over the last decades, this is the likely location of some of the best habitat conditions.

7. Focus on areas with reasonable access, in terms of road networks, which are available in most of the spotted owl habitat in these GMAs. Closed roads may be used similar to a trail system if they can be safely walked. Trail systems can be used where roads do not exist, but roads are generally preferred to maximize operational efficiency.

8. Include lands of interested or willing landowners or land managers. A focus on areas where landowners have expressed interest in barred owl management and may have the ability to assist with operations will speed the implementation of actual barred owl management and encourage involvement.

9. Consider the ratio of barred owls to northern spotted owls. There has been very little survey effort outside of the Rainier Demography Study Area in the Western Washington Cascades. Therefore, the ratio of barred owls to northern spotted owls is unknown for most areas. However, we do know based on surveys in demography study areas, that barred owls tend to be at higher densities in more contiguous, lower elevation, high-quality habitat and tend to

be at lower densities in more marginal, less contiguous habitat, particularly in either drier marginal habitats or higher up slopes, or at the backs of fjord-like valleys. These more marginal areas where barred owls are at lower densities, tend to be the areas where spotted owls have persisted in areas that have had barred owl competition for long periods. We recommend conducting more surveys in the Western Washington Cascades Province and targeting areas with lower barred owl densities and expanding management out to include higher quality habitats where barred owls are typically at higher densities.

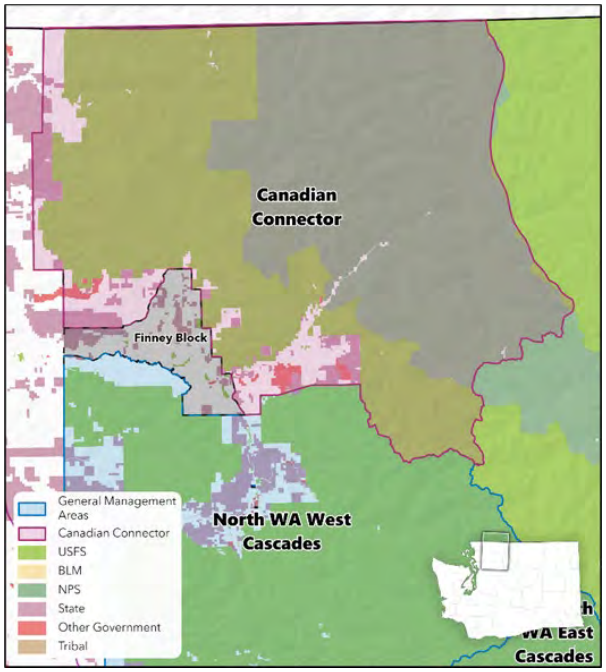
10. Consider the potential for connection to other FMAs in the GMA, to neighboring GMAs and spotted owl site management areas, and to habitat on the east side of the Cascade Crest with recent spotted owl presence. Placement of FMAs within close proximity to other managed areas, and where there is forest that may provide connection to the Eastern Washington Cascades through low passes, can connect populations in these areas.

11. Consider including areas where more efficient use of funding (such as targeting more accessible areas or areas where surveys are funded and planned) can be used to maximize treatment efficacy at scale, and more efficiently reduce the impact of barred owls on northern spotted owl.

A4.2.B.3 Special Designated Areas

A4.2.B.3.a. Canadian Connector – Priority D

The Canadian Connector special designation area lies north of Highway 20 and west of the Cascade Crest, and includes parts of the Mount Baker Snoqualmie National Forest and parts of North Cascades National Park as well as State lands, SOSEA lands and some private lands. It includes 89 percent Federal lands (National Forests and National Park), 3 percent State land and the remainder in generally private ownership.



The Canadian Connector was mapped for the following reasons:

- The primary reason for mapping this area was to provide future opportunities to support the Canadian spotted owl reintroduction should that become possible.
- It contains historic activity centers, but has no recent survey information and recent presence is unknown, which contributed to it being ranked as priority D. Surveys using autonomous recording units are planned for some areas on the Mount Baker Snoqualmie Forest in the near future in parts of this special designated area. The area does contain fewer historical activity centers than areas further south, which contributed to it being ranked as priority D.

- The Canadian Connector has a large amount of high-quality habitat and historic activity centers capable of supporting northern spotted owl populations according to Northwest Forest Plan modeling. It also includes large habitat areas mapped as fire and climate refugia. Compared to the GMAs further south in the province, it has a lower density of habitat capable of supporting northern spotted owl populations according to Northwest Forest Plan monitoring, which contributed to it being ranked as priority D.
- The Canadian Connector has connectivity to areas with high densities of northern spotted owl habitat, is adjacent to connectivity areas to spotted owl habitat in Canada, is connected to a GMA to the south and to habitat in the Washington East Cascades province with recent spotted owl presence.
- Much of the Canadian Connector is accessible, allowing for implementation.

Description of the elements considered in mapping: In mapping the boundaries of the Canadian Connector we used information on the following elements.

Spotted Owl Data:

- Historic spotted owl activity centers.
- Areas with relatively large amount of high-quality habitat and historic activity centers from which to select focused management areas large enough to support northern spotted owl populations. This includes Northwest Forest Plan modeling efforts that show modeled fire refugia in this area and a high likelihood of habitat capable of supporting viable populations of spotted owls in this GMA. This GMA contains areas that have an estimated habitat carrying capacity to support clusters of 20 or more pairs.

Conditions:

- Availability of access via roads and trails in most of this area, mostly in fjord-like habitat.
- The location of a neighboring GMA, and the ability of the Canadian Connector to provide connectivity to habitat and GMAs in the Washington East Cascades.
- The presence of SOSEAs with habitat and activity centers. Including these areas allows for incentives for management.

Other Considerations:

- Areas to the west were excluded due to the presence of less habitat in these areas, no recent spotted owl occupancy, and very little to no historical occupancy, and more marginal habitat in these areas.
- We did not try to exclude high elevation areas without habitat, or areas where habitat has been lost to wildfire. This can be considered during development of the FMA boundaries.

Focal Management Areas (FMAs)

The primary function of the Canadian Connector is future opportunity to support spotted owl reintroduction in Canada, the management of blocks of habitat for spotted owl populations provides the best potential for such contributions.

The short-term focus for management in this area is to identify remaining occupied spotted owl sites and conduct barred owl management to protect these remaining sites. Longer term, focus on creating smaller blocks of habitat allowing for spotted owl populations to connect across this area and reducing overall barred owl population density to support spotted owl connections across this area. Initially, we recommend conducting surveys of historical spotted owl sites, and areas with high-quality spotted owl habitat without historical spotted owl data. If occupied spotted owl sites are found, manage all these sites using the site management described above, with at least 26,058 acres (2 home range radii), and preferably larger.

In the longer term, we recommend developing barred owl management areas around the occupied and historic spotted owl sites, with a focus on scattered small blocks across the entire connectivity area to provide for connection. In addition, general barred owl removal in this area, designed to reduce barred owl densities, may provide opportunities for successful dispersal of spotted owls. This is not anticipated to be as intense or continuous at that within management blocks.

Where opportunities exist, consider developing FMAs large enough to potentially support 50 spotted owl pair sites where possible. However, where the landscape or forest conditions do not allow this, smaller or more sinuous areas may be appropriate.

Priorities: The following is our recommended priorities for defining and selecting FMAs within the Canadian Connector. The following are in general priority order, however, local expertise will be important in applying these to specific FMA boundary designs.

1. Manage around current occupied spotted owl sites (sites with detections in the last five years). This provides a nucleus of spotted owl sites to maintain distribution where it exists across the Canadian Connector. Where recent survey data are not available, the nucleus may instead rely on sites that have not undergone significant habitat modification since they were last known to be occupied.

2. Prioritize spotted owl site management, or place small management blocks, to include clusters of sites with good current demographic parameters (e.g., higher survival, occupancy, reproductive output, etc.) relative to others in the Canadian Connector.

3. Select management areas to facilitate connectivity, both within the Canadian Connector and with nearby GMAs and connectivity areas, via landscapes that can support dispersal. In particular, facilitate connectivity between close treatment areas, with treatment distributed across the Canadian Connector to make steppingstones for generational dispersal between neighboring GMAs.

4. Select clusters of spotted owl sites or place small blocks in areas with the highest acreage of high-quality spotted owl habitat, for example, as measured by relative habitat suitability. These are likely to be areas with the highest per-area carrying capacity for northern spotted owls, which can be measured using a habitat-based calculation of the estimated maximum population of territorial northern spotted owls without barred owl presence.

5. Build future FMAs around current spotted owl sites with presence or occupancy of spotted owls. This provides a nucleus of spotted owls for the potential recolonization of sites within the FMA as barred owl numbers are reduced. Include areas with high-quality historic spotted owl sites (sites with no confirmed occupancy in the last five years or more). These are areas that have been shown by past use to be attractive to spotted owls and therefore more likely to be reoccupied, especially as spotted owl populations increase.

6. Consider the presence of areas already designated for spotted owl conservation, recovery and management, such as Late Successional Reserves under the Northwest Forest Plan, SOSEAs and areas identified as high priorities in the Northern Spotted Owl Recovery Plan and final Critical Habitat rule. Including these areas provides support for spotted owls and limits impacts on other resources. Because many of these have been managed for older forest over the last decades, this is the likely location of some of the best habitat conditions.

7. Focus on areas with reasonable access, in terms of road networks, which are available in most of the spotted owl habitat in these GMAs. Closed roads may be used similar to a trail system if they can be safely walked. Trail systems can be used where roads do not exist, but roads are generally preferred to maximize operational efficiency.

8. Include lands of interested or willing landowners or land managers. A focus on areas where landowners have expressed interest in barred owl management and may have the ability to assist with operations will speed the implementation of actual barred owl management and encourage involvement.

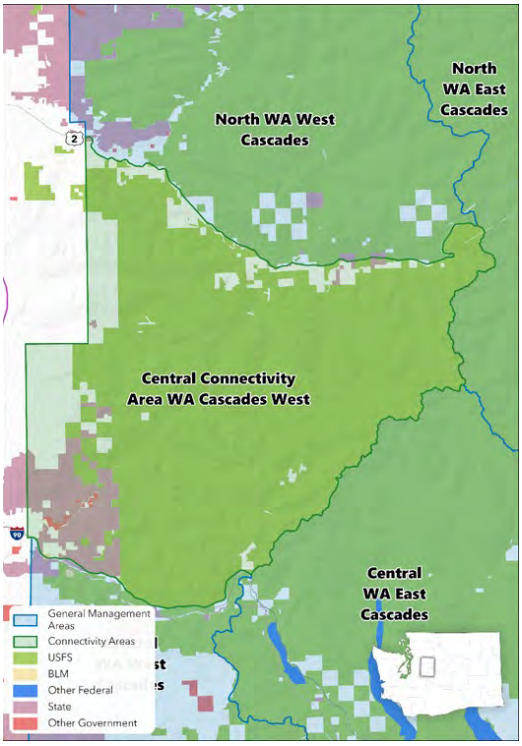
9. Consider the ratio of barred owls to northern spotted owls. There has been very little survey effort outside of the Rainier Demography Study Area in the Western Washington Cascades. Therefore, the ratio of barred owls to northern spotted owls is unknown for most areas. However, we do know based on surveys in demography study areas, that barred owls tend to be at higher densities in more contiguous, lower elevation, high-quality habitat and tend to be at lower densities in more marginal, less contiguous habitat, particularly in either drier marginal habitats or higher up slopes, or at the backs of fjord-like valleys. These more marginal areas where barred owls are at lower densities, tend to be the areas where spotted owls have persisted in areas that have had barred owl competition for long periods. We recommend conducting more surveys in the Western Washington Cascades Province and targeting areas with lower barred owl densities and expanding management out to include higher quality habitats where barred owls are typically at higher densities.

10. Consider the potential for connection to other FMAs in the GMA, to neighboring GMAs and spotted owl site management areas, and to habitat on the east side of the Cascade Crest with recent spotted owl presence. Placement of FMAs within close proximity to other managed areas, and where there is forest that may provide connection to the Eastern Washington Cascades through low passes, can connect populations in these areas.

11. Consider including areas where more efficient use of funding (such as targeting more accessible areas or areas where surveys are funded and planned) can be used to maximize

treatment efficacy at scale, and more efficiently reduce the impact of barred owls on northern spotted owl.

A4.2.B.3.b Central Connectivity Area Washington Cascades West – Priority D



The Central Connectivity Area Washington Cascades West lies north of I-90 and south of the North Washington West Cascades GMA, and west of the Cascade Crest, and includes parts of the Mount Baker Snoqualmie National Forest (including parts of the Darrington and Snoqualmie Ranger Districts) as well as State lands, SOSEA lands and some private lands. It includes 81 percent Federal lands (National Forests), 6 percent State land and the remainder in primarily private ownership.

The Central Connectivity Area Washington Cascades West was mapped for the following reasons:

- It contains historic activity centers, mostly in fjord-like habitat, but has no recent survey information and recent presence is unknown, which contributed to it being ranked as priority D.
- The Central Connectivity Area Washington Cascades West has a large amount of high-quality habitat and historic activity centers capable of supporting northern spotted owl populations according to Northwest Forest Plan modeling. Compared to the GMAs in the Province, it has a lower density of habitat capable of supporting northern spotted owl populations according to Northwest Forest Plan monitoring, which contributed to it being ranked as priority D.
- The Central Connectivity Area Washington Cascades West provides potential connectivity to areas with high densities of northern spotted owl habitat, is adjacent to four GMAs to the north, south and east, including habitat to the east and south with recent known presence.
- Much of the Central Connectivity Area Washington Cascades West is accessible, allowing for implementation.

<u>Description of the elements considered in mapping:</u> In mapping the boundaries of the Central Connectivity Area Washington Cascades West we used information on the following elements.

Spotted Owl Data:

- Historic spotted owl activity centers.
- Areas with relatively large amount of high-quality habitat and historic activity centers from which to select focused management areas large enough to support northern spotted owl populations, movement and connectivity. This includes Northwest Forest Plan modeling efforts that show a high likelihood of habitat capable of supporting viable

populations of spotted owls in this GMA. This GMA contains areas that have an estimated habitat carrying capacity to support clusters of 20 or more pairs.

Conditions:

- Availability of access via roads and trails in most of this area in fjord-like habitat.
- The location of four neighboring GMAs, the ability of this GMA to provide connectivity to GMAs to the north and south in the West Cascades, and to GMAs in the East Cascades, including habitat to the east and south with recent spotted owl presence.
- The presence of SOSEAs with habitat and activity centers. Including these areas allows for incentives for management.

Other Considerations:

- Areas to the west were excluded due to the presence of less habitat in these areas, no recent spotted owl occupancy, and very little to no historical occupancy, and more marginal habitat in these areas.
- We did not try to exclude high elevation areas without habitat, or areas where habitat has been lost to wildfire. This can be considered during development of the FMA boundaries.

Focal Management Areas (FMAs)

In the Central Connectivity Area Western Washington Cascades, we recommend developing FMAs large enough to potentially support 50 spotted owl pair sites where possible. Generally, larger blocky areas provide a smaller edge-to-area ratio, and this may help reduce the influx of barred owls from outside the FMA in the future. However, where the landscape or forest conditions do not allow this, smaller or more sinuous areas may be appropriate. For example, in higher elevation areas where habitat is confined to valley bottoms, large blocky FMAs may not be reasonable or effective, and smaller, but still multiple pair areas, may be a practical option. These may be more sinuous in nature due to the habitat limitations.

Where smaller areas are developed due to topography, forest condition, access, funding limitations, or other reasons, we recommend these be closer together and multiple areas designed with the intent of encouraging exchange of spotted owls between these smaller areas. Where possible, when setting up smaller areas, design them such that they could be expanded in the future if funding becomes available.

Coordinate FMA locations with the spotted owl site management described above. Including recently occupied sites in FMAs provides a potential core population for development of spotted owl populations as barred owl populations are reduced.

Priorities: The following is our recommended priorities for defining and selecting FMAs within the Central Connectivity Area Western Washington Cascades. The following are in general priority order, however, local expertise will be important in applying these to specific FMA boundary designs.

1. Build FMAs around current spotted owl sites with presence or occupancy of spotted owls. This provides a nucleus of spotted owls for the potential recolonization of sites within the FMA as barred owl numbers are reduced.

2. Include areas with high-quality historic spotted owl sites (sites with no confirmed occupancy in the last five years or more). These are areas that have been shown by past use to be attractive to spotted owls and therefore more likely to be reoccupied, especially as spotted owl populations increase.

3. Select areas with the best spotted owl habitat in terms of total acreage or density of northern spotted owl habitat.

4. Place blocks allowing for the maximum number of spotted owls to be supported. Focus on areas with the potential for at least 20 spotted owl pairs, though 50 pair sized areas are the target where possible.

5. Include areas with the most high-quality habitat in large areas where possible. This high-quality habitat may be in historical spotted owl sites or it may connect sites.

6. Consider the presence of areas already designated for spotted owl conservation, recovery and management, such as Late Successional Reserves under the Northwest Forest Plan, SOSEAs and areas identified as high priorities in the Northern Spotted Owl Recovery Plan and final Critical Habitat rule. Including these areas provides support for spotted owls and limits impacts on other resources. Because many of these have been managed for older forest over the last decades, this is the likely location of some of the best habitat conditions.

7. Focus on areas with reasonable access, in terms of road networks, which are available in most of the spotted owl habitat in these GMAs. Closed roads may be used similar to a trail system if they can be safely walked. Trail systems can be used where roads do not exist, but roads are generally preferred to maximize operational efficiency.

8. Include lands of interested or willing landowners or land managers. A focus on areas where landowners have expressed interest in barred owl management and may have the ability to assist with operations will speed the implementation of actual barred owl management and encourage involvement.

9. Consider the ratio of barred owls to northern spotted owls. There has been very little survey effort outside of the Rainier Demography Study Area in the Western Washington Cascades. Therefore, the ratio of barred owls to northern spotted owls is unknown for most areas. However, we do know based on surveys in demography study areas, that barred owls tend to be at higher densities in more contiguous, lower elevation, high-quality habitat and tend to be at lower densities in more marginal, less contiguous habitat, particularly in either drier marginal habitats or higher up slopes, or at the backs of fjord-like valleys. These more marginal areas where barred owls are at lower densities, tend to be the areas where spotted owls have persisted in areas that have had barred owl competition for long periods. We recommend conducting more surveys in the Western Washington Cascades Province and

targeting areas with lower barred owl densities and expanding management out to include higher quality habitats where barred owls are typically at higher densities.

10. Consider the potential for connection to other FMAs in the GMA, to neighboring GMAs and spotted owl site management areas, and to habitat on the east side of the Cascade Crest with recent spotted owl presence. Placement of FMAs within close proximity to other managed areas, and where there is forest that may provide connection to the Eastern Washington Cascades through low passes, can connect populations in these areas.

11. Consider including areas where more efficient use of funding (such as targeting more accessible areas or areas where surveys are funded and planned) can be used to maximize treatment efficacy at scale, and more efficiently reduce the impact of barred owls on northern spotted owl.

A4.2.B.3.c Spotted Owl Special Emphasis Areas – Priority E

The State of Washington identified 10 key landscapes, referred to as Spotted Owl Special Emphasis Areas (SOSEAs), where northern spotted owl conservation in the form of demographic and/or dispersal support was important on non-federal lands. In mapping the Strategy, some SOSEAs were included in mapped GMAs, Central Connectivity Area Washington Cascades West, or the Canadian Connector. Where SOSEAs lie within GMAs, connectivity areas, or the Canadian Connector, barred owl management as described for those designations would apply. Where SOSEA lands fell outside of these designations, we mapped the areas as SOSEA special designation areas.

There are four SOSEA Special Designated Areas in the Western Washington Cascades.

SOSEA	Forest Acres on Federal lands	Forest Acres on State Lands	Forest Acres on Private Lands	Maximum Forest Acres Under Management
Finney Block SOSEA	1,070	13,020	44,225	14,626
Mineral Block SOSEA	37,151	2,435	65,358	26,264
Mineral Link SOSEA	0	33,414	112,672	38,969
Columbia Gorge SOSEA	10,985	9,379	11,629	7,943

In the original designation by Washington, each SOSEA was described in terms of one or more conservation functions -- demographic support, dispersal support, and combination support. Demographic support meant that adequate amounts and arrangements of suitable habitat are maintained to support reproductive spotted owl pairs. Dispersal support is provided by a landscape that includes dispersal habitat at the stand level interspersed with areas of higher quality habitat. Combination support was defined as either maintaining suitable spotted owl habitat to protect the viability of the owls at a spotted owl site center or providing a variety of habitat conditions which in total are more than dispersal support and less than demographic support.

For the Strategy, barred owl management in the form of removal could be occur at any scale in a SOSEA. We recommend spotted owl site-based management as described in Section 8.4.1.2. of

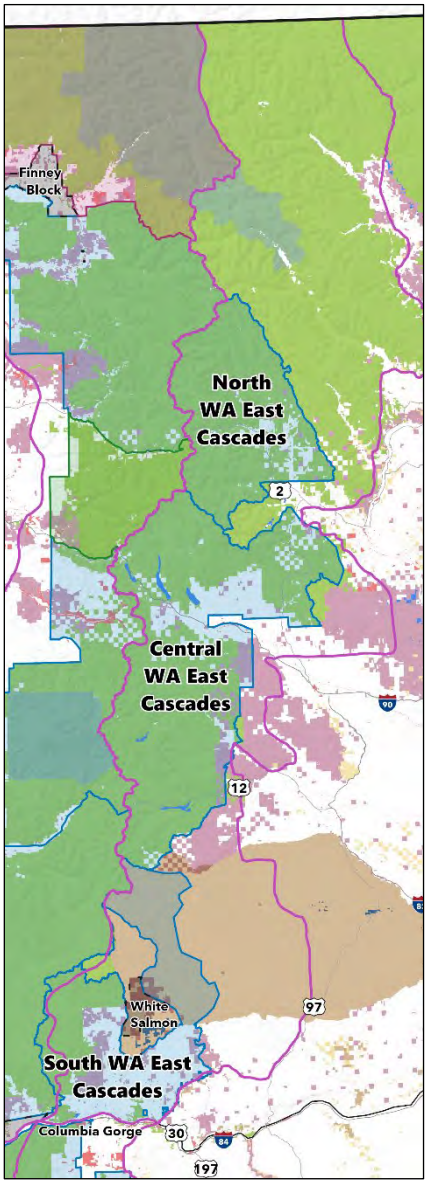
the Strategy and Section B.1 above. Removal of barred owls around spotted owl sites can be applied anywhere within the province and is an appropriate small scale management effort in SOSEAs. Removing barred owls within and around occupied spotted owl sites retains the existing population, increases the potential for recruitment of young, and provides source populations for recolonization of areas where barred owl management occurs. Spotted owl site management can provide connectivity between larger block areas. Where feasible, clustering spotted owl site management into small blocks increases the functionality of this management.

A4.3. Eastern Washington Cascades Province

A4.3.A Background:

A4.3.A.1 Spotted Owl Condition in the Eastern Washington Cascades:

The Washington Eastern Cascades Province, is one of four physiographic provinces in Washington. The province includes a large portion of U.S. Forest Service lands with 64 percent of the area, 15 percent Tribal lands, 9 percent comprised of State lands, and the remainder private land. Federal lands in the province include approximately 548,964 acres of spotted owl NRF (suitable) habitat. The Washington Eastern Cascades are characterized by cold, snowy winters and dry summers with a high frequency of natural disturbance due to fires and outbreaks of forest insects and pathogens.



Within the Washington Eastern Cascades Province, the Cle Elum Demography Study Area provides data on spotted owl populations since 1989. Monitoring efforts indicate that spotted owl occupancy at historic territories have declined substantially. Spotted owl occupancy on sites within the Cle Elum study area dropped to 7 percent in the Cle Elum Demography Study Area by 2017 (Franklin et al. 2021). Comprehensive surveys in 2021 indicated five singles males and one pair on the Cle Elum Demography Study Area and 1 single male and one single female on the adjoining Rainier Demography Study Area (Rossi 2021, p. 5). On the Cle Elum study area northern spotted owl pairs have declined by as much as 98 percent since 1992 with as few as one remaining pair.

A4.3.A.2 Barred Owl condition in the GMAs in Eastern Washington Cascades Province:

Barred owls have been at high densities in Washington for longer periods of time compared to areas further south in the northern spotted owl range. On the Cle Elum Study area in the

Eastern Washington Cascades Province, barred owls occupied 43 percent of the of the surveyed area as detected by autonomous recording units, whereas northern spotted owl were detected in only six percent of the same surveyed land area in 2021 (Lesmeister et al. 2022).

A4.3.B. Management Strategy

A4.3.B.1 Spotted owl site management in Washington East Cascades Province

A4.3.B.1.a Background

Given the limited northern spotted owl population in this province, it is crucial to protect the remaining spotted owls through barred owl management at spotted owl sites.

- Managing recently occupied spotted owl sites will help to reduce the rate of spotted owl population decline as quickly as possible and prevent extinction/extirpation of the spotted owl in the province.
- Protected spotted owl sites, if occupied, or reoccupied, by spotted owls, and reproducing, may provide a source of young for colonization of management blocks. Where these occur near GMAs, reproductively-active spotted owl sites, or sites that may become reproductively active, can provide demographic support to block management areas.
- Where spotted owl site management occurs within a GMA, these spotted owl sites may serve as focal points for the development of focal management areas, now and in the future. Site management may be expanded into block management over time.
- Maintaining spotted owl sites distributed across the province, whether within block management areas or not, will reduce the risk of loss of spotted owls in the province from catastrophic events, such as wildfire, by spreading sites across the area. Managing spotted owl sites also provides the opportunity for maintaining spotted owls in areas where block management is not feasible or recommended. This approach applies across the entire province, whether or not the locations are within a GMA or other mapped designation.
- Provide a potential source of spotted owl individuals for direct augmentation of block management areas in the future should such management action be necessary. These spotted owl sites may serve as key points for the development of focal management areas, now and in the future.
- These sites may serve to increase potential connectivity between and within block management areas, and provide sites in the vicinity of blocked management areas that can interact at a demographic level with those management areas.
- Spotted owl site management, due to its smaller size when compared to block management, provides a wider range of options for landowner contribution to barred owl managements, particularly for smaller landowners, or areas where there are not large amounts of suitable habitat due to terrain, or extensive loss of habitat from wildfires or harvest.

Selection of spotted owl sites for management in Eastern Washington Cascades Province

Occupied spotted owl sites are extremely limited in this province. The primary focus of spotted owl site management in this province is on sites that have been occupied by, or had detections of, spotted owls in the last five years. These areas are more likely to be recolonized by spotted owls after barred owl removal. This is reflected in the priorities for site management.

Spotted Owl Site Management Priorities

Priority	Spotted Owl Site Condition
A	Sites that have been occupied by resident spotted owls (pair or single) in the past five years, or where there have been detections of spotted owls (not reaching resident status) in the past five years
B	Sites that were occupied by resident spotted owls (pair or single) between five and ten years ago
C	Sites that were occupied by resident spotted owls (pair or single) more than ten years ago, whether or not they have been surveyed recently.
D	Areas with sufficient high-quality habitat to support a spotted owl site, whether surveyed recently or not.

Other considerations for selection of spotted owl sites for management:

If site management cannot be initiated on all sites, we recommend the following be considered in selecting the specific spotted owl sites for management.

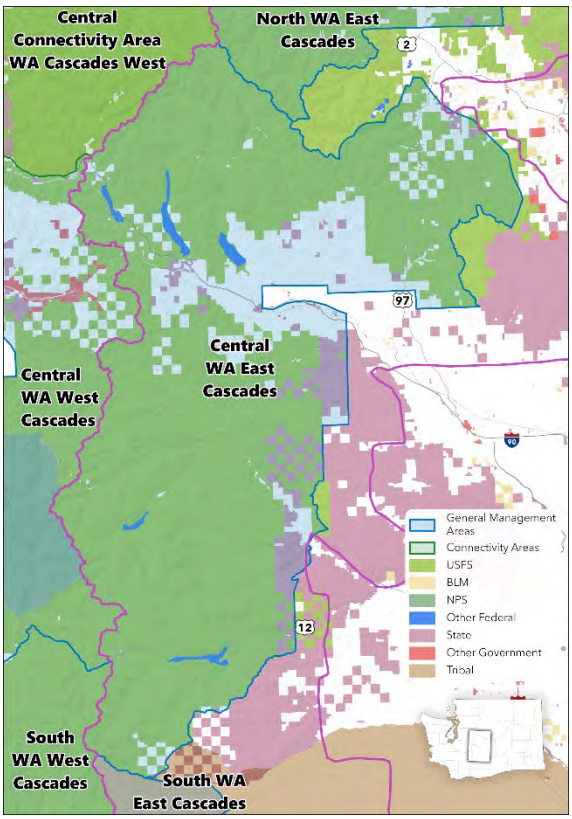
- Select sites with the most recent occupancy, particularly if surveys have been conducted on these areas in recent years. Do not discount sites as unoccupied based on lack of recent surveys.
- Focus first on sites with recent occupancy by pairs, then singles, then detections.
- Consider past reproductive history of the site. Select sites with a history of reproduction on the site where surveys are available.
- Consider the condition of habitat in the area, particularly loss of habitat to fire or other actions since the last surveys. Sites where much of the habitat has been removed, from high severity fire or timber harvest would be a lower priority.

A4.3.B.1.b Management Recommendations:

Within each individual site, remove barred owls from an area between 14,657 and 26,058 acres. This represents the area in a circle of 1.5 and 2 home range radii (Table 1). This can be distributed in a circle around the core area, or implementers can use local knowledge, topography, and habitat condition to design an area of the appropriate size that provides the best conditions for barred owl management. In areas where spotted owl sites are isolated, and particularly for spotted owl sites in Priority A condition (see table above), we recommend a larger management area, up to 58,630 acres (3 home range radii).

A4.3.B.2 General Management Areas in Eastern Washington Cascades Province

A4.3.B.2.a Central Washington East Cascades GMA- Priority A



The Central Washington East Cascades GMA lies east of the Cascade Crest, north of the Yakama Nation Reservation and includes the Naches Ranger District, the Cle Elum Ranger District and parts of the Wenatchee River Ranger district on the Okanogan-Wenatchee National Forest as well as State SOSEA lands and some private lands. It includes 81 percent Federal lands (National Forests), 5 percent State land and the remainder primarily in private ownership.

This GMA was mapped for the following reasons:

- It contains the most current/recent known pair activity in the Washington East Cascades Physiographic province.
- The GMA includes Cle Elum Spotted Owl Demography Study Area, with its historic and recent spotted owl data. This area is already slated for higher level monitoring (20 percent ARU-based), providing additional future data on both spotted and barred owls. This portion of the GMA is well known and accessible, allowing for quicker implementation.
- The GMA is centrally located, allowing for connectivity to GMAs to the north and west.
- The GMA contains a diversity of habitat types, from relatively cool/moist to warmer/drier. This allows for management in the range of habitat types that spotted owl occupy in the Eastern Washington Cascades. Historically, some of the highest fecundity rates for spotted owls occurred in the Cle Elum demography study area, even in the warmer/drier portions of it, and some of the few remaining known pairs occur in the warmer/drier parts of this GMA. These forest types can be more vulnerable to more frequent loss from catastrophic wildfire. Therefore, by including a diversity of forest types in this GMA that connect warmer/drier forest types to relatively cooler/moister forest types that are predicted to function as fire refugia, particularly in the mid, to long term future, we build in connectivity to more resilient and diverse habitat types for a future spotted owl population in this GMA.

Description of the elements considered in mapping: In mapping the boundaries of the Central Washington East Cascades GMA we used information on the following elements.

Spotted Owl Data:

- Historic spotted owl activity centers, recent spotted owl presence documented on Cle Elum, Naches and Wenatchee River Ranger Districts, historic and recent Cle Elum Demography Study Area data.
- Areas with relatively large amount of high-quality habitat and activity centers from which to select focused management areas large enough to support spotted owl populations. This includes Northwest Forest Plan modeling efforts that show a high likelihood of habitat capable of supporting viable populations of spotted owls in this GMA. This GMA contains areas that have an estimated habitat carrying capacity to support clusters of 20 or more pairs.
- We did not try to exclude high elevation areas without habitat, or areas where habitat has been lost to wildfire. This can be considered during development of the FMA boundaries.

Conditions:

- Availability of access via roads and trails in most of this area. The diversity of habitat types (relatively cool/moist to warmer/drier for Eastern Washington Cascades), and fjord-like habitat within the area allowing for management of all types of landscapes.
- The location of neighboring GMAs, and the ability of this GMA to provide connectivity to GMAs in the Western Washington Cascades, the East Cascades North GMA within the province, and habitat on the Yakama Nation Reservation
- The presence of SOSEAs with habitat and activity centers. Including these areas allows for incentives for management.

Other Considerations:

- This GMA includes some areas with current and planned higher intensity monitoring of spotted owls (20% ARU monitoring of the Cle Elum study area Demography Study Area) and inclusion of former experimental removal area provides opportunity for long term monitoring and research of success of barred owl management strategy.
- Areas to the east were excluded due to the presence of less habitat in these areas, no recent spotted owl occupancy, and more marginal habitat in these driest areas.

Focal Management Areas (FMAs)

We recommend developing FMAs large enough to potentially support 50 spotted owl pair sites where possible. Generally, larger blocky areas provide a smaller edge-to-area ratio, and this may help reduce the influx of barred owls from outside the FMA in the future. However, where the landscape or forest conditions do not allow this, smaller or more sinuous areas may be appropriate. For example, in higher elevation areas where habitat is confined to valley bottoms, large blocky FMAs may not be reasonable or effective, and smaller, but still multiple pair areas, may be a practical option. These may be more sinuous in nature due to the habitat limitations.

Where smaller areas are developed due to topography, forest condition, access, funding limitations, or other reasons, we recommend these be closer together and multiple areas designed with the intent of encouraging exchange of spotted owls between these smaller areas. Where

possible, when setting up smaller areas, design them such that they could be expanded in the future if funding becomes available.

Coordinate FMA locations with the site management described above. Including recently occupied sites in FMAs provides a potential core population for development of spotted owl populations as barred owl populations are reduced.

Priorities: The following is our recommended priorities for defining and selecting FMAs within the Central Washington East Cascades GMA. The following are in general priority order, however, local expertise will be important in applying these to specific FMA boundary designs.

1. Build FMAs around current sites with presence or occupancy of spotted owls. This provides a nucleus of spotted owls for the potential recolonization of sites within the FMA as barred owl numbers are reduced.

2. Focus on areas with reasonable access, in terms of road networks, which are available in most of the spotted owl habitat in the GMA. Closed roads may be used similar to a trail system if they can be safely walked. Trail systems can be used where roads do not exist, but roads are generally preferred to maximize operational efficiency.

3. Consider fire risk in mapping the boundaries of the FMAs. Risk alone should not eliminate an area from consideration, but should be considered in placing boundaries. Placement of multiple FMAs within the GMA, inclusion of large areas with a range of habitat types for spotted owls, and inclusion of areas with a range of fire risk would reduce the risk of complete or substantial loss of FMAs in a GMA. Avoid concentrating FMAs solely in areas identified as having the highest risk of catastrophic fire loss, however, some areas with high fire risk in FMAs may still be important, particularly where there is current or recent use of the area by spotted owls. Providing connectivity in FMAs from higher risk spotted owl habitat to areas identified as fire refugia, and areas with relatively lower risk in the fire prone landscape of the east Cascades will be important.

4. Place blocks allowing for the maximum number of spotted owls to be supported. Focus on areas with the potential for at least 20 spotted owl pairs, though 50 pair sized areas are the target where possible.

5. Select areas with the best spotted owl habitat in terms of total acreage or density of spotted owl habitat.

6. Include lands of interested or willing landowners or land managers. A focus on areas where landowners have expressed interest in barred owl management and have the ability to assist with operations will speed the implementation of actual barred owl management and encourage involvement.

7. Include areas with high-quality historic spotted owl sites (sites with no confirmed occupancy in the last five years or more). These are areas that have been shown by past use

to be attractive to spotted owls and therefore more likely to be reoccupied, especially as spotted owl populations increase.

8. Consider the potential for connection to other FMAs in the GMA, and to neighboring GMAs. Placement of FMAs within close proximity to other GMAs, and where there is forest that may provide connection to the Western Washington Cascades through low passes, can connect populations in these areas.

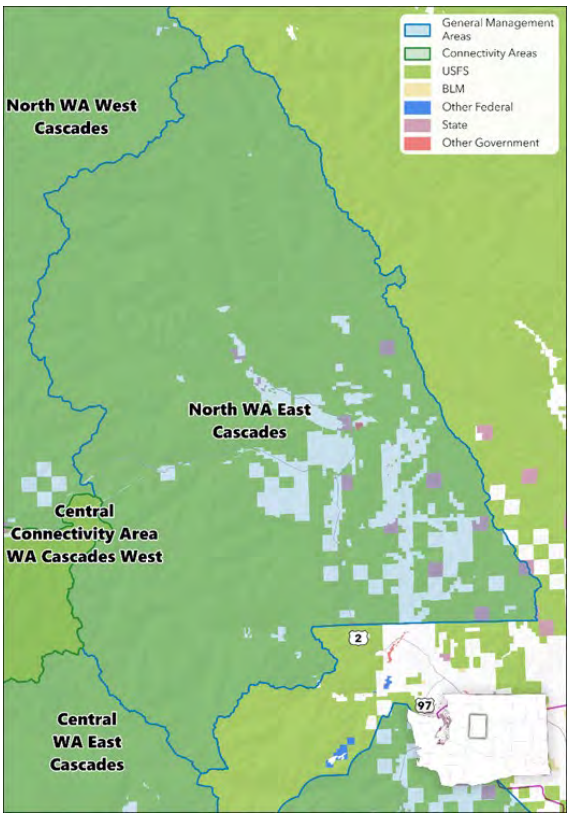
9. Consider the presence of areas already designated for spotted owl conservation, recovery and management, such as Late Successional Reserves under the Northwest Forest Plan, SOSEAs and areas identified as high priorities in the Northern Spotted Owl Recovery Plan and final Critical Habitat rule. Including these areas provides support for spotted owls and limits impacts on other resources. Because many of these have been managed for older forest over the last decades, this is the likely location of some of the best habitat conditions.

10. Select areas with a diversity of spotted owl habitat types. Given the range of forest conditions in this GMA that spotted owls use, selecting areas with different habitat types provides for a variety of conditions for future spotted owl population development and response to a changing landscape under an uncertain future under climate change. Inclusion of large areas with a range of connected habitat types would reduce the risk of complete or substantial loss of an FMA s from threats such as catastrophic very large fires. Historically, the Eastern Washington Cascades had some of the highest fecundity rates for spotted owls, even in warmer/drier areas with more fire risk while the relatively cool, moist areas of the may have more long-term resiliency or act as fire refugia. Managing a variety of connected types of spotted owl habitats in this province would potentially allow spotted owl to best withstand a dynamic future under climate change with increased risk of habitat loss from very large, high intensity fires and outbreaks of tree disease and insects that effect trees.

11. Consider climate change resilience in selecting areas. This is a lower priority factor, but other things being equal, include areas with identified as having greater resilience. This may include areas identified as fire refugia or areas with sufficient spotted owl habitat that have been treated for improved resilience to threats associated with climate change such as increases in habitat/forest loss from widespread insect or disease outbreak and/or catastrophic very large fires.

12. Consider including areas where more efficient use of funding (such as targeting more accessible areas) can be used to maximize treatment efficacy at scale, and more efficiently reduce the impact of barred owls on spotted owls.

A4.3.B.2.b North Washington East Cascades GMA- Priority B



The North Washington East Cascades GMA lies east of the Cascade Crest, north of the Cle Elum Ranger District and includes most of the Wenatchee River Ranger district on the Okanogan-Wenatchee National Forest as well as State SOSEA lands and some private lands. It lies on both the north and south side of the Highway 2 corridor and stretches north to Entiat ridge and the south boundary of the Entiat Ranger District. It includes 90 percent Federal lands (National Forests), 1 percent State land and the remainder in primarily private ownership.

This GMA was mapped for the following reasons:

- It contains recent/current spotted owl presence and known pair activity, but not as much spotted owl presence as the Central GMA in the Washington East Cascades Physiographic Province just to the south.
- This GMA has a high amount and density of habitat capable of supporting spotted owl populations according to Northwest Forest Plan modeling.
- This GMA has connectivity to areas with high densities of spotted owl habitat and areas with recent spotted owl presence to the South, and connectivity to GMAs to the West
- It contains a diversity of habitat types (relatively cool/moist to warmer/drier for Eastern Washington Cascades), which should improve long term resilience of the GMA to substantial loss from catastrophic wildfire, and provide connectivity for spotted owls in less resilient areas to areas identified as fire refugia. Management in a large area with diverse habitat types will allow for management in the range of habitat types that spotted owl occupy in the Eastern Washington Cascades.
- Much of the GMA is well known and accessible, with recent surveys, potentially allowing for quicker implementation.

Description of the elements considered in mapping: In mapping the boundaries of the North Washington East Cascades GMA we used information on the following elements.

Spotted Owl Data:

- Historic spotted owl activity centers, recent spotted owl presence.
- Areas with relatively large amount of high-quality habitat and activity centers from which to select focused management areas large enough to support spotted owl populations. This includes Northwest Forest Plan modeling efforts that show a high likelihood of habitat capable of supporting viable populations of spotted owls in this GMA. This GMA

contains areas that have an estimated habitat carrying capacity to support clusters of 20 or more pairs.

Conditions:

- Availability of access via roads and trails in most of this area. The diversity of habitat types (relatively cool/moist to warmer/drier for Eastern Washington Cascades), and fjord-like habitat within the area allowing for management of all types of landscapes.
- The location of neighboring GMAs, and the ability of this GMA to provide connectivity to GMAs in the Western Washington Cascades, and the East Cascades Central GMA within the province.
- The presence of SOSEAs with habitat and activity centers. Including these areas allows for incentives for management.

Other Considerations:

- Areas to the east were excluded due to the presence of less habitat in these areas, no recent spotted owl occupancy, and more marginal habitat in these driest areas.
- We did not try to exclude high elevation areas without habitat (with the exception of clipping out the high elevation areas of the Stuart Range), or areas where habitat has been lost to wildfire. This can be considered during development of the Focal Management Area boundaries.
- Habitat further north in the Eastern Washington Cascades, was not included as a GMA due to lack of large blocks of habitat to support spotted owl populations such as 20 pair areas. The area to the north has less habitat remaining due to loss from largescale wildfires over the past 30 years, and historically lower amounts of habitat and spotted owl sites in this area prior to the wildfires. Remaining habitat is not likely sufficient to support 20 pair areas or areas large enough to meet minimum GMA size requirements, but could still be managed with individual site management. There have been recent records of limited numbers of individual spotted owls in the area north of the proposed North Washington East Cascades GMA. Areas with habitat capable of supporting owls, especially areas with recent spotted owl presence, to the north can still be managed with individual site management, particularly with managing clusters of sites with habitat capable of supporting spotted owls.

Focal Management Areas (FMAs)

We recommend developing FMAs large enough to potentially support 50 spotted owl pair sites where possible. Generally, larger blocky areas provide a smaller edge-to-area ratio, and this may help reduce the influx of barred owls from outside the FMA in the future. However, where the landscape or forest conditions do not allow this, smaller or more sinuous areas may be appropriate. For example, in higher elevation areas where habitat is confined to valley bottoms, large blocky FMAs may not be reasonable or effective, and smaller, but still multiple pair areas, may be a practical option. These may be more sinuous in nature due to the habitat limitations.

Where smaller areas are developed due to topography, forest condition, access, funding limitations, or other reasons, we recommend these be closer together and multiple areas designed

with the intent of encouraging exchange of spotted owls between these smaller areas. Where possible, when setting up smaller areas, design them such that they could be expanded in the future if funding becomes available.

Coordinate FMA locations with the site management described above. Including recently occupied sites in FMAs provides a potential core population for development of spotted owl populations as barred owl populations are reduced.

Priorities: The following is our recommended priorities for defining and selecting FMAs within the North Washington East Cascades GMA. The following are in general priority order, however, local expertise will be important in applying these to specific FMA boundary designs.

1. Build FMAs around current sites with presence or occupancy of spotted owls. This provides a nucleus of spotted owls for the potential recolonization of sites within the FMA as barred owl numbers are reduced.

2. Focus on areas with reasonable access, in terms of road networks, which are available in most of the spotted owl habitat in the GMA. Closed roads may be used similar to a trail system if they can be safely walked. Trail systems can be used where roads do not exist, but roads are generally preferred to maximize operational efficiency.

3. Consider fire risk in mapping the boundaries of the FMAs. Risk alone should not eliminate an area from consideration, but should be considered in placing boundaries. Placement of multiple FMAs within the GMA, inclusion of large areas with a range of habitat types for spotted owls, and inclusion of areas with a range of fire risk would reduce the risk of complete or substantial loss of FMAs in a GMA. Avoid concentrating FMAs solely in areas identified as having the highest risk of catastrophic fire loss, however, some areas with high fire risk in FMAs may still be important, particularly where there is current or recent use of the area by spotted owls. Providing connectivity in FMAs from higher risk spotted owl habitat to areas identified as fire refugia, and areas with relatively lower risk in the fire prone landscape of the east Cascades will be important.

4. Place blocks allowing for the maximum number of spotted owls to be supported. Focus on areas with the potential for at least 20 spotted owl pairs, though 50 pair sized areas are the target where possible.

5. Select areas with the best spotted owl habitat in terms of total acreage or density of spotted owl habitat.

6. Include lands of interested or willing landowners or land managers. A focus on areas where landowners have expressed interest in barred owl management and have the ability to assist with operations will speed the implementation of actual barred owl management and encourage involvement.

7. Include areas with high-quality historic spotted owl sites (sites with no confirmed occupancy in the last five years or more). These are areas that have been shown by past use

to be attractive to spotted owls and therefore more likely to be reoccupied, especially as spotted owl populations increase.

8. Consider the potential for connection to other FMAs in the GMA, and to neighboring GMAs. Placement of FMAs within close proximity to other GMAs, and where there is forest that may provide connection to the Western Washington Cascades through low passes, can connect populations in these areas.

9. Consider the presence of areas already designated for spotted owl conservation, recovery and management, such as Late Successional Reserves under the Northwest Forest Plan, SOSEAs and areas identified as high priorities in the Northern Spotted Owl Recovery Plan and final Critical Habitat rule. Including these areas provides support for spotted owls and limits impacts on other resources. Because many of these have been managed for older forest over the last decades, this is the likely location of some of the best habitat conditions.

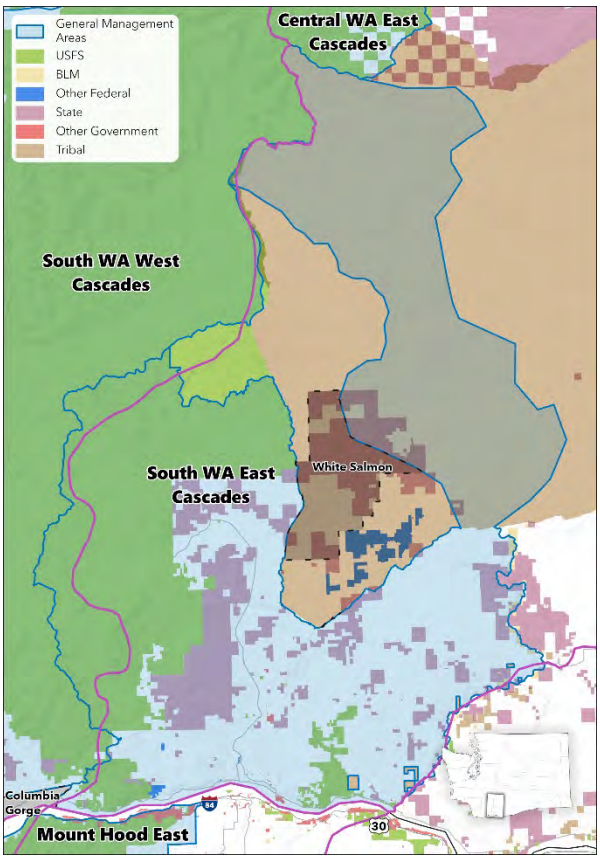
10. Select areas with a diversity of spotted owl habitat types. Given the range of forest conditions in this GMA that spotted owls use, selecting areas with different habitat types provides for a variety of conditions for future spotted owl population development and response to a changing landscape under an uncertain future under climate change. Inclusion of large areas with a range of connected habitat types would reduce the risk of complete or substantial loss of an FMA s from threats such as catastrophic very large fires. Historically, the Eastern Washington Cascades had some of the highest fecundity rates for spotted owls, even in warmer/drier areas with more fire risk while the relatively cool, moist areas of the may have more long-term resiliency or act as fire refugia. Managing a variety of connected types of spotted owl habitats in this province would potentially allow spotted owls to best withstand a dynamic future under climate change with increased risk of habitat loss from very large, high intensity fires and outbreaks of tree disease and insects that effect trees.

11. Consider climate change resilience in selecting areas. This is a lower priority factor, but other things being equal, include areas with identified as having greater resilience. This may include areas identified as fire refugia or areas with sufficient spotted owl habitat that have been treated for improved resilience to threats associated with climate change such as increases in habitat/forest loss from widespread insect or disease outbreak and/or catastrophic very large fires.

12. Consider including areas where more efficient use of funding (such as targeting more accessible areas) can be used to maximize treatment efficacy at scale, and more efficiently reduce the impact of barred owls on spotted owls.

A4.3.B.2.c South Washington East Cascades GMA - Priority C

The South Washington East Cascades GMA lies north of the Columbia River and east of the Cascade Crest, and includes the eastern most parts of the Gifford Pinchot Nation Forest (mostly on the Mount Adams Ranger district) as well as State lands, SOSEA lands and some private lands. It stretches north to the southern boundary of the Yakama Nation Reservation and includes parts of the Columbia River Gorge National Scenic Area on its southern edge. It includes 31 percent Yakama Nation lands, 21 percent Federal lands (National Forests), 10 percent State land and the remainder primarily in private ownership.



This GMA was mapped for the following reasons:

- It contains historic spotted owl activity centers, but has no recent survey information and recent presence is unknown, compared to the other two GMAs in the province to the north with recent surveys and presence, which contributed to it being ranked as Priority C.
- This GMA has a large amount of high-quality habitat and historic activity centers capable of supporting spotted owl populations according to Northwest Forest Plan modeling. Compared to the two GMAs further north in the Province, it has a lower density of habitat capable of supporting spotted owl populations according to Northwest Forest Plan monitoring, which contributed to it being ranked as priority C.
- This GMA has connectivity to areas with high densities of spotted owl habitat, and connectivity to GMAs to the West and South, and connectivity to habitat on the Yakama Nation Reservation to the north. It has less connectivity to large blocks of spotted owl habitat and areas with known recent presence than other GMAs in Eastern Washington Cascades, which contributed to its ranking as priority C.
- It contains a diversity of habitat types (relatively cool/moist to warmer/drier for Eastern Washington Cascades), which should improve long term resilience of the GMA to substantial loss from catastrophic wildfire, and provide connectivity for spotted owls in less resilient areas to areas identified as fire refugia. Management in a large area with diverse habitat types will allow for management in the range of habitat types that spotted owls are known to use in the Eastern Washington Cascades.
- An area on the east side of the GMA with relatively lesser amounts of habitat where past known dispersal occurred of juvenile spotted owls from the Yakama Nation Reservation was included. This area is mostly private timberland, but there were areas of high-quality habitat and historic productive spotted owl activity centers in this area.

- Much of the GMA is accessible, allowing for implementation.

Description of the elements considered in mapping: In mapping the boundaries of the South Washington East Cascades GMA we used information on the following elements.

Spotted Owl Data:

- Historic spotted owl activity centers, and known areas of juvenile dispersal, concentrated presence, and settlement.
- Areas with relatively large amount of high-quality habitat and historic activity centers from which to select focused management areas large enough to support spotted owl populations. This includes Northwest Forest Plan modeling efforts that show a high likelihood of habitat capable of supporting viable populations of spotted owls in this GMA. This GMA contains areas that have an estimated habitat carrying capacity to support clusters of 20 or more pairs.

Conditions:

- Availability of access via roads and trails in most of this area. The diversity of habitat types (relatively cool/moist to warmer/drier for Eastern Washington Cascades), allowing for management of multiple types of spotted owl habitat.
- The location of neighboring GMAs, and the ability of this GMA to provide connectivity to habitat on the Yakama Nation Reservation, and GMAs in the Western Washington Cascades, and south to GMAs in the northern Oregon Cascades.
- The presence of SOSEAs with habitat and activity centers. Including these areas allows for incentives for management.

Other Considerations:

- Areas to the east were excluded due to the presence of less habitat in these areas, no recent spotted owl occupancy, and very little to no historical occupancy, and more marginal habitat in these driest areas.
- We did not try to exclude high elevation or large lava flow areas without habitat, or areas where habitat has been lost to wildfire. This can be considered during development of the Focal Management Area boundaries.

Focal Management Areas (FMAs)

In South Washington East Cascades GMA, we recommend developing FMAs large enough to potentially support 50 spotted owl pair sites where possible. Generally, larger blocky areas provide a smaller edge-to-area ratio, and this may help reduce the influx of barred owls from outside the FMA in the future. However, where the landscape or forest conditions do not allow this, smaller or more sinuous areas may be appropriate. For example, in higher elevation areas where habitat is confined to valley bottoms, large blocky FMAs may not be reasonable or effective, and smaller, but still multiple pair areas, may be a practical option. These may be more sinuous in nature due to the habitat limitations.

Where smaller areas are developed due to topography, forest condition, access, funding limitations, or other reasons, we recommend these be closer together and multiple areas designed with the intent of encouraging exchange of spotted owls between these smaller areas. Where possible, when setting up smaller areas, design them such that they could be expanded in the future if funding becomes available.

Coordinate FMA locations with the site management described above. Including recently occupied sites in FMAs provides a potential core population for development of spotted owl populations as barred owl populations are reduced.

Priorities: The following is our recommended priorities for defining and selecting FMAs within the South Washington East Cascades GMA. The following are in general priority order, however, local expertise will be important in applying these to specific FMA boundary designs.

1. Build FMAs around current sites with presence or occupancy of spotted owls. This provides a nucleus of spotted owls for the potential recolonization of sites within the FMA as barred owl numbers are reduced.

2. Focus on areas with reasonable access, in terms of road networks, which are available in most of the spotted owl habitat in these GMAs. Closed roads may be used similar to a trail system if they can be safely walked. Trail systems can be used where roads do not exist, but roads are generally preferred to maximize operational efficiency.

3. Consider fire risk in mapping the boundaries of the FMAs. Risk alone should not eliminate an area from consideration, but should be considered in placing boundaries. Placement of multiple FMAs within the GMA, inclusion of large areas with a range of habitat types for spotted owls, and inclusion of areas with a range of fire risk would reduce the risk of complete or substantial loss of FMAs in a GMA. Avoid concentrating FMAs solely in areas identified as having the highest risk of catastrophic fire loss, however, some areas with high fire risk in FMAs may still be important, particularly where there is current or recent use of the area by spotted owls. Providing connectivity in FMAs from higher risk spotted owl habitat to areas identified as fire refugia, and areas with relatively lower risk in the fire prone landscape of the east Cascades will be important.

4. Place blocks allowing for the maximum number of spotted owls to be supported. Focus on areas with the potential for at least 20 spotted owl pairs, though 50 pair sized areas are the target where possible.

5. Select areas with the best spotted owl habitat in terms of total acreage or density of spotted owl habitat.

6. Include lands of interested or willing landowners or land managers. A focus on areas where landowners have expressed interest in barred owl management and have the ability to assist with operations will speed the implementation of actual barred owl management and encourage involvement.

7. Include areas with high-quality historic spotted owl sites (sites with no confirmed occupancy in the last five years or more). These are areas that have been shown by past use to be attractive to spotted owls and therefore more likely to be reoccupied, especially as spotted owl populations increase.

8. Consider the potential for connection to other FMAs in the GMA, and to neighboring GMAs. Placement of FMAs within close proximity to other GMAs, and where there is forest that may provide connection to the Western Washington Cascades through low passes, can connect populations in these areas.

9. Consider the presence of areas already designated for spotted owl conservation, recovery and management, such as Late Successional Reserves under the Northwest Forest Plan, SOSEAs and areas identified as high priorities in the Northern Spotted Owl Recovery Plan and final Critical Habitat rule. Including these areas provides support for spotted owls and limits impacts on other resources. Because many of these have been managed for older forest over the last decades, this is the likely location of some of the best habitat conditions.

10. Select areas with a diversity of spotted owl habitat types. Given the range of forest conditions in this GMA that spotted owls use, selecting areas with different habitat types provides for a variety of conditions for future spotted owl population development and response to a changing landscape under an uncertain future under climate change. Inclusion of large areas with a range of connected habitat types would reduce the risk of complete or substantial loss of an FMA s from threats such as catastrophic very large fires. Historically, the Eastern Washington Cascades had some of the highest fecundity rates for spotted owls, even in warmer/drier areas with more fire risk while the relatively cool, moist areas of the may have more long-term resiliency or act as fire refugia. Managing a variety of connected types of spotted owl habitats in this province would potentially allow spotted owls to best withstand a dynamic future under climate change with increased risk of habitat loss from very large, high intensity fires and outbreaks of tree disease and insects that effect trees.

11. Consider climate change resilience in selecting areas. This is a lower priority factor, but other things being equal, include areas with identified as having greater resilience. This may include areas identified as fire refugia or areas with sufficient spotted owl habitat that have been treated for improved resilience to threats associated with climate change such as increases in habitat/forest loss from widespread insect or disease outbreak and/or catastrophic very large fires.

12. Consider including areas where more efficient use of funding (such as targeting more accessible areas) can be used to maximize treatment efficacy at scale, and more efficiently reduce the impact of barred owls on spotted owls.

A4.3.B.3 Special Designated Areas:

A4.3.B.3.a Spotted Owl Special Emphasis Areas – Priority E

The State of Washington identified 10 key landscapes, referred to as Spotted Owl Special Emphasis Areas (SOSEAs), where northern spotted owl conservation in the form of demographic and/or dispersal support was important on non-federal lands. Where SOSEAs lie within GMAs, barred owl management as described for those designations would apply. Where SOSEA lands fell outside of these designations, we mapped the areas as SOSEA special designation areas.

There is one SOSEA Special Designated Area in the Eastern Washington Cascades Province.

SOSEA	Forest Acres on Federal lands	Forest Acres on State Lands	Forest Acres on Private Lands	Maximum Forest Acres Under Management
White Salmon SOSEA	0	28,005	16,903	8,522

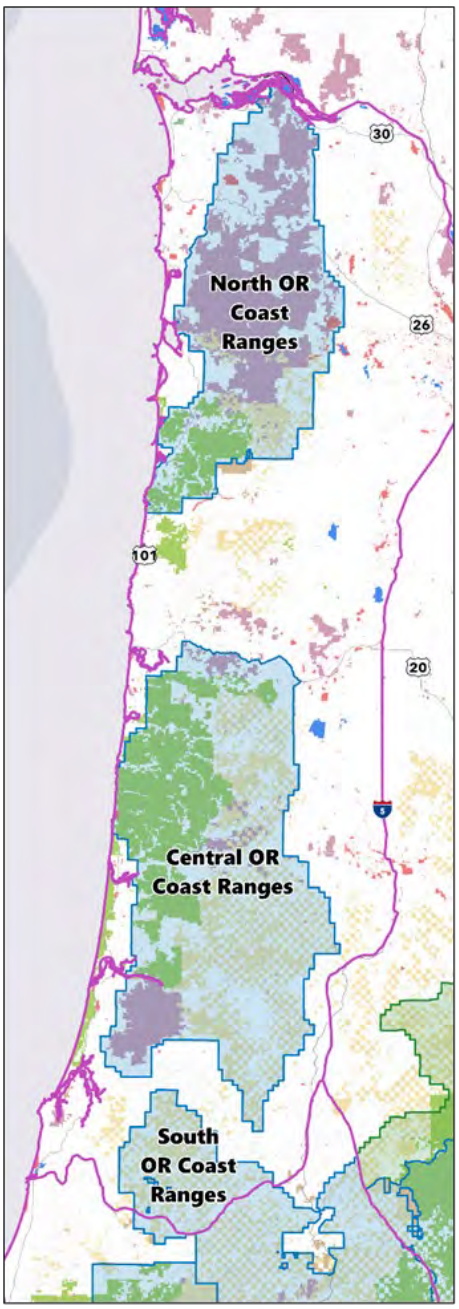
In the original designation by Washington, each SOSEA was described in terms of one or more conservation functions -- demographic support, dispersal support, and combination support. Demographic support meant that adequate amounts and arrangements of suitable habitat are maintained to support reproductive spotted owl pairs. Dispersal support is provided by a landscape that includes dispersal habitat at the stand level interspersed with areas of higher quality habitat. Combination support was defined as either maintaining suitable spotted owl habitat to protect the viability of the owls at a spotted owl site center or providing a variety of habitat conditions which in total are more than dispersal support and less than demographic support.

For the Strategy, barred owl management in the form of removal could be occur at any scale in a SOSEA. We recommend spotted owl site-based management as described in Section 8.4.1.2. of the Strategy and Section 4.3.B.1 above. Removal of barred owls around spotted owl sites can be applied anywhere within the province and is an appropriate small scale management effort in SOSEAs. Removing barred owls within and around occupied spotted owl sites retains the existing population, increases the potential for recruitment of young, and provides source populations for recolonization of areas where barred owl management occurs. Spotted owl site management can provide connectivity between larger block areas. Where feasible, clustering spotted owl site management into small blocks increases the functionality of this management.

A4.4. Oregon Coast Ranges Province, Plus West Edge of Willamette Valley

A4.4.A Background:

A4.4.A.1.Spotted Owl Condition in the Oregon Coast Ranges Province:



The Oregon Coast Ranges Province is one of five physiographic provinces in Oregon. Management areas designated in this province also include small areas of forested lands within the portions of the Willamette Valley Province and the Oregon Klamath Province that are immediately adjacent to the Oregon Coast Ranges Province. The province includes 25 percent of the area in Federal lands, 12 percent comprised of State lands, and the remainder generally private land. Federal lands in the province (not including those neighboring areas) include approximately 557,562 acres of spotted owl NRF (suitable) habitat. State lands are important in this province and include approximately 112,126 acres of spotted owl NRF (suitable) habitat.

The Oregon Coast Ranges are characterized by cool, dry summers and mild, wet winters. During the last 200 years, much of the area was either burned in large, severe fires, or been heavily logged, or both. Therefore, many areas of this province lack significant quantities of well-connected, high-quality spotted owl habitat, and some of the spotted owls in this province rely primarily on lower quality habitat.

Two spotted owl demography study areas occur within the Oregon Coast Ranges province, the Oregon Coast Ranges Demography Study Area and the Tyee Demography Study Area, provides data on spotted owl populations since 1990. Monitoring efforts indicate that spotted owl occupancy at historical territories has declined substantially.

Spotted owl occupancy on sites within the Coast Ranges study area dropped from 72 percent in 1993 to 15 percent in 2018. Since then, spotted owls have been monitored via ARU at this study area, and the proportion of stations where spotted owls were detected declined from 7 percent in 2018 to 4 percent in 2020, though we note that these data are not directly comparable to those for 2018 because they were obtained using different survey methods.

Spotted owl occupancy at historical territories in the Tyee study area has declined substantially. Spotted owl occupancy on sites within the Tyee study area has from dropped 46 percent in 1993 to 17 percent in 2018, in spite of earlier increases between 1993 and the early 2000s. Comprehensive surveys in 2020 confirmed 14 unpaired adults or subadults and 5 pairs on the Tyee Demography Study Area, with occupancy at approximately 14 percent of the historical sites surveyed.

In both of these study areas, previously territorial spotted owls now frequently move away from their territories, often repeating this dispersal behavior annually. These kinds of movements have increased in frequency across the northern spotted owl range, but are markedly more common in the Oregon Coast Ranges province, possibly due to the high densities of barred owls present in this province (see below).

A4.4.A.2. Barred Owl condition in the GMA:

Barred owls are present at very high densities in the Oregon Coast Ranges. In 2019, on areas of the Oregon Coast Ranges Demography Study Area where barred owls were not being removed, barred owls were estimated to occupy 90 percent of potential barred owl home ranges. Between 2018 and 2020, barred owls were detected at 93 to 94 percent of ARU survey stations each year, and in 2018, barred owls were present in 94 percent of spotted owl home ranges in the Oregon Coast Ranges Demography Study Area, outside of barred owl removal areas. Barred owl occupancy in the Tyee Demography Study Area may be slightly lower, but is still very high: in 2018, barred owls were present in 82 percent of spotted owl home ranges.

A4.4.B Management Strategy

A4.4.B.1 Spotted owl site management in the Oregon Coast Ranges Plus Province

A4.4.B.1.a Background:

Given the limited number of northern spotted owls in this province, and the high pressure from barred owls, it is crucial to protect the remaining spotted owls through barred owl management at spotted owl sites.

- Managing recently occupied spotted owl sites will help to reduce the rate of spotted owl population decline as quickly as possible and prevent extinction/extirpation of the spotted owl in the province.
- Where spotted owl site management occurs within a GMA, these spotted owl sites may serve as key points for the development of focal management areas, now and in the future. Site management may be expanded into block management over time.
- These spotted owl sites may serve to increase potential connectivity between and within block management areas. If so, this connectivity may prevent genetic bottlenecks or reductions in genetic diversity.
- Where sites are recently, but not currently, occupied, management will provide areas for recolonization and population growth.
- Protected spotted owl sites, if occupied, or reoccupied, by spotted owls, and reproducing, may provide a source of young for colonization of management blocks. Where managed

sites occur near GMAs, reproductively-active spotted owl sites can interact demographically with block management areas.
- These managed sites may provide a source of spotted owl individuals for direct augmentation of block management areas in the future should such management action be necessary.

Selection of spotted owl sites for management

Currently occupied spotted owl sites are very limited in this province. The primary focus of spotted owl site management in this province is on sites that have been occupied by, or had detections of, spotted owls in the last five years. These areas are more likely to be recolonized by spotted owls after barred owl removal. This is reflected in the priorities for site management.

Spotted Owl Site Management Priorities

Priority	Spotted Owl Site Condition
A	Sites that have been occupied by resident spotted owls (pair or single) in the last five years, or where there have been detections of spotted owls (not reaching resident status) in the past five years
C	Sites that were occupied by resident spotted owls more than five years ago, with or without recent surveys, but without detections in the last five years, as well as areas with sufficient high-quality habitat to support a spotted owl site, and no recent surveys.
D	Areas with sufficient high-quality habitat to support a spotted owl site, with recent surveys but no recent detections.

Other considerations for selection of spotted owl sites for management:

If site management cannot be initiated on all sites, we recommend the following be considered in selecting the specific spotted owl sites for management.

- Select sites with the most recent occupancy.
- Where relevant information is available, select sites with the best recent demographic performance (i.e., select the sites where the largest numbers of young have fledged).
- Preferentially select sites with good accessibility, to maximize the efficiency of implementation.
- Consider the condition of habitat in the area. All other things being equal, select sites with abundant high-quality habitat. Sites that have lost substantial amounts of habitat to harvest or other disturbances may be lower priority.
- Choose sites within GMAs, near GMAs, or creating stepping-stone connectivity between GMAs.
- Consider the history of spotted owl use at the site. Where historical survey information is available, focus first on sites with a long history of pair occupancy, including reproduction.

A4.4.B.1.b Management Recommendations:

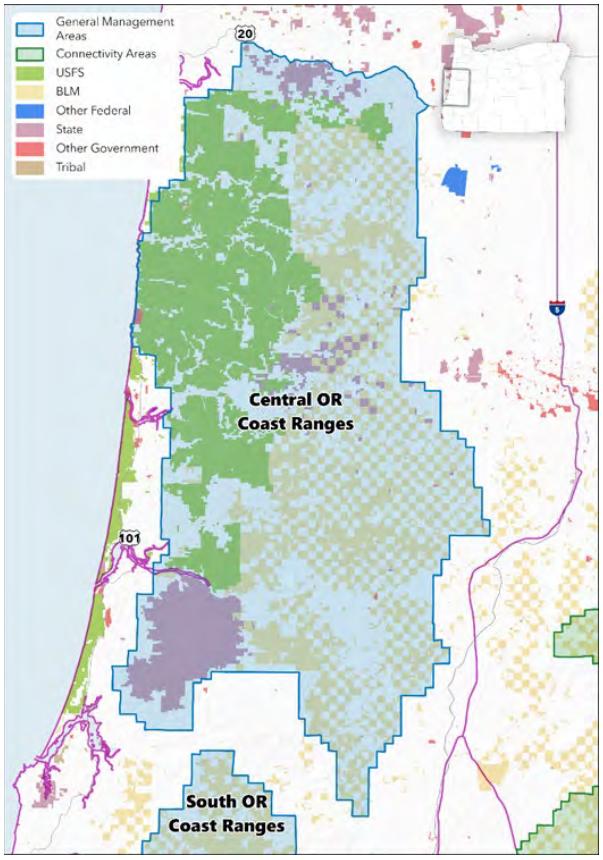
Within each individual site, remove barred owls from an area between 10,179 and 18,096 acres. This represents the area in a circle of 1.5 and 2 home range radii (Table 1). This can be distributed in a circle around the core area, or implementers can use local knowledge, topography, and habitat condition to design an area of the appropriate size that provides the best conditions for barred owl management.

In areas where spotted owl sites are isolated, and particularly for sites in Priority A condition (see table above), we recommend a larger management area, up to 40,715 acres (3 home range radii).

A4.4.B.2 General Management Areas in the Oregon Coast Ranges Province

A4.4.B.2.a Central Oregon Coast Ranges GMA - Priority A

The Central Oregon Coast Ranges GMA lies in the south-central portion of the Oregon Coast Ranges Province and spans the province from west to east, including some adjacent areas within the forested foothills of the Willamette Valley Province. It includes the Elliott State Research Forest, the largest contiguous portion of the Siuslaw National Forest, and adjacent and interspersed Bureau of Land Management, State, and private lands. Overall, the GMA is 50 percent Federal lands (National Forests and BLM), 8 percent State land and the remainder primarily in private ownership.



This GMA was mapped for the following reasons:

- It includes the highest habitat density within the Oregon Coast Ranges Province.
- The GMA includes the Oregon Coast Ranges and Tyee Demography Study Areas, with their historical and recent spotted owl data. These areas are already slated for higher level monitoring (a 20 percent sample of the area to be surveyed by autonomous recording units), providing additional future data on both spotted and barred owls. This allows for efficiencies in monitoring barred owl removal and its effects on spotted owls. These portions of the GMA are well known and accessible, allowing for quicker implementation.

Description of the elements considered in mapping: In mapping the boundaries of the Central Oregon Coast Ranges GMA we used information on the following elements.

Spotted Owl Data:

- We included areas with a relatively large amount of high-quality habitat. This portion of the Oregon Coast Ranges Province contains most of the concentrations of high-quality habitat.
- We referred to information regarding the location of activity centers, where survey information was available, and sites were located near a potential boundary. In some cases, this led to small portions of the Willamette Valley Province being included.
- We did not include the South Willamette-North Umpqua Area of Concern identified in the Northwest Forest Plan standards and guidelines, which includes lands managed by the Eugene District of the Bureau of Land Management, even though this area likely presents the best possible opportunity for direct connectivity between the Oregon West Cascades and Oregon Coast Ranges Provinces. We excluded it because public lands make up a minority of the lands in this area, and little suitable spotted owl habitat remains on private lands. If, in the future, there are opportunities to develop spotted owl habitat on private lands in this area, this decision should be reconsidered.

Conditions:

- Availability of access via roads and trails in most of this area.

Other Considerations:

- This GMA includes some areas with current and planned higher intensity monitoring of spotted owls (20% ARU monitoring of the Coast Ranges and Tyee study areas) and inclusion of a former experimental removal area provides opportunity for long term monitoring and research of success of barred owl management strategy.
- The GMA includes State lands where two separate Habitat Conservation Plans (HCPs) are in development, and barred owl management could potentially be used to mitigate unavoidable impacts of land management activities.

Focal Management Areas (FMAs)

In this GMA, we recommend developing FMAs large enough to potentially support 50 spotted owl pair sites.

Generally, larger blocky areas provide a smaller edge-to-area ratio, and this may help reduce the influx of barred owls from outside the FMA in the future. Because of the history of barred owl research and experimental management in parts of this area, additional information may be available regarding areas with higher and lower barred owl influxes, and implementers should refer to this information in FMA development.

Where smaller areas are developed due to topography, forest condition, access, funding limitations, or other reasons, we recommend these be closer together and multiple areas designed with the intent of encouraging exchange of spotted owls between these smaller areas. Where possible, when setting up smaller areas, design them such that they could be expanded in the future if funding becomes available.

Coordinate FMA locations with the site management described above. Including recently occupied sites in FMAs provides a potential core population for development of spotted owl populations once barred owl populations are reduced.

Priorities: The following are our recommended priorities for defining and selecting FMAs within the Central Oregon Coast Ranges GMA. The following are in general priority order, however, local expertise will be important in applying these to specific FMA boundary designs.

1. Build FMAs around current occupied spotted owl sites (sites with detections in the last five years). This provides a nucleus of spotted owls for the potential recolonization of sites within the FMA as barred owl numbers are reduced.

2. Select areas with the best spotted owl habitat in terms of acreage or density.

3. Include lands of interested or willing landowners or land managers. A focus on areas where landowners have expressed interest in barred owl management will speed the implementation of actual barred owl management and encourage involvement.

4. Place blocks to include spotted owl populations, or clusters of sites, with good current demographic parameters (e.g., higher survival, occupancy, reproductive output, etc.) relative to others in the GMA.

5. Include known sites with indicators of high site quality, as determined during evaluations of current and historical sites. These indicators may include, for example, especially good habitat amount, quality, and configuration; a history of good past demographic performance; or a history of long-term occupancy.

6. Place FMAs in areas with good connectivity within the local environment, including habitat connectivity within an FMA, between neighboring FMAs, and/or between an FMA and nearby managed spotted owl sites. Consider placing an FMA to facilitate connectivity with the South Oregon Coast Ranges GMA. Opportunities for connectivity to the North Oregon Coast Ranges GMA are tenuous, so trying to achieve connectivity with that GMA is not a high priority.

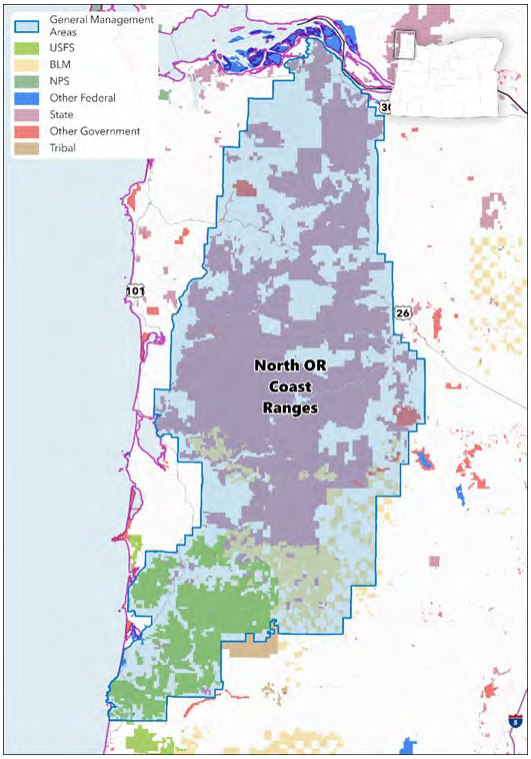
7. Place FMAs to minimize the cost of management. For example, select areas where existing monitoring will meet some of the monitoring needs associated with barred owl management.

8. Place FMAs to maximize the potential carrying capacity for spotted owls. The amount and configuration of habitat can be used to estimate the potential spotted owl population size without barred owls.

9. Select areas with good networks of accessible, drivable roads.

10. Choose areas where funding is available for management.

A4.4.B.2.b North Oregon Coast Ranges GMA - Priority B



The North Oregon Coast Ranges GMA lies in the northern portion of the Oregon Coast Ranges Province and spans the province from west to east. It includes most of the Clatsop and Tillamook State Forests, adjacent BLM lands, and the northernmost portion of the Siuslaw National Forest. Saddle Mountain State Natural Area and the municipal watershed for the city of Astoria are also within the GMA. This GMA also contains substantial amounts of adjacent and interspersed private lands, where the density and quality of suitable spotted owl habitat is low, but which may provide habitat for barred owls. Overall, the GMA is 17 percent Federal lands (National Forests and BLM), 44 percent State land and the remainder primarily in private ownership.

This GMA was mapped for the following reasons:

- In spite of high densities of barred owls and relatively low-quality spotted owl habitat, spotted owls persist on this landscape.
- Where habitat is conserved, for example, in reserved or constrained land allocations, habitat quantity and quality are likely to increase over time as the landscape recovers from historical fire and harvest.
- Oregon Department of Forestry has expressed interest in barred owl management on their lands and has drafted an HCP that includes barred owl management as a conservation measure.
- A relatively detailed survey history is available for most of the area within the GMA.
- Should the HCP be finalized and implemented on the Oregon Department of Forestry lands, monitoring will occur as part of HCP implementation, creating efficiencies for the monitoring required for barred owl management. The GMA also includes the northernmost area of the Oregon Coast Ranges Demography Study Area, which is slated for the higher-level monitoring under the Northwest Forest Plan (a 20 percent sample of the area to be surveyed by autonomous recording units), providing additional future data on both spotted and barred owls.
- This GMA includes the northernmost population of spotted owls within Oregon.
- Federal lands in the southern portion of the GMA contain some concentrations of higher quality habitat.

Description of the elements considered in mapping: In mapping the boundaries of the North Oregon Coast Ranges GMA we used information on the following elements.

Spotted Owl Data:

- We referred to information regarding the location of activity centers, where survey information was available, and sites were located near a potential boundary.
- We included areas at the southern end of the GMA with somewhat larger amounts of high-quality habitat than are available elsewhere in the northern portion of the Oregon Coast Ranges.

Conditions:

- This area has a relatively high road density.

Other Considerations:

- This GMA includes all of the larger Habitat Conservation Areas proposed for the northern portion of the province within the Oregon Department of Forestry's draft HCP.
- This area includes a relatively large amount of private land with relatively low density of spotted owl habitat. These areas were included in order to reduce the edge-to-area ratio of the GMA, making it possible to create FMAs with low edge-to-area (see below). These areas also buffer the areas of spotted owl habitat, providing for the possibility of removing barred owls that would otherwise move into areas of spotted owl habitat where barred owls have been removed.

Focal Management Areas (FMAs)

In this GMA, we recommend developing FMAs large enough to potentially support 50 spotted owl pair sites.

Generally, larger blocky areas provide a smaller edge-to-area ratio, and this may help reduce the influx of barred owls from outside the FMA in the future. However, where the landscape or forest conditions do not allow this, smaller or more sinuous areas may be appropriate.

Where smaller areas are developed due to topography, forest condition, access, funding limitations, or other reasons, we recommend these be closer together and multiple areas designed with the intent of encouraging exchange of spotted owls between these smaller areas. Where possible, when setting up smaller areas, design them such that they could be expanded in the future if funding becomes available.

Coordinate FMA locations with the site management described above. Including recently occupied sites in FMAs provides a potential core population for development of spotted owl populations once barred owl populations are reduced.

Priorities: The following are our recommended priorities for defining and selecting FMAs within the North Oregon Coast Ranges GMA. The following are in general priority order, however, local expertise will be important in applying these to specific FMA boundary designs.

1. Build FMAs around current occupied spotted owl sites (sites with detections in the last five years). This provides a nucleus of spotted owls for the potential recolonization of sites within the FMA as barred owl numbers are reduced.

2. Select areas with the best spotted owl habitat in terms of acreage or density.

3. Include lands of interested or willing landowners or land managers. A focus on areas where landowners have expressed interest in barred owl management will speed the implementation of actual barred owl management and encourage involvement.

4. Place blocks to include spotted owl populations, or clusters of sites, with good current demographic parameters (e.g., higher survival, occupancy, reproductive output, etc.) relative to others in the GMA.

5. Include known sites with indicators of high site quality, as determined during evaluations of current and historical sites. These indicators may include, for example, especially good habitat amount, quality, and configuration; a history of good past demographic performance; or a history of long-term occupancy.

6. Place FMAs in areas with good connectivity within the local environment, including habitat connectivity within an FMA, between neighboring FMAs, and/or between an FMA and nearby managed spotted owl sites.

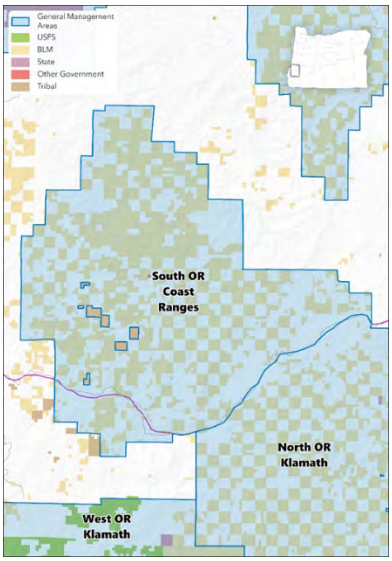
7. Place FMAs to minimize the cost of management. For example, select areas where existing monitoring will meet some of the monitoring needs associated with barred owl management.

8. Place FMAs to maximize the potential carrying capacity for spotted owls. The amount and configuration of habitat can be used to estimate the potential spotted owl population size without barred owls.

9. Choose areas where funding is available for management.

10. When selecting FMAs, consider the contribution of the potential FMA toward maintaining the historical range of the spotted owl within this province. In other words, select FMAs to maintain spotted owl presence from north to south within the GMA.

A4.4.B.2.c South Oregon Coast Ranges GMA - Priority C



The South Oregon Coast Ranges GMA lies in the southernmost portion of the Oregon Coast Ranges Province and includes small areas of the Oregon Klamath Province to the south. It consists of BLM checkerboard lands with private lands interspersed. Overall, the GMA is 45 percent Federal lands (BLM), 8 percent State land and the remainder primarily in private ownership.

This GMA was mapped for the following reasons:

- It includes the southernmost area of spotted owl habitat and public land in the province.
- It allows for connectivity to the North Oregon Klamath GMA immediately to the southeast, which in turn allows for connectivity to other Oregon Klamath GMAs and to management areas in the Oregon West Cascades Province.
- If healthy spotted owl populations can be supported here, they could provide for natural recolonization to neighboring areas in multiple provinces.

Description of the elements considered in mapping: In mapping the boundaries of the South Oregon Coast Ranges GMA we used information on the following elements.

Spotted Owl Data:

- We referred to information regarding the location of activity centers, where survey information was available, and sites were located near a potential boundary.
- We included an area of relatively high habitat density in the neighboring portion of the Oregon Klamath Province, because this area lacks connectivity with other habitat within the Oregon Klamath Province but is contiguous with habitat already included in the GMA.

Conditions:

- This area has a relatively high road density.

Other Considerations:

- This GMA includes areas of private land with relatively low density of spotted owl habitat. These areas were included in order to reduce the edge-to-area ratio of the GMA, making it possible to create FMAs with low edge-to-area (see below). These areas also buffer the areas of spotted owl habitat, providing for the possibility of removing barred owls that would otherwise move into areas of spotted owl habitat where barred owls have been removed.

Focal Management Areas (FMAs)

In this GMA, we recommend developing at least one FMA large enough to potentially support 50 spotted owl pair sites. Development of multiple FMAs large enough to support 50 spotted owl pair sites would require designation of at least one FMA that is shared between this GMA and the North Oregon Klamath GMA. The same purpose could be accomplished by developing two smaller, adjacent FMAs, one in each GMA, that would support 50 spotted owl pair sites between them.

Generally, larger blocky areas provide a smaller edge-to-area ratio, and this may help reduce the influx of barred owls from outside the FMA in the future. However, where the landscape or forest conditions do not allow this, smaller or more sinuous areas may be appropriate.

Where smaller areas are developed due to topography, forest condition, access, funding limitations, or other reasons, we recommend these be closer together and multiple areas designed with the intent of encouraging exchange of spotted owls between these smaller areas. Where possible, when setting up smaller areas, design them such that they could be expanded in the future if funding becomes available.

Coordinate FMA locations with the site management described above. Including recently occupied sites in FMAs provides a potential core population for development of spotted owl populations once barred owl populations are reduced.

Priorities: The following are our recommended priorities for defining and selecting FMAs within the North Oregon Coast Ranges GMA. The following are in general priority order, however, local expertise will be important in applying these to specific FMA boundary designs.

1. Build FMAs around current occupied spotted owl sites (sites with detections in the last five years). This provides a nucleus of spotted owls for the potential recolonization of sites within the FMA as barred owl numbers are reduced.

2. Select areas with the best spotted owl habitat in terms of acreage or density.

3. Include lands of interested or willing landowners or land managers. A focus on areas where landowners have expressed interest in barred owl management will speed the implementation of actual barred owl management and encourage involvement.

4. Place blocks to include spotted owl populations, or clusters of sites, with good current demographic parameters (e.g., higher survival, occupancy, reproductive output, etc.) relative to others in the GMA.

5. Include known sites with indicators of high site quality, as determined during evaluations of current and historical sites. These indicators may include, for example, especially good habitat amount, quality, and configuration; a history of good past demographic performance; or a history of long-term occupancy.

6. Place FMAs to support connectivity with the North Oregon Klamath GMA.

7. Place FMAs in areas with good connectivity within the local environment, including habitat connectivity within an FMA, between neighboring FMAs, and/or between an FMA and nearby managed spotted owl sites.

8. Place FMAs to minimize the cost of management. For example, select areas where existing monitoring will meet some of the monitoring needs associated with barred owl management.

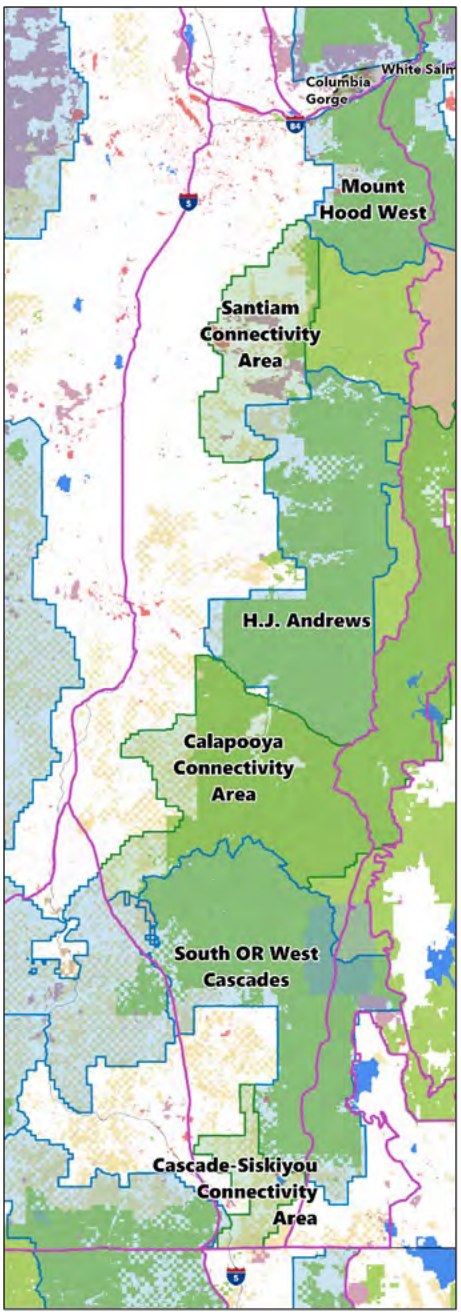
9. Place FMAs to maximize the potential carrying capacity for spotted owls. The amount and configuration of habitat can be used to estimate the potential spotted owl population size without barred owls.

10. Choose areas where funding is available for management.

A4.5. Western Oregon Cascades Province, Plus East Edge of Willamette Valley

A4.5.A Background:

A4.5.A.1 Spotted Owl Condition in the Western Oregon Cascades Province:



The Western Oregon Cascades Province is one of five physiographic provinces in Oregon. It includes 68 percent Federal lands (National Forests and BLM), 1 percent State land and the remainder primarily in private ownership. Federal lands in the province include approximately 2,046,965 acres of spotted owl NRF (suitable) habitat.

The Western Oregon Cascades are characterized by dry summers and wet winters, with mild temperatures and precipitation falling as rain at lower elevations, and colder temperature with precipitation falling as snow at higher elevations.

Spotted owl habitat is abundant in this province, with large concentrations of habitat available throughout most of the middle elevation areas of the province. In some areas, spotted owl habitat is present up to the Cascade Crest, but in other areas, high elevation conditions preclude the development of spotted owl habitat. At the lowest elevations, spotted owl habitat is sparser due to heavier human use of the landscape, including human population centers and timberlands that have been heavily harvested. The distribution of spotted owl habitat has also been affected by wildfires, and in particular, north-south connectivity was affected by large, severe fires in 2020 that burned along the Santiam River and up through the Santiam Pass.

The Western Oregon Cascades Province includes the H.J. Andrews Demography Study Area, as well as the majority of the South Cascades Demography Study Area, so we use these study areas to represent the status of spotted owls in the province. In the central portion of the province, the H.J. Andrews study area provides data on spotted owl populations since 1987. Monitoring efforts indicate that spotted owl occupancy at historical territories has declined substantially. Spotted owl occupancy on sites within the H.J. Andrews study area dropped from 91 percent in 1993 to 27 percent in 2018. Surveys of the study area in 2022 detected spotted owls at 16 percent of the surveyed historical sites, including pairs at 8 percent of surveyed sites. The

2022 results are concerning, because they may indicate a precipitous decline over a period of a few years, but the 2022 results represent raw data, whereas the 2018 results are corrected for imperfect detection, and therefore are not directly comparable. At the south end of the province, the South Cascades study area provides data on spotted owl populations since 1991. Monitoring efforts indicate that spotted owl occupancy at historical territories has declined substantially. Spotted owl occupancy on sites within the South Cascades study area dropped from 70 percent in 1993 to 23 percent in 2018. Comprehensive surveys in 2022 detected spotted owls at 17 percent of historical sites, including pairs at 11 percent of historical sites. The same caveat given above for the 2022 data from the H.J. Andrews study area applies to the 2022 data here as well.

A4.5.A.2 Barred Owl condition in the Western Oregon Cascades Province:

We expect that barred owl densities likely vary throughout this province, with higher densities in the north, and lower densities in the south, due to the longer time since the initial invasion in the north. This assumption is consistent with information from the study areas. At the H.J. Andrews study area in 2018, barred owls were present in 67 percent of spotted owl home ranges. In the South Cascades Demography Study Area in 2018, barred owls were present in 43 percent of spotted owl home ranges, the second lowest proportion found at any study area throughout the northern spotted owl range.

A4.5.B Management Strategy

A4.5.B.1 Spotted owl site management in the Oregon East Cascades Province

A4.5.B.1.a Background:

Although the number of spotted owls remaining in this province is larger than in some other provinces, spotted owl populations continue to decline, and therefore it is crucial to protect the remaining spotted owl sites, especially in the northern portions of the province where the barred owl influence is likely to be strongest and local extirpations may be more imminent.

- Where spotted owl site management occurs within a GMA, these spotted owl sites may serve as key points for the development of focal management areas, now and in the future. Site management may be expanded into block management over time.
- Managing recently occupied spotted owl sites will help to reduce the rate of spotted owl population decline as quickly as possible and prevent extinction/extirpation of the spotted owl in the province. At present, the prevention of local extirpation is especially important in the northern portions of the province, but reducing the rate of population decline is important throughout.
- Protected spotted owl sites, if occupied, or reoccupied, by spotted owls, and reproducing, may provide a source of young for colonization of management blocks and other managed areas within the province. Where managed sites occur near GMAs, reproductively-active spotted owl sites can interact demographically with block management areas.
- These sites may serve to increase potential connectivity between and within block management areas. If so, this connectivity may prevent genetic bottlenecks or reductions in genetic diversity.

- Spotted owl site management, due to its smaller size when compared to block management, provides a wider range of options for landowner contribution to barred owl managements, particularly smaller landowners.
- These sites may provide a source of individuals for direct augmentation of populations in block management areas, either within this province or in other provinces, or for a captive breeding population, if decisions are made to pursue either of these translocation strategies in the future.
- Maintaining spotted owl sites distributed across the province, whether within block management areas or not, will reduce the risk of loss of spotted owls in the province from catastrophic events, such as wildfire, by spreading sites across the area. Managing spotted owl sites also provides the opportunity for maintaining spotted owls in areas where block management is not feasible or recommended. This approach applies across the entire province, whether or not the locations are within a GMA or other mapped designation.
- Spotted owl site management, due to its smaller size when compared to block management, provides a wider range of options for landowner contribution to barred owl managements, particularly smaller landowners.

Selection of spotted owl sites for management

Occupied spotted owl sites are somewhat limited in this province. The primary focus of spotted owl site management in this province is on sites that have been occupied by, or had detections of, spotted owls in the last five years. These areas are more likely to be recolonized by spotted owls after barred owl removal. This is reflected in the priorities for site management.

Spotted Owl Site Management Priorities

Priority	Spotted Owl Site Condition
A	Sites that have been occupied by resident spotted owls (pair or single) in the past five years, or where there have been detections of spotted owls (not reaching resident status) in the past five years, especially in the northern portion of the province where spotted owl populations are thought to be smaller and closer to extirpation.
B	Sites that have been occupied by resident spotted owls (pair or single), or where there have been detections of spotted owls (not reaching resident status), in the past five years, in portions of the province where evidence indicates that spotted owl populations are more abundant and declining more slowly.
C	Sites that were occupied by resident spotted owls between five and ten years ago, with or without recent surveys, but without detections in the last five years.
D	Historical spotted owl sites last known to be occupied more than ten years ago, and areas with sufficient high-quality habitat to support a spotted owl site, with or without recent surveys, but without detections in the last five years.

Other considerations for selection of spotted owl sites for management:

If site management cannot be initiated on all sites, we recommend the following be considered in selecting the specific spotted owl sites for management.

- Select sites with the most recent occupancy.

- Focus first on sites with recent occupancy by pairs, then singles, then detections.
- Where relevant information is available, select sites with the best recent demographic performance (i.e., select the sites where the largest numbers of young have fledged).
- Preferentially select sites with good accessibility, to maximize the efficiency of implementation.
- Consider the condition of habitat in the area. All other things being equal, select sites with abundant high-quality habitat. Sites that have lost substantial amounts of habitat to harvest or other disturbances may be lower priority, other factors being equal.
- Choose sites within GMAs, near GMAs, or creating stepping stone connectivity between GMAs.
- Consider the history of spotted owl use at the site. Where historical survey information is available, focus first on sites with a long history of pair occupancy, including reproduction.

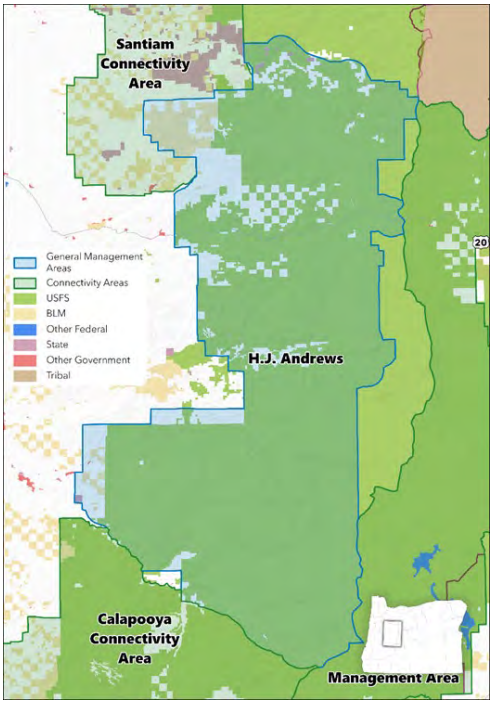
A4.5.B.1.b Management Recommendations:

Within each individual site, remove barred owls from an area between 6,514 and 11,581 acres. This represents the area in a circle of 1.5 and 2 home range radii (Table 1). This can be distributed in a circle around the core area, or implementers can use local knowledge, topography, and habitat condition to design an area of the appropriate size that provides the best conditions for barred owl management. In areas where spotted owl sites are isolated, and particularly for sites in Priority A condition (see table above), we recommend a larger management area, up to 26,058 acres (3 home range radii).

A4.5.B.2 General Management Areas

A4.5.B.2.a H.J. Andrews GMA - Priority A

The H.J. Andrews GMA is located in the central portion of the Western Oregon Cascades Province, and generally includes all of the mid-elevation centered on the H.J. Andrews Experimental Forest, with additional areas to the north and south. It includes a large portion of the Willamette National Forest, as well as some lower elevation areas managed by the BLM Northwest Oregon District, a few small parcels of State lands, and adjacent and interspersed private lands. Overall, the GMA is 89 percent Federal lands (National Forests and BLM) and the remainder primarily in private ownership.



This GMA was mapped for the following reasons:

- It encompasses the central portion of the spotted owl range within this province.
- Habitat density is very high here.
- The GMA includes the H.J. Andrews Demography Study Areas, with its historical and recent spotted

owl data. The study area is already slated for higher level monitoring (a 20 percent sample of the area to be surveyed by autonomous recording units), providing additional future data on both spotted and barred owls. This allows for efficiencies in monitoring barred owl removal and its effects on spotted owls. This portion of the GMA is well known and accessible, allowing for quicker implementation.

- Demographic information from the study area indicates that spotted owls there maintained better demographic rates, more characteristic of areas further south, in spite of having higher barred owl occupancy rates more characteristic of areas further north. This may be due to the high quantity and quality of available spotted owl habitat. We interpret this as an indication that the potential for population recovery is high here, once the pressure from barred owls is reduced.
- Recent information indicating the possibility of rapid declines in spotted owl numbers in this area highlights the urgency of management here.
- Taken together, these factors indicate that rapid implementation of GMA management in this area may have the greatest impact on both the short-term likelihood of extirpation, as well as the long-term likelihood of recovery, in this province.

Description of the elements considered in mapping: In mapping the boundaries of the H.J. Andrews GMA we used information on the following elements.

Spotted Owl Data:

- We included areas of especially high habitat density and excluded most areas with lesser quantities or quality of habitat.
- We included some areas of lesser quality habitat where it appeared that the habitat might support dispersal between this GMA and the Deschutes GMA in the Oregon East Cascades, due to the presence of habitat (even if lower quality) on either side of the Cascade Crest, and concentrations of enough higher quality habitat to support a spotted owl pair within a few miles of the crest on either side.

Conditions:

- We did generally excluded areas of inventoried roadless areas or wilderness areas that were located more than two miles from the nearest road. Some of the included areas may remain difficult to access, and this should be considered during implementation.

Other Considerations:

- We included most of the H.J. Andrews Demography Study Area, except where it coincides with the Mount Hagen Inventoried Roadless Area, where spotted owl habitat is present but with a higher proportion of non-habitat than other portions of the study area.
- In several areas, we used a road to guide the drawing of the GMA boundary, but also included a buffer area on the other side of the road to avoid situations in which an individual barred owl may be easily accessible from the road, but cannot be removed due to a boundary line along the road.
- This GMA includes areas with current and planned higher intensity monitoring of spotted owls (20% ARU monitoring of the H.J. Andrews study area), potentially leading to efficiencies for the implementation and monitoring of barred owl management.

Focal Management Areas (FMAs)

In this GMA, we recommend developing FMAs large enough to support as many spotted owl pair sites as possible, up to 50 pair sites per FMA. Generally, larger blocky areas provide a smaller edge-to-area ratio, and this may help reduce the influx of barred owls from outside the FMA in the future.

Where smaller areas are developed due to topography, forest condition, access, funding limitations, or other reasons, we recommend these be closer together and multiple areas designed with the intent of encouraging exchange of spotted owls between these smaller areas. Where possible, when setting up smaller areas, design them such that they could be expanded in the future if funding becomes available.

Coordinate FMA locations with the site management described above. Including recently occupied sites in FMAs provides a potential core population for development of spotted owl populations once barred owl populations are reduced. In areas where habitat connectivity is limited, site management may help to provide connectivity between smaller FMAs.

Priorities: The following are our recommended priorities for defining and selecting FMAs within the H.J. Andrews GMA. The following are in general priority order, however, local expertise will be important in applying these to specific FMA boundary designs.

1. Build FMAs around current occupied spotted owl sites (sites with detections in the last five years). This provides a nucleus of spotted owls for the potential recolonization of sites within the FMA as barred owl numbers are reduced. Where recent survey data are not available, the nucleus may instead rely on sites that have not undergone significant habitat modification since they were last known to be occupied.

2. Place blocks to include spotted owl populations, or clusters of sites, with good current demographic parameters (e.g., higher survival, occupancy, reproductive output, etc.) relative to others in the GMA.

3. Select areas with the highest acreage of high-quality spotted owl habitat, for example, as measured by relative habitat suitability. These are likely to be areas with the highest carrying capacity for northern spotted owls, which can be measured using a habitat-based calculation of the estimated maximum population of territorial northern spotted owls without barred owl presence.

4. Place FMAs to minimize the cost of management. Select areas where drivable roads are available and accessible (including access rights and weather conditions) during the period when management is needed. Where roads are not available, trails may be used, but avoid areas lacking in roads and trails. Select areas where existing monitoring will meet some of the monitoring needs associated with barred owl management.

5. Place FMAs in areas allowing for connectivity within the local environment, including habitat connectivity within an FMA, between neighboring FMAs, and/or between an FMA and nearby managed spotted owl sites. Place FMAs to facilitate connectivity between treatment areas, including the neighboring Connectivity Areas and the Deschutes GMA in the Oregon East Cascades Province. Consider the capability of the landscape to support dispersal.

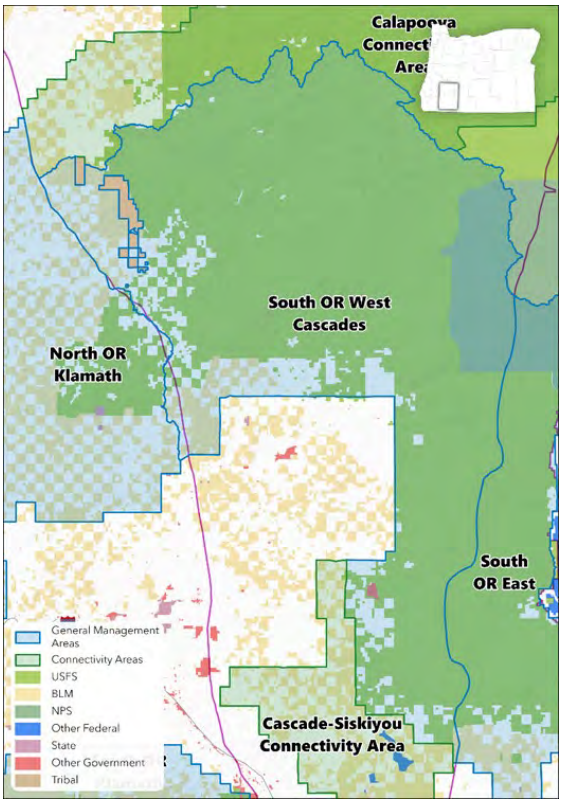
6. Include known sites with indicators of high site quality, as determined during evaluations of current and historical sites. These indicators may include, for example, especially good habitat amount, quality, and configuration; a history of good past demographic performance; or a history of long-term occupancy.

7. Include lands of interested or willing landowners or land managers. A focus on areas where landowners have expressed interest in barred owl management will speed the implementation of actual barred owl management and encourage involvement. Focus first on areas where funding is available.

8. Preferentially select FMAs to include areas where spotted owl habitat has higher projected climate change resilience. This may include indications of higher microclimate stability, lower fire risk, lower risk of tree mortality due to drought, lower likelihood of vegetation shifts away from forest types supporting spotted owl habitat conditions, or other factors.

9. Choose areas that may serve as source populations in the future. These will be areas in which the spotted owl population is large enough, with good enough demographic parameters (e.g., survival, site occupancy, and fecundity) to produce enough young that they disperse to other areas. Such areas may not exist now, but habitat and historical information might be informative as to where such spotted owl populations may become possible, with a reduction in barred owl densities.

A4.5.B.2.b South Oregon West Cascades GMA - Priority B



The South Oregon West Cascades GMA is located in the southern portion of the Western Oregon Cascades Province and spans the province from west to east, and includes a small neighboring area of the Oregon Klamath Province. It is primarily made up of Federal lands, including portions of Umpqua and Rogue River Siskiyou National Forests, Crater Lake National Park, and BLM lands associated with the Medford and Roseburg Districts. It also includes adjacent and interspersed private lands, and one county park surrounded by Forest Service lands. Overall, the GMA is 90 percent Federal lands (National Forests and BLM) and the remainder primarily in private ownership.

This GMA was mapped for the following reasons:

- This area allows for connectivity to both the Oregon East Cascades and Oregon Klamath Provinces, and from there to the Oregon Coast Ranges Province and other provinces in California.
- It includes the largest concentrations of spotted owl habitat in the southern portion of the province.
- A portion of the area overlaps the South Cascades Demographic Study Area, with its historical and recent spotted owl data. The study area is already slated for higher level monitoring (a 20 percent sample of the area to be surveyed by autonomous recording units), providing additional future data on both spotted and barred owls. This allows for efficiencies in monitoring barred owl removal and its effects on spotted owls. This portion of the GMA is well known and accessible, allowing for quicker implementation.
- Demographic data from the South Cascades study area indicates that spotted owls here have a potential for high fecundity if the negative influence of barred owls can be reduced.

Description of the elements considered in mapping: In mapping the boundaries of the South Oregon West Cascades GMA we used information on the following elements.

Spotted Owl Data:

- We focused on concentrations of spotted owl habitat in the southern portion of the province, moving north from the southern end of the South Cascades study area.
- The GMA includes several areas of potential connectivity to the South Oregon East Cascades GMA, where habitat to support spotted owl dispersal is present up to the Cascades Crest on both the east and west sides.

- The GMA boundary includes a long segment along the province boundary with the Oregon Klamath Province, allowing for good connectivity with the North Oregon Klamath Province. Spotted owl habitat is abundant on both sides of the boundary.
- North of State Highway 62, between the towns of Trail and Prospect, the GMA includes two peninsulas with higher concentrations of spotted owl habitat in an area where habitat is somewhat sparser than in other portions of the GMA. This is due to information indicating spotted owl presence in these locations.

Conditions:

- We did not exclude inventoried roadless areas or wilderness areas, where road and trail access may be lacking, but these factors should be considered during implementation.

Other Considerations:

- Along the northern boundary of the GMA, we used roads to guide the boundary location, but also included a buffer area on the other side of the road to avoid situations in which an individual barred owl may be easily accessible from the road, but cannot be removed due to a boundary line along the road.
- This GMA includes areas with current and planned higher intensity monitoring of spotted owls (20% ARU monitoring of the South Cascades study area), potentially leading to efficiencies for the implementation and monitoring of barred owl management.

Focal Management Areas (FMAs)

In this GMA, we recommend developing FMAs large enough to support as many spotted owl pair sites as possible, up to 50 pair sites per FMA. Generally, larger blocky areas provide a smaller edge-to-area ratio, and this may help reduce the influx of barred owls from outside the FMA in the future. It may be beneficial to designate FMAs that span the boundary between this GMA and the South Oregon East Cascades GMA, or the North Oregon Klamath GMA. Alternatively, smaller FMAs could be designated on either side of a given boundary, but could effectively function as one spotted owl population.

Where smaller areas are developed due to topography, forest condition, access, funding limitations, or other reasons, we recommend these be closer together and multiple areas designed with the intent of encouraging exchange of spotted owls between these smaller areas. Where possible, when setting up smaller areas, design them such that they could be expanded in the future if funding becomes available.

Coordinate FMA locations with the site management described above. Including recently occupied sites in FMAs provides a potential core population for development of spotted owl populations once barred owl populations are reduced. In areas where habitat connectivity is limited, site management may help to provide connectivity between smaller FMAs.

Priorities: The following are our recommended priorities for defining and selecting FMAs within the South Oregon West Cascades GMA. The following are in general priority order, however, local expertise will be important in applying these to specific FMA boundary designs.

1. Build FMAs around current occupied spotted owl sites (sites with detections in the last five years). This provides a nucleus of spotted owls for the potential recolonization of sites within the FMA as barred owl numbers are reduced. Where recent survey data are not available, the nucleus may instead rely on sites that have not undergone significant habitat modification since they were last known to be occupied.

2. Place blocks to include spotted owl populations, or clusters of sites, with good current demographic parameters (e.g., higher survival, occupancy, reproductive output, etc.) relative to others in the GMA.

3. Select areas with the highest acreage of high-quality spotted owl habitat, for example, as measured by relative habitat suitability. These are likely to be areas with the highest carrying capacity for northern spotted owls, which can be measured using a habitat-based calculation of the estimated maximum population of territorial northern spotted owls without barred owl presence.

4. Place FMAs to minimize the cost of management. Select areas where drivable roads are available and accessible (including access rights and weather conditions) during the period when management is needed. Where roads are not available, trails may be used, but avoid areas lacking in roads and trails. Select areas where existing monitoring will meet some of the monitoring needs associated with barred owl management.

5. Place FMAs to facilitate connectivity between treatment areas, including the neighboring Connectivity Areas, the South Oregon East Cascades GMA, and the North Oregon Klamath GMA. Place FMAs in areas allowing for connectivity within the local environment, including habitat connectivity within an FMA, between neighboring FMAs, and/or between an FMA and nearby managed spotted owl sites. Consider the capability of the landscape to support dispersal.

6. Include known sites with indicators of high site quality, as determined during evaluations of current and historical sites. These indicators may include, for example, especially good habitat amount, quality, and configuration; a history of good past demographic performance; or a history of long-term occupancy.

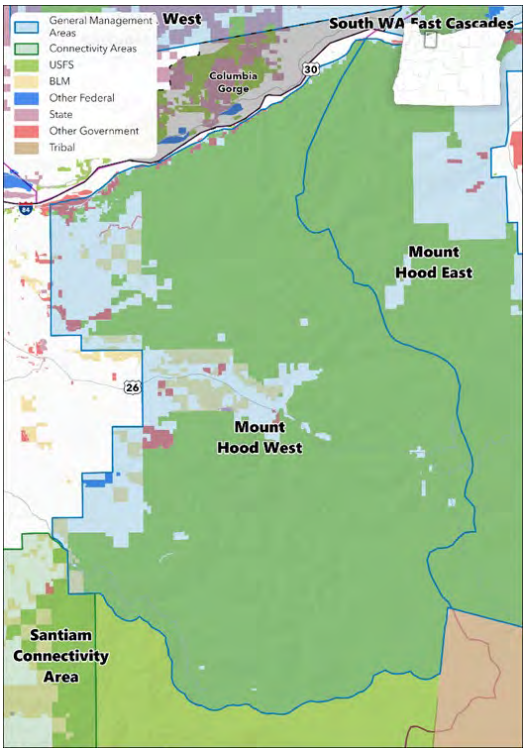
7. Include lands of interested or willing landowners or land managers. A focus on areas where landowners have expressed interest in barred owl management will speed the implementation of actual barred owl management and encourage involvement. Focus first on areas where funding is available.

8. Preferentially select FMAs to include areas where spotted owl habitat has higher projected climate change resilience. his may include indications of higher microclimate stability, lower fire risk, lower risk of tree mortality due to drought, lower likelihood of vegetation shifts away from forest types supporting spotted owl habitat conditions, or other factors.

9. If areas of lower barred owl population density can be identified, include these areas in FMAs. Where barred owls are at lower densities, fewer will need to be removed, and their negative effects on spotted owl populations may be reversed more quickly.

10. Choose areas that may serve as source populations in the future. These will be areas in which the spotted owl population is large enough, with good enough demographic parameters (e.g., survival, site occupancy, and fecundity) to produce enough young that they disperse to other areas. Such areas may not exist now, but habitat and historical information might be informative as to where such spotted owl populations may become possible, with a reduction in barred owl densities.

A4.5.B.2.c Mount Hood West GMA - Priority C



The Mount Hood West GMA is located in the northernmost portion of the Western Oregon Cascades Province and nearly spans the province from west to east. It is primarily made up of Federal lands on the Mount Hood National Forest, but also includes of BLM lands associated with the Northwest Oregon District. Additionally, the GMA includes small areas of municipal lands and private lands, where these are adjacent to or interspersed with the Federal lands described above. Notably, the GMA includes the Bull Run watershed, which is located mainly on National Forest lands and provides most of the municipal drinking water supply for the City of Portland. Overall, the GMA is 87 percent Federal lands (National Forests and BLM) and the remainder primarily in private ownership.

This GMA was mapped for the following reasons:

- The GMA includes the northern extent of spotted owl distribution in the Western Oregon Cascades.
- It includes large concentrations of spotted owl habitat.
- This area provides many opportunities for connectivity to the Oregon East Cascades Province, and some limited potential for connectivity to the Washington West Cascades Province to the north. Although historical and current patterns of spotted owl dispersal across the Columbia River are not well understood, there is some possibility that it would occur here, given the relatively narrow width of open water southwest of Cascade Locks, and the presence of spotted owl habitat on both sides of the river, albeit at lower concentrations than farther east.

Description of the elements considered in mapping: In mapping the boundaries of the Mount Hood East GMA we used information on the following elements.

Spotted Owl Data:

- We included most concentrations of spotted owl habitat in the northernmost portion of the province.
- We included areas of potential connectivity to management blocks in the Oregon East Cascades Province, where habitat to support spotted owl dispersal is present up to the Cascades Crest on both the east and west sides.

Conditions:

- We did not exclude inventoried roadless areas or wilderness areas, where road and trail access may be lacking, but these factors should be considered during implementation.

Other Considerations:

- Along the southern boundary of the GMA, we used roads to guide the boundary location, but also included a buffer area on the other side of the road to avoid situations in which an individual barred owl may be easily accessible from the road, but cannot be removed due to a boundary line along the road.
- Although we focused on public lands, including local government lands, we also included some areas of private lands with little spotted owl habitat, because these areas may provide barred owl habitat, and if not managed, could be an ongoing source of barred owls entering removal areas within spotted owl habitat.

Focal Management Areas (FMAs)

In this GMA, we recommend developing FMAs large enough to support as many spotted owl pair sites as possible, up to 50 pair sites per FMA. Generally, larger blocky areas provide a smaller edge-to-area ratio, and this may help reduce the influx of barred owls from outside the FMA in the future. It may be beneficial to designate FMAs that span the boundary between the Mount Hood West and Mount Hood East GMAs.

Where smaller areas are developed due to topography, forest condition, access, funding limitations, or other reasons, we recommend these be closer together and multiple areas designed with the intent of encouraging exchange of spotted owls between these smaller areas. Where possible, when setting up smaller areas, design them such that they could be expanded in the future if funding becomes available.

Coordinate FMA locations with the site management described above. Including recently occupied sites in FMAs provides a potential core population for development of spotted owl populations once barred owl populations are reduced. In areas where habitat connectivity is limited, site management may help to provide connectivity between smaller FMAs.

Priorities: The following are our recommended priorities for defining and selecting FMAs within the Mount Hood West GMA. The following are in general priority order, however, local expertise will be important in applying these to specific FMA boundary designs.

1. Build FMAs around current occupied spotted owl sites (sites with detections in the last five years). This provides a nucleus of spotted owls for the potential recolonization of sites within the FMA as barred owl numbers are reduced. Where recent survey data are not available, the nucleus may instead rely on sites that have not undergone significant habitat modification since they were last known to be occupied.

2. Place blocks to include spotted owl populations, or clusters of sites, with good current demographic parameters (e.g., higher survival, occupancy, reproductive output, etc.) relative to others in the GMA.

3. Select areas with the highest acreage of high-quality spotted owl habitat, for example, as measured by relative habitat suitability. These are likely to be areas with the highest carrying capacity for northern spotted owls, which can be measured using a habitat-based calculation of the estimated maximum population of territorial northern spotted owls without barred owl presence.

4. Place FMAs to minimize the cost of management. Select areas where drivable roads are available and accessible (including access rights and weather conditions) during the period when management is needed. Where roads are not available, trails may be used, but avoid areas lacking in roads and trails. Select areas where existing monitoring will meet some of the monitoring needs associated with barred owl management.

5. Place FMAs in areas allowing for connectivity within the local environment, including habitat connectivity within an FMA, between neighboring FMAs, and/or between an FMA and nearby managed spotted owl sites. Place FMAs to facilitate connectivity between treatment areas, including the Mount Hood East GMA, the Santiam Connectivity Area, and, to a lesser extent, to management blocks in the Washington West Cascades Province. Consider the capability of the landscape to support dispersal.

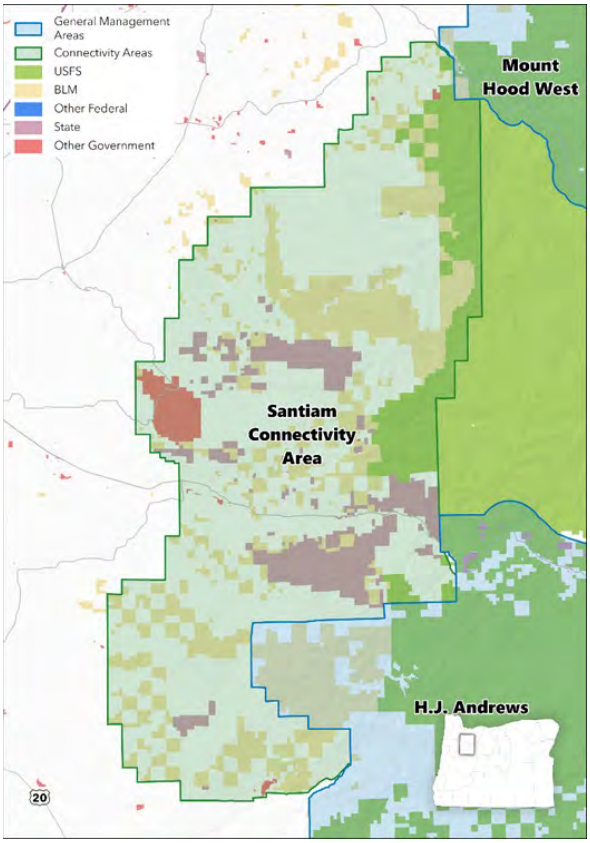
6. Include known sites with indicators of high site quality, as determined during evaluations of current and historical sites. These indicators may include, for example, especially good habitat amount, quality, and configuration; a history of good past demographic performance; or a history of long-term occupancy.

7. Include lands of interested or willing landowners or land managers. A focus on areas where landowners have expressed interest in barred owl management will speed the implementation of actual barred owl management and encourage involvement. Focus first on areas where funding is available.

8. Preferentially select FMAs to include areas where spotted owl habitat has higher projected climate change resilience. This may include indications of higher microclimate stability, lower fire risk, lower risk of tree mortality due to drought, lower likelihood of vegetation shifts away from forest types supporting spotted owl habitat conditions, or other factors.

A4.5.B.3 Special Designated Areas:

A4.5.B.3.a Santiam Connectivity Area - Priority D



The Santiam Connectivity Area is located in the northern portion of the Western Oregon Cascades Province, at lower elevations along the boundary with the Willamette Valley Province, and including some small adjacent areas of the Willamette Valley Province. It includes 32 percent Federal lands, including the southwestern corner of the Mount Hood National Forest, the northeastern corner of the Willamette National Forest, and BLM lands associated with the Northwest Oregon District; 9 percent State lands, including the Santiam State Forest and Silver Falls State Park; some small areas of county lands; and the remainder in private ownership.

Description of the elements considered in mapping:

- Following the large, severe Beachie Creek and Lionshead fires of 2020, north-south connectivity between the northern and central portions of the Western Oregon Cascades Province was greatly constricted. The area within this Connectivity Area can provide a low-elevation pathway connecting these two portions of the province.
- The area lies between the Mount Hood West and H.J. Andrews GMAs, and could provide connection between spotted owl populations that eventually develop within those GMAs.
- While recent survey data is limited, this area contains historical spotted owl activity centers and some concentrations of habitat, although habitat is sparser here than in many other portions of the province.
- The Connectivity Area includes the Santiam State Forest, which is included in an HCP that is currently in development, and barred owl management could potentially be used to mitigate unavoidable impacts of land management activities. This Connectivity Area includes all of the larger Habitat Conservation Areas proposed for Santiam State Forest within ODF's draft HCP.
- The Connectivity Area includes small neighboring areas of the Willamette Valley Province, mainly in and around Silver Falls State Park. Silver Falls State Park was included because of very high habitat density, and the area around it was included to minimize the edge to area ratio.

Management within the Connectivity Area.

The short-term focus for management in this area is to identify remaining occupied spotted owl sites and conduct barred owl management to protect these remaining sites. Longer term, focus on creating smaller blocks of habitat allowing for spotted owl populations to connect across this area and reducing overall barred owl population density to support spotted owl connections across this area.

Initially, we recommend conducting surveys of historical spotted owl sites, and areas with high-quality spotted owl habitat without historical spotted owl data. If occupied sites are found, manage all these sites using the site management described above, with at least 11,581 acres (2 home range radii), and preferably larger.

In the longer term, we recommend developing barred owl management areas around the occupied and historic spotted owl sites, with a focus on scattered small blocks across the entire connectivity area to provide for connection. In addition, general barred owl removal in this area, designed to reduce barred owl densities, may provide opportunities for successful dispersal of spotted owls. This is not anticipated to be as intense or continuous at that within management blocks.

Priorities: The following are our recommended priorities for management in the Santiam Connectivity Area. The following are in general priority order, however, local expertise will be important in applying these to specific management area selections.

1. Manage around current occupied spotted owl sites (sites with detections in the last five years). This provides a nucleus of spotted owl sites to maintain distribution where it exists across the connectivity area. Where recent survey data are not available, the nucleus may instead rely on sites that have not undergone significant habitat modification since they were last known to be occupied.

2. Prioritize spotted owl site management, or place small management blocks, to include clusters of sites with good current demographic parameters (e.g., higher survival, occupancy, reproductive output, etc.) relative to others in the Connectivity Area.

3. Select management areas to facilitate connectivity, both within the Connectivity Area and between the Mount Hood West and H.J. Andrews GMAs, via landscapes that can support dispersal. In particular, facilitate connectivity between close treatment areas, with treatment distributed across the Connectivity Area to make steppingstones for generational dispersal between neighboring GMAs.

4. Select clusters of spotted owl sites or place small blocks in areas with the highest acreage of high-quality spotted owl habitat, for example, as measured by relative habitat suitability. These are likely to be areas with the highest per-area carrying capacity for northern spotted owls, which can be measured using a habitat-based calculation of the estimated maximum population of territorial northern spotted owls without barred owl presence.

5. Place management areas to minimize the cost of management. Select areas where drivable roads are available and accessible (including access rights and weather conditions) during the period when management is needed. Where roads are not available, trails may be used, but avoid areas lacking in roads and trails. Select areas where existing monitoring will meet some of the monitoring needs associated with barred owl management.

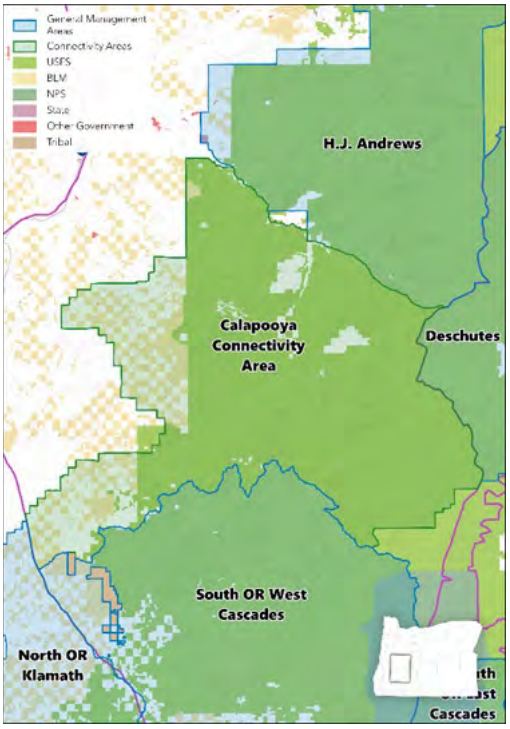
6. Include known spotted owl sites with indicators of high site quality, as determined during evaluations of current and historical spotted owl sites. These indicators may include, for example, especially good habitat amount, quality, and configuration; a history of good past demographic performance; or a history of long-term occupancy.

7. Include lands of interested or willing landowners or land managers. A focus on areas where landowners have expressed interest in barred owl management will speed the implementation of actual barred owl management and encourage involvement. Focus first on areas where funding is available.

8. Preferentially select management areas where spotted owl habitat has higher projected climate change resilience. This may include indications of higher microclimate stability, lower fire risk, lower risk of tree mortality due to drought, lower likelihood of vegetation shifts away from forest types supporting spotted owl habitat conditions, or other factors.

A4.5.B.3.b Calapooya Connectivity Area - Priority D

The Calapooya Connectivity Area is located in the south-central portion of the Western Oregon Cascades Province, and spans the province from west to east. It is situated between the H.J. Andrews and South Oregon West Cascades GMAs, and borders the North Oregon Klamath GMA to the southwest and the Deschutes GMA to the northeast. It includes 85 percent Federal lands, including portions of the Willamette and Umpqua National Forests, and BLM lands associated with the Northwest Oregon and Roseburg Districts. It also includes adjacent and interspersed areas of private ownership.



Description of the elements considered in mapping:

- This Connectivity Area includes a large expanse of public lands with high habitat density.
- The area lies between the H.J. Andrews and South Oregon West GMAs to the north and south, respectively, and between the North Oregon Klamath GMA to the west and the Deschutes GMA to the east, respectively. It is intended to facilitate connectivity between all of these areas.
- While recent survey data is not uniformly available, this area contains current and historical spotted owl activity centers.

Management within the Connectivity Area.

The short-term focus for management in this area is to identify remaining occupied spotted owl sites and conduct barred owl management to protect these remaining sites. Longer term, focus on creating smaller blocks of habitat allowing for spotted owl populations to connect across this area and reducing overall barred owl population density to support spotted owl connections across this area.

Initially, we recommend conducting surveys of historical spotted owl sites, and areas with high-quality spotted owl habitat without historical spotted owl data. If occupied spotted owl sites are found, manage all these sites using the spotted owl site management described above, with at least 11,581 acres (2 home range radii), and preferably larger.

In the longer term, we recommend developing barred owl management areas around the occupied and historic spotted owl sites, with a focus on scattered small blocks across the entire connectivity area to provide for connection. In addition, general barred owl removal in this area, designed to reduce barred owl densities, may provide opportunities for successful dispersal of spotted owls. This is not anticipated to be as intense or continuous at that within management blocks.

Priorities: The following are our recommended priorities for management in the Calapooya Connectivity Area. The following are in general priority order, however, local expertise will be important in applying these to specific management area selections.

1. Manage around current occupied spotted owl sites (sites with detections in the last five years). This provides a nucleus of spotted owl sites to maintain distribution where it exists across the connectivity area. Where recent survey data are not available, the nucleus may instead rely on spotted owl sites that have not undergone significant habitat modification since they were last known to be occupied.

2. Prioritize spotted owl site management, or place small management blocks, to include clusters of sites with good current demographic parameters (e.g., higher survival, occupancy, reproductive output, etc.) relative to others in the Connectivity Area.

3. Select management areas to facilitate connectivity, both within the Connectivity Area and between the H.J. Andrews, South Oregon West Cascades, North Oregon Klamath, and Deschutes GMAs, via landscapes that can support dispersal. In particular, facilitate connectivity between close treatment areas, with treatment distributed across the Connectivity Area to make steppingstones for generational dispersal between neighboring GMAs.

4. Select clusters of spotted owl sites or place small blocks in areas with the highest acreage of high-quality spotted owl habitat, for example, as measured by relative habitat suitability. These are likely to be areas with the highest per-area carrying capacity for northern spotted

owls, which can be measured using a habitat-based calculation of the estimated maximum population of territorial northern spotted owls without barred owl presence.

5. Place management areas to minimize the cost of management. Select areas where drivable roads are available and accessible (including access rights and weather conditions) during the period when management is needed. Where roads are not available, trails may be used, but avoid areas lacking in roads and trails. Select areas where existing monitoring will meet some of the monitoring needs associated with barred owl management.

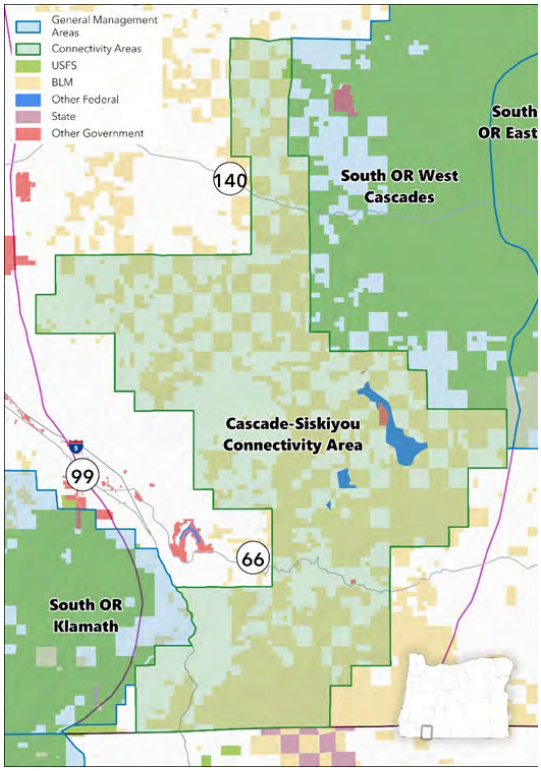
6. Include known spotted owl sites with indicators of high site quality, as determined during evaluations of current and historical sites. These indicators may include, for example, especially good habitat amount, quality, and configuration; a history of good past demographic performance; or a history of long-term occupancy.

7. Include lands of interested or willing landowners or land managers. A focus on areas where landowners have expressed interest in barred owl management will speed the implementation of actual barred owl management and encourage involvement. Focus first on areas where funding is available.

8. Preferentially select management areas where spotted owl habitat has higher projected climate change resilience. This may include indications of higher microclimate stability, lower fire risk, lower risk of tree mortality due to drought, lower likelihood of vegetation shifts away from forest types supporting spotted owl habitat conditions, or other factors.

A4.5.B.3.c Cascade-Siskiyou Connectivity Area - Priority D

The Cascade-Siskiyou Connectivity Area is located in the southernmost portion of the Western Oregon Cascades Province, and spans the province from west to east. It is situated between the South Oregon West Cascades and the South Oregon Klamath GMAs. It includes 51 percent Federal lands, mostly within the Cascade-Siskiyou National Monument, as well as other BLM lands associated with the Medford District. It includes a very small area of the Rogue River Siskiyou National Forest, as well as a county park, and adjacent and interspersed areas of private ownership.



<u>Description of the elements considered in mapping:</u>

- This Connectivity Area provides another avenue for connectivity between the Western Oregon Cascades and Oregon Klamath Provinces.

- The Connectivity Area is located near, but not quite bordering, both the South Oregon East Cascades and the North California Klamath GMA, and may facilitate connection across four provinces: Oregon East and West Cascades, and Oregon and California Klamath.
- Survey data indicates that this area contains several currently active spotted owl sites.
- Included most concentrations of spotted owl habitat to the south and west of the South Oregon West Cascades GMA, and excluded most areas with little or no habitat, while maintaining a reasonably low edge to area ratio.

Management within the Connectivity Area.

The short-term focus for management in this area is to identify remaining occupied spotted owl sites and conduct barred owl management to protect these remaining sites. Longer term, focus on creating smaller blocks of habitat allowing for spotted owl populations to connect across this area and reducing overall barred owl population density to support spotted owl connections across this area.

Initially, we recommend conducting surveys of historical spotted owl sites, and areas with high-quality spotted owl habitat without historical spotted owl data. If occupied sites are found, manage all these sites using the site management described above, with at least 11,581 acres (2 home range radii), and preferably larger.

In the longer term, we recommend developing barred owl management areas around the occupied and historical spotted owl sites, with a focus on scattered small blocks across the entire connectivity area to provide for connection. In addition, general barred owl removal in this area, designed to reduce barred owl densities, may provide opportunities for successful dispersal of spotted owls. This is not anticipated to be as intense or continuous at that within management blocks.

Priorities: The following are our recommended priorities for management in the Cascade-Siskiyou Connectivity Area. The following are in general priority order, however, local expertise will be important in applying these to specific management area selections.

1. Manage around current occupied spotted owl sites (sites with detections in the last five years). This provides a nucleus of spotted owl sites to maintain distribution where it exists across the connectivity area. Where recent survey data are not available, the nucleus may instead rely on sites that have not undergone significant habitat modification since they were last known to be occupied.

2. Prioritize spotted owl site management, or place small management blocks, to include clusters of sites with good current demographic parameters (e.g., higher survival, occupancy, reproductive output, etc.) relative to others in the Connectivity Area.

3. Select management areas to facilitate connectivity, both within the Connectivity Area and between the South Oregon West Cascades, South Oregon Klamath, and to a lesser extent, South Oregon East Cascades, and North California Klamath, via landscapes that can support dispersal. In particular, facilitate connectivity between close treatment areas, with treatment

distributed across the Connectivity Area to make steppingstones for generational dispersal between neighboring GMAs.

4. Select clusters of spotted owl sites or place small blocks in areas with the highest acreage of high-quality spotted owl habitat, for example, as measured by relative habitat suitability. These are likely to be areas with the highest per-area carrying capacity for northern spotted owls, which can be measured using a habitat-based calculation of the estimated maximum population of territorial northern spotted owls without barred owl presence.

5. Place management areas to minimize the cost of management. Select areas where drivable roads are available and accessible (including access rights and weather conditions) during the period when management is needed. Where roads are not available, trails may be used, but avoid areas lacking in roads and trails. Select areas where existing monitoring will meet some of the monitoring needs associated with barred owl management.

6. Include known spotted owl sites with indicators of high site quality, as determined during evaluations of current and historical sites. These indicators may include, for example, especially good habitat amount, quality, and configuration; a history of good past demographic performance; or a history of long-term occupancy.

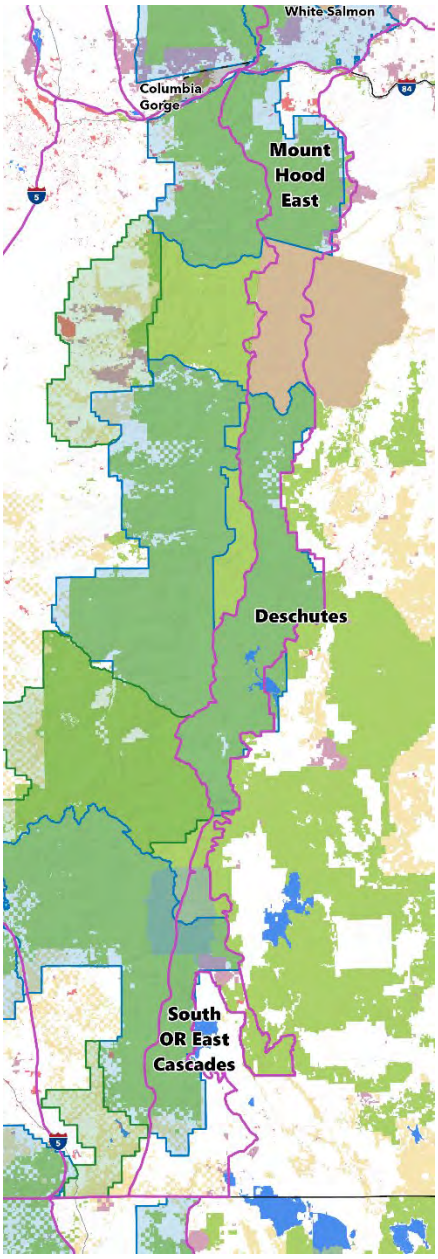
7. Include lands of interested or willing landowners or land managers. A focus on areas where landowners have expressed interest in barred owl management will speed the implementation of actual barred owl management and encourage involvement. Focus first on areas where funding is available.

8. Preferentially select management areas where spotted owl habitat has higher projected climate change resilience. This may include indications of higher microclimate stability, lower fire risk, lower risk of tree mortality due to drought, lower likelihood of vegetation shifts away from forest types supporting spotted owl habitat conditions, or other factors.

A4.6. Eastern Oregon Cascades Province

A4.6.A Background:

A4.6.A.1 Spotted Owl Condition in the Eastern Oregon Cascades Province:



The Eastern Oregon Cascades Province is one of five physiographic provinces in Oregon. Federal lands in the province include approximately 270,583 acres of spotted owl NRF (suitable) habitat.

The Eastern Oregon Cascades have a dry climate, with cold winters and warm summers. Spotted owl habitat is located in a relatively narrow elevation band where suitable climate and soil conditions support appropriate forest types. Volcanic soils and lava flows influence the distribution of spotted owl habitat in this province. Wildfires and insect outbreaks have also affected the amount and distribution of habitat in this province.

The Eastern Oregon Cascades Province includes a portion of the South Cascades Demography Study Area, so we used data from this study area to represent the status of spotted owls in the province. This study area may not be fully representative of the province, but no other study area is active in the province, so it provides the most relevant information.

The South Cascades study area provides data on spotted owl populations since 1991. Monitoring efforts indicate that spotted owl occupancy at historical territories has declined substantially. Spotted owl occupancy on sites within the South Cascades study area dropped from 70 percent in 1993 to 23 percent in 2018. Comprehensive surveys in 2022 detected spotted owls at 17 percent of historical spotted owl sites, including pairs at 11 percent of historical sites. This study area is located in the southern portion of the province, and we assume that spotted owl condition in this province may follow a gradient, with smaller numbers and worse demographic conditions in the north and better conditions in the south. Therefore, use of the South Cascades study area to represent conditions throughout the province may provide a more optimistic view than is truly warranted.

A4.6.A.2 Barred Owl condition in the Eastern Oregon Cascades Province:

Barred owls may be present at lower densities in the Eastern Oregon Cascades Province than in many other parts of the northern spotted owl range. We expect that this may vary, with higher

densities in the north, and lower densities in the south, due to the longer time since the initial invasion in the north. However, we lack barred owl data from the northern and central portions of the province. In the South Cascades Demography Study Area in 2018, barred owls were present in 43 percent of spotted owl home ranges, the second lowest proportion found at any study area throughout the northern spotted owl range.

A4.6.B Management Strategy

A4.6.B.1 Spotted Owl Site management in the Eastern Oregon Cascades Province

A4.6.B.1.a Background:

Given the limited number of northern spotted owls in this province, it is crucial to protect the remaining spotted owls through barred owl management at spotted owl sites.

- Managing recently occupied spotted owl sites will help to reduce the rate of spotted owl population decline as quickly as possible and prevent extinction/extirpation of the spotted owl in the province.
- Where spotted owl site management occurs within a GMA, these spotted owl sites may serve as key points for the development of focal management areas, now and in the future. Site management may be expanded into block management over time.
- These sites may serve to increase potential connectivity between and within block management areas. If so, this connectivity may prevent genetic bottlenecks or reductions in genetic diversity.
- Protected spotted owl sites, if occupied, or reoccupied, by spotted owls, and reproducing, may provide a source of young for colonization of management blocks and other managed areas within the province. Where managed sites occur near GMAs, reproductively-active spotted owl sites can interact demographically with block management areas.
- Maintaining spotted owl sites distributed across the province, whether within block management areas or not, will reduce the risk of loss of spotted owls in the province from catastrophic events, such as wildfire, by spreading sites across the area. Managing spotted owl sites also provides the opportunity for maintaining spotted owls in areas where block management is not feasible or recommended. This approach applies across the entire province, whether or not the locations are within a GMA.
- Where sites are not currently occupied, management will provide areas for recolonization by young produced in blocks, boosting population growth.

Selection of spotted owl sites for management

Occupied spotted owl sites are very limited in this province. The primary focus of spotted owl site management in this province is on sites that have been occupied by, or had detections of, spotted owls in the last five years. These areas are more likely to be recolonized by spotted owls after barred owl removal. This is reflected in the priorities for site management.

Spotted Owl Site Management Priorities

Priority	Spotted Owl Site Condition
A	Sites that have been occupied by resident spotted owls (pair or single) in the past five years, or where there have been detections of spotted owls (not reaching resident status) in the past five years
C	Sites that were occupied by resident spotted owls between 5 and 10 years ago, with or without recent surveys, but without detections in the last 5 years, as well as historical spotted owl sites and other areas with sufficient high-quality habitat to support a spotted owl site, and no recent surveys.
D	Historical spotted owl sites last known to be occupied more than 10 years ago, with recent surveys and no recent detections.
E	Historically unsurveyed areas with sufficient high-quality habitat to support a spotted owl site, with recent surveys but no recent detections.

Other considerations for selection of spotted owl sites for management:

If spotted owl site management cannot be initiated on all sites, we recommend the following be considered in selecting the specific spotted owl sites for management.

- Select sites with the most recent detections.
- Focus first on known territorial pairs or singles, then on other detections.
- Focus first on the sites with the best recent demographic performance, if known (i.e., select the sites where the largest numbers of young have fledged).
- Consider the history of spotted owl use at the site. Where historical survey information is available, focus first on sites with a steady recent history of occupancy, and next on historical sites with a long history of pair occupancy, including reproduction.
- Prioritize areas with known recent occupancy over areas without recent surveys, but prioritize areas without recent surveys over areas that were recently surveyed without any recent detections.
- Consider the condition of habitat in the area. All other things being equal, select sites with abundant high-quality habitat. Sites that have lost substantial amounts of habitat to fire, harvest, insect damage, or other disturbances may be lower priority, other factors being equal.
- Choose sites within GMAs, near GMAs, or creating stepping-stone connectivity between GMAs.
- Where possible, choose sites with lower risk of habitat disturbance, for example, areas with lower fire risk.

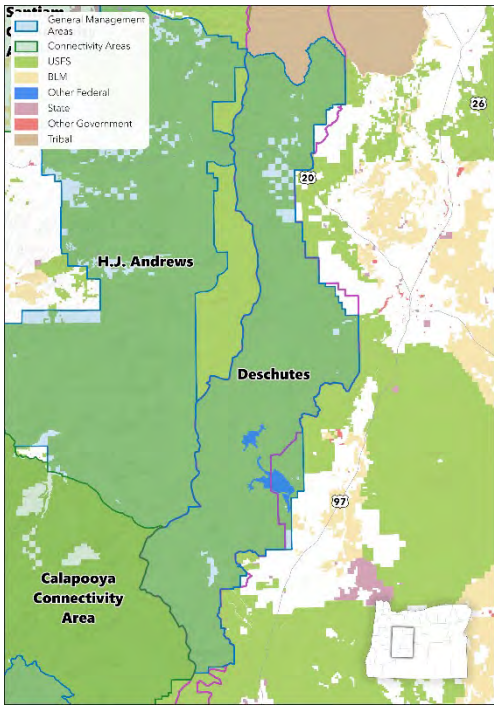
A4.6.B.1.b Management Recommendations:

Within each individual site, remove barred owls from an area between 6,514 and 11,581 acres. This represents the area in a circle of 1.5 and 2 home range radii (Table 1). This can be distributed in a circle around the core area, or implementers can use local knowledge, topography, and habitat condition to design an area of the appropriate size that provides the best conditions for barred owl management.

In areas where spotted owl sites are isolated, and particularly for sites in Priority A condition (see table above), we recommend a larger management area, up to 26,058 acres (3 home range radii). In particular, these larger management buffers would be appropriate in portions of the Deschutes GMA where connectivity is lacking and on the Ya Whee Plateau. There may be additional areas, especially outside of GMAs, where larger buffers are appropriate, or may become appropriate in the future following habitat losses due to wildfire, insect damage, drought mortality, or other factors.

A4.6.B.2 General Management Areas

A4.6.B.2.a Deschutes GMA- Priority A



The Deschutes GMA is located in the central portion of the Eastern Oregon Cascades Province, spans the province from west to east, and includes some adjacent areas immediately to the east outside of the range of the northern spotted owl. It generally coincides with the portion of the Deschutes National Forest that is within the range of the northern spotted owl. Overall, the GMA is 99 percent Federal lands (National Forests and BLM) and the remainder primarily in private ownership.

This GMA was mapped for the following reasons:

- It encompasses the central portion of the spotted owl range within this province.
- The Deschutes National Forest has a relatively consistent history of surveys for northern spotted owls, which shows that spotted owls remain present in some areas but are not detected at many historical sites.
- Although we lack demographic information for the GMA, we expect that, like other dry portions of the northern spotted owl range, there is a potential for high fecundity here if the negative influence of barred owls can be reduced.

Description of the elements considered in mapping: In mapping the boundaries of the Deschutes GMA we used information on the following elements.

Spotted Owl Data:

- We included areas of potential connectivity to management blocks in the Oregon West Cascades Province, where habitat to support spotted owl dispersal is present up to the Cascades Crest on both the east and west sides.
- The southern boundary of the GMA follows the boundary between the Deschutes and Fremont Winema National Forests, excluding a segment of the province where the spotted owl range is very narrow from west to east, and much of the width does not have

soil conditions capable of supporting any type of forest, including forested habitats for spotted or barred owls.

Conditions:

- We did not exclude inventoried roadless areas or wilderness areas, where road and trail access may be lacking, but these factors should be considered during implementation.

Other Considerations:

- The northern boundary of the GMA follows the boundary of the Warm Springs Reservation.
- We included lands outside of the spotted owl range around Wickiup Reservoir because there is a known concentration of barred owls in the spotted owl range near this reservoir, and this area may be an ongoing source of barred owls entering the spotted owl range.

Focal Management Areas (FMAs)

In this GMA, we recommend developing FMAs large enough to support as many spotted owl pair sites as possible. The maximum practicable size of FMAs is likely to be much smaller than 50 pairs in this GMA, and some portions of the GMA, thus management of small clusters of sites may be more reasonable than block management. Generally, larger blocky areas provide a smaller edge-to-area ratio, and this may help reduce the influx of barred owls from outside the FMA in the future, so even smaller blocks are preferable to scattered sites.

Where smaller areas are developed due to topography, forest condition, access, funding limitations, or other reasons, we recommend these be closer together and multiple areas designed with the intent of encouraging exchange of spotted owls between these smaller areas. Where possible, when setting up smaller areas, design them such that they could be expanded in the future if funding becomes available.

Coordinate FMA locations with the site management described above. Including recently occupied sites in FMAs provides a potential core population for development of spotted owl populations once barred owl populations are reduced. In areas where habitat connectivity is limited, site management may help to provide connectivity between smaller FMAs.

Priorities: The following are our recommended priorities for defining and selecting FMAs within the Deschutes GMA. The following are in general priority order, however, local expertise will be important in applying these to specific FMA boundary designs.

1. Build FMAs around current occupied spotted owl sites (sites with detections in the last five years). This provides a nucleus of spotted owls for the potential recolonization of sites within the FMA as barred owl numbers are reduced. Where recent survey data are not available, the nucleus may instead rely on sites that have not undergone significant habitat modification since they were last known to be occupied.

2. Place blocks to include spotted owl populations, or clusters of sites, with good current demographic parameters (e.g., higher survival, occupancy, reproductive output, etc.) relative to others in the GMA.

3. Place FMAs to minimize the cost of management. For example, select areas where existing monitoring will meet some of the monitoring needs associated with barred owl management. Select areas where drivable roads are available and accessible (including access rights and weather conditions) during the period when management is needed. Where roads are not available, trails may be used, but avoid areas lacking in roads and trails.

4. Select areas with the best spotted owl habitat in terms of acreage or density, and the best quality, as measured by available data (for example, higher proportions of nesting and roosting habitat, or higher relative habitat suitability values). Consider recent fire effects on habitat suitability.

5. Place FMAs to facilitate connectivity between treatment areas, including treatment areas in the Oregon West Cascades Province. Place FMAs in areas allowing for connectivity within the local environment, including habitat connectivity within an FMA, between neighboring FMAs, and/or between an FMA and nearby managed spotted owl sites. The quality or density of dispersal habitat between managed areas may be informative as to the level of connectivity. Consider recent fire effects on connectivity.

6. Preferentially select FMAs to include spotted owl habitat in areas with cooler, moister microclimates or long-term fire refugia, rather than areas where fire suppression has allowed for spotted owl habitat development that will not be sustainable in the long term, often associated with unhealthy true fir stands.

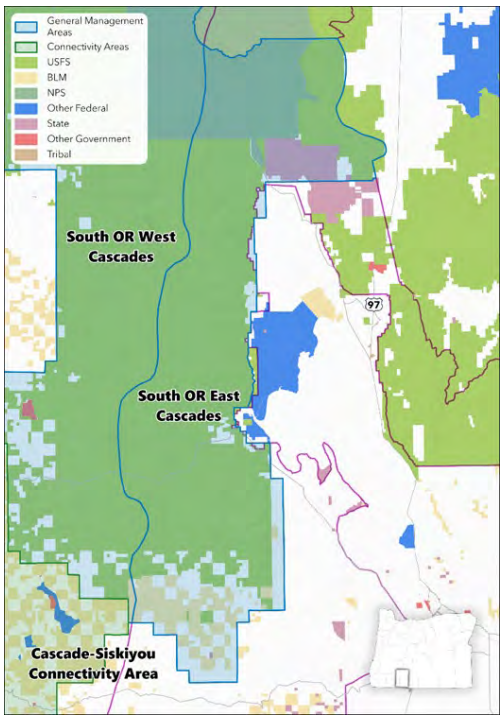
7. Include known sites with indicators of high site quality, as determined during evaluations of current and historical sites. These indicators may include, for example, especially good habitat amount, quality, and configuration; a history of good past demographic performance; or a history of long-term occupancy.

8. Locate FMAs adjacent to landscapes that are likely to limit barred owl movement into or out of the area, for example, in areas of spotted owl habitat with shrub steppe immediately to the east. Areas of ice and snow, agricultural landscapes, and areas recently burned at high severity may provide smaller-scale limitations to barred owl movement and should also be considered as places to place FMA boundaries.

9. Select areas with lower fire risk, as compared with other portions of the GMA.

10. Select areas already prioritized for spotted owl conservation, such as Late Successional Reserves.

A4.6.B.2.b South Oregon East Cascades GMA - Priority A



The South Oregon East Cascades GMA is located in the southern portion of the Eastern Oregon Cascades Province and spans the province from west to east. It is primarily made up of Federal lands, including portions of Crater Lake National Park, Fremont Winema National Forest, and BLM lands associated with the Klamath Falls Field Office of the Lakeview District. Overall, the GMA is 85 percent Federal lands (National Forests, BLM, National Park), 4 percent State lands, and the remainder primarily in private ownership.

This GMA was mapped for the following reasons:

- This area allows for connectivity to the Oregon West Cascades Province, and from there, to the Oregon Klamath Province and beyond.
- It includes the largest concentrations of spotted owl habitat in the southern portion of the province.
- A portion of the area overlaps the South Cascades Demographic Study Area, with its historical and recent spotted owl data. The study area is already slated for higher level monitoring (a 20 percent sample of the area to be surveyed by autonomous recording units), providing additional future data on both spotted and barred owls. This allows for efficiencies in monitoring barred owl removal and its effects on spotted owls. This portion of the GMA is well known and accessible, allowing for quicker implementation.
- Demographic data from the South Cascades study area, as well as other dry portions of the northern spotted owl range, indicates that spotted owls here have a potential for high fecundity here if the negative influence of barred owls can be reduced.

Description of the elements considered in mapping: In mapping the boundaries of the South Oregon East Cascades GMA we used information on the following elements.

Spotted Owl Data:

- We included all concentrations of spotted owl habitat in the southern portion of the province, moving south from Crater Lake.
- The GMA includes several areas of potential connectivity to the South Oregon West Cascades GMA, where habitat to support spotted owl dispersal is present up to the Cascades Crest on both the east and west sides.
- The GMA excludes areas of sparse habitat to the north and south. In the north, the northeastern portion of Crater Lake National Park does not appear contain adequate habitat to support territorial spotted owls, according to rangewide habitat models. Spotted owl habitat is extremely sparse in the private lands and BLM checkerboard lands to the south of the GMA. Although rangewide habitat models do not always capture the full spectrum of spotted owl habitat usage in dry forests, we have consulted with local

biologists and are confident that the areas to the south are truly lacking in concentrations of suitable habitat.

Conditions:

- We did not exclude inventoried roadless areas or wilderness areas, where road and trail access may be lacking, but these factors should be considered during implementation.

Other Considerations:

- We included a portion of the Sun Pass State Forest, which is not managed for spotted owl conservation. This portion of Sun Pass State Forest connects two mapped concentrations of spotted owl habitat, one to the northwest mainly on Crater Lake National Park, and the other to the east on Fremont Winema National Forest. This portion of the State Forest was included to reduce the edge to area ratio of the GMA and provide opportunities to remove barred owls that may be present outside of spotted owl habitat, and may otherwise present sources of barred owl influx into spotted owl habitat where barred owls have been removed.
- We did not include concentrations of spotted owl habitat on the Ya Whee Plateau, even though spotted owls have been detected there in recent years, because it is too separated from other areas of the GMA. Instead, we have recommended the use of individual site management with an expanded buffer (3 home range radii, or the equivalent area) in this location.
- This GMA includes areas with current and planned higher intensity monitoring of spotted owls (20% ARU monitoring of the South Cascades study area), potentially leading to efficiencies for the implementation and monitoring of barred owl management.

Focal Management Areas (FMAs)

In this GMA, we recommend developing FMAs large enough to support as many spotted owl pair sites as possible, up to 50 pair sites per FMA. Generally, larger blocky areas provide a smaller edge-to-area ratio, and this may help reduce the influx of barred owls from outside the FMA in the future. Due to the configuration of habitat in this GMA, however, it may be more practicable to develop long, thin FMAs, even though this configuration does not reduce the edge-to-area ratio. In this case, we still recommend including enough habitat to support as many spotted owl pair sites as possible. It may be beneficial to develop FMAs that span the boundary between the South Oregon East Cascades and South Oregon West Cascades GMAs. Alternatively, separate FMAs could be placed in neighboring areas of each GMA, and these could be smaller areas since they may essentially function as one spotted owl population.

Where smaller areas are developed due to topography, forest condition, access, funding limitations, or other reasons, we recommend these be closer together and multiple areas designed with the intent of encouraging exchange of spotted owls between these smaller areas. Where possible, when setting up smaller areas, design them such that they could be expanded in the future if funding becomes available.

Coordinate FMA locations with the site management described above. Including recently

occupied sites in FMAs provides a potential core population for development of spotted owl populations once barred owl populations are reduced. In areas where habitat connectivity is limited, site management may help to provide connectivity between smaller FMAs.

Priorities: The following are our recommended priorities for defining and selecting FMAs within the South Oregon East Cascades GMA. The following are in general priority order, however, local expertise will be important in applying these to specific FMA boundary designs.

1. Build FMAs around current occupied spotted owl sites (sites with detections in the last five years). This provides a nucleus of spotted owls for the potential recolonization of sites within the FMA as barred owl numbers are reduced. Where recent survey data are not available, the nucleus may instead rely on sites that have not undergone significant habitat modification since they were last known to be occupied.

2. Place blocks to include spotted owl populations, or clusters of sites, with good current demographic parameters (e.g., higher survival, occupancy, reproductive output, etc.) relative to others in the GMA.

3. Place FMAs to minimize the cost of management. For example, select areas where existing monitoring will meet some of the monitoring needs associated with barred owl management. Select areas where drivable roads are available and accessible (including access rights and weather conditions) during the period when management is needed. Where roads are not available, trails may be used, but avoid areas lacking in roads and trails.

4. Select areas with the highest carrying capacity for northern spotted owls. This is a habitat-based calculation of the estimated maximum population of territorial northern spotted owls without barred owl presence. This may be accomplished by choosing areas with the best spotted owl habitat in terms of acreage or density, and the best quality, as measured by available data (for example, higher proportions of nesting and roosting habitat, or higher relative habitat suitability values). Consider recent fire effects on habitat suitability.

5. Place FMAs to facilitate connectivity between treatment areas, especially treatment areas in the Oregon West Cascades Province. Place FMAs in areas allowing for connectivity within the local environment, including habitat connectivity within an FMA, between neighboring FMAs, and/or between an FMA and nearby managed spotted owl sites. The quality or density of dispersal habitat between managed areas may be informative as to the level of connectivity. Consider recent fire effects on connectivity.

6. Preferentially select FMAs to include spotted owl habitat in areas with cooler, moister microclimates or long-term fire refugia, rather than areas where fire suppression has allowed for spotted owl habitat development that will not be sustainable in the long term, often associated with unhealthy true fir stands.

7. Include known sites with indicators of high site quality, as determined during evaluations of current and historical sites. These indicators may include, for example, especially good

habitat amount, quality, and configuration; a history of good past demographic performance; or a history of long-term occupancy.

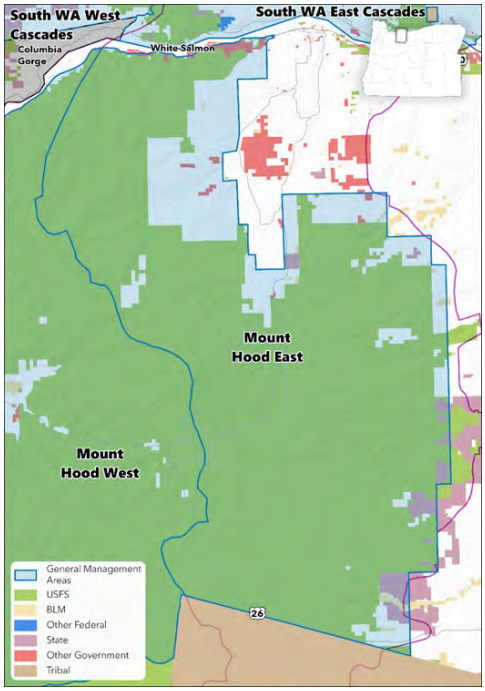
8. Locate FMAs adjacent to landscapes that are likely to limit barred owl movement into or out of the area. Areas of ice and snow, agricultural landscapes, and areas recently burned at high severity may provide limitations to barred owl movement and should also be considered as places to place FMA boundaries.

9. Select areas with lower fire risk, as compared with other portions of the GMA.

10. Select areas already prioritized for spotted owl conservation or compatible conservation purposes, such as Late Successional Reserves and National Park lands.

11. Include lands of interested or willing landowners or land managers. A focus on areas where landowners have expressed interest in barred owl management will speed the implementation of actual barred owl management and encourage involvement.

A4.2.B.2.c Mount Hood East GMA - Priority C



The Mount Hood East GMA is located in the northernmost portion of the Eastern Oregon Cascades Province and spans the province from west to east. It is primarily made up of Federal lands on the Mount Hood National Forest, but also includes small parcels of BLM lands associated with the Deschutes Resource Area of the Prineville District. Additionally, the GMA includes small areas of State lands, municipal lands, and private lands. Overall, the GMA is 82 percent Federal lands (National Forests and BLM), 2 percent State lands, and the remainder primarily in private ownership.

This GMA was mapped for the following reasons:

- The GMA includes the northern extent of spotted owl distribution in the Eastern Oregon Cascades.
- It includes the largest concentrations of spotted owl habitat in the Eastern Oregon Cascades province. The density of spotted owl habitat is higher here than in other parts of the province.
- This area provides many opportunities for connectivity to the Oregon West Cascades Province, and the potential for connectivity to the Washington East Cascades Province to the north. Although historical and current patterns of spotted owl dispersal across the Columbia River are not well understood, this GMA is likely in the best location for such dispersal events, due to concentrations of spotted owl habitat on both sides of the river, and places where the expanse of open water is narrower than in many other nearby portions of the river.
- Spotted owl habitat within the GMA appears to be at lower risk of natural disturbances, for example, wildfires, than spotted owl habitat in other areas of the province.

- Although demographic data from this area is not available, we assume that, similar to other dry portions of the northern spotted owl range, spotted owls here have a potential for high fecundity if the negative influence of barred owls can be reduced.

Description of the elements considered in mapping: In mapping the boundaries of the Mount Hood East GMA we used information on the following elements.

Spotted Owl Data:

- We included most concentrations of spotted owl habitat in the northernmost portion of the province.
- We included areas of potential connectivity to management blocks in the Oregon West Cascades Province, where habitat to support spotted owl dispersal is present up to the Cascades Crest on both the east and west sides.

Conditions:

- We excluded some areas of mapped habitat concentrations where they coincided with human population centers.
- We did not exclude inventoried roadless areas or wilderness areas, where road and trail access may be lacking, but these factors should be considered during implementation.

Other Considerations:

- The southern boundary of the GMA follows the boundary of the Warm Springs Reservation.
- We included some areas with little spotted owl habitat, especially along the eastern boundary of the GMA, because barred owls are known to be present, and if not managed, this area may be an ongoing source of barred owls entering the spotted owl range.

Focal Management Areas (FMAs)

In this GMA, we recommend developing FMAs large enough to support as many spotted owl pair sites as possible, up to 50 pair sites per FMA. Generally, larger blocky areas provide a smaller edge-to-area ratio, and this may help reduce the influx of barred owls from outside the FMA in the future. It may be beneficial to designate FMAs that span the boundary between the Mount Hood East and Mount Hood West GMAs.

Where smaller areas are developed due to topography, forest condition, access, funding limitations, or other reasons, we recommend these be closer together and multiple areas designed with the intent of encouraging exchange of spotted owls between these smaller areas. Where possible, when setting up smaller areas, design them such that they could be expanded in the future if funding becomes available.

Coordinate FMA locations with the site management described above. Including recently occupied sites in FMAs provides a potential core population for development of spotted owl populations once barred owl populations are reduced. In areas where habitat connectivity is limited, site management may help to provide connectivity between smaller FMAs.

Priorities: The following are our recommended priorities for defining and selecting FMAs within the Mount Hood East GMA. The following are in general priority order, however, local expertise will be important in applying these to specific FMA boundary designs.

1. Build FMAs around current occupied spotted owl sites (sites with detections in the last five years). This provides a nucleus of spotted owls for the potential recolonization of sites within the FMA as barred owl numbers are reduced. Where recent survey data are not available, the nucleus may instead rely on sites that have not undergone significant habitat modification since they were last known to be occupied.

2. Place blocks to include spotted owl populations, or clusters of sites, with good current demographic parameters (e.g., higher survival, occupancy, reproductive output, etc.) relative to others in the GMA.

3. Place FMAs to minimize the cost of management. For example, select areas where existing monitoring will meet some of the monitoring needs associated with barred owl management. Select areas where drivable roads are available and accessible (including access rights and weather conditions) during the period when management is needed. Where roads are not available, trails may be used, but avoid areas lacking in roads and trails.

4. Select areas with the highest carrying capacity for northern spotted owls. This is a habitat-based calculation of the estimated maximum population of territorial northern spotted owls without barred owl presence. This may be accomplished by choosing areas with the best spotted owl habitat in terms of acreage or density, and the best quality, as measured by available data (for example, higher proportions of nesting and roosting habitat, or higher relative habitat suitability values). Consider recent fire effects on habitat suitability.

5. Place FMAs to facilitate connectivity between treatment areas, including treatment areas in the Oregon West Cascades and the Washington East Cascades Provinces. Place FMAs in areas allowing for connectivity within the local environment, including habitat connectivity within an FMA, between neighboring FMAs, and/or between an FMA and nearby managed spotted owl sites. The quality or density of dispersal habitat between managed areas may be informative as to the level of connectivity. Consider recent fire effects on connectivity.

6. Preferentially select FMAs to include spotted owl habitat in areas with cooler, moister microclimates or long-term fire refugia, rather than areas where fire suppression has allowed for spotted owl habitat development that will not be sustainable in the long term, often associated with unhealthy true fir stands.

7. Include known sites with indicators of high site quality, as determined during evaluations of current and historical sites. These indicators may include, for example, especially good habitat amount, quality, and configuration; a history of good past demographic performance; or a history of long-term occupancy.

8. Locate FMAs adjacent to landscapes that are likely to limit barred owl movement into or out of the area, for example, in areas of spotted owl habitat with shrub steppe immediately to the east. Areas of ice and snow, agricultural landscapes, and areas recently burned at high severity may provide smaller-scale limitations to barred owl movement and should also be considered as places to situate FMA boundaries.

9. Select areas with lower fire risk, as compared with other portions of the GMA.

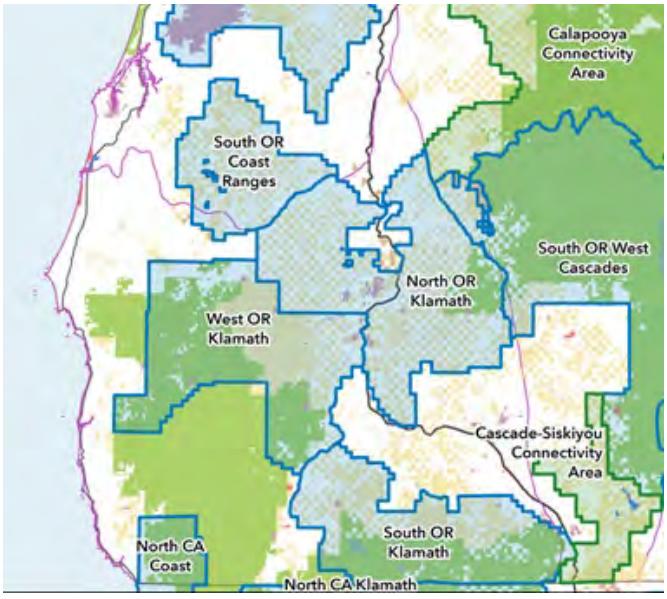
10. Select areas already prioritized for spotted owl conservation, such as Late Successional Reserves.

11. Include lands of interested or willing landowners or land managers. A focus on areas where landowners have expressed interest in barred owl management will speed the implementation of actual barred owl management and encourage involvement.

A4.7. Oregon Klamath Province

A4.7.A Background

A4.7.A.1 Spotted Owl condition in the Oregon Klamath Province:



The Oregon Klamath Province is the southern most of the four physiographic provinces in Oregon within the range of the northern spotted owl. The province predominantly consists of Federal lands with 53 percent of the area managed by the Forest Service and BLM, one percent State, and the remainder private land. Federal lands in the province include approximately 992,815 acres of spotted owl suitable habitat.

Mixed conifer forest type and mixed fire severity has resulted in heterogenous landscape. Fire suppression may have created apparent owl habitat through ingrowth of forests in absence of fire. Federal ownership is dominant, with BLM checkerboard and large contiguous patches in the eastern two-thirds and Forest Service on the western third. River valleys and parts of central area of province are non-forest.

There have been a series of large fires primarily on Forest Service land in the western part of the province and across the northern section. The repeat fires in the western section have removed habitat function from large expanses of this area.

The Klamath Demography Study Area (DSA) provides the most relevant inference on spotted owl population trends in the province. Monitoring efforts indicate that spotted owl occupancy at

historic territories have declined substantially. Spotted owl occupancy on sites within the DSA dropped to 61% percent in the Cle Elum Demography Study Area by 2017 (Franklin et al. 2021). Demography surveys have been phased out and are being replaced with passive acoustic based monitoring (Lesmeister et al. 2021). Additional years of data will be necessary before a population estimate can be reliable derived.

A4.7.A.2 Barred Owl Condition in the Province:

There are no barred owl specific population estimates available; however various studies in the province give some inference. Barred owl numbers appear to have steadily increased in the province as their apparent southward migration progresses (Franklin et al. 2021, Lesmeister et al. 2022; Wiens et al. 2021). In 2019, barred owls were detected in 95% of the sample units in the Klamath DSA, in 2020 they were detected in 95% (Lesmeister et al. 2022, Table 8).

A4.7.B Management Strategy

A4.7.B.1 Site management in Oregon Klamath Province

A4.7.B.1.a Background:

Maintaining the existing northern spotted owl population to the maximum extent possible will provide for greater potential for recruitment and population expansion.

- Managing occupied spotted owl sites retains the existing population and increases the potential for recruitment of young.
- Managing barred owls in occupied northern spotted owl sites provide the nexus for source populations for recolonization of areas where barred owl management occurs (e.g. FMA).
- Maintaining spotted owl sites distributed across the province, whether within block management areas or not, will reduce the risk of loss of spotted owls in the province from catastrophic events, such as wildfire, by spreading sites across the area.
- Managing spotted owl sites also provides the opportunity for maintaining spotted owls in areas where block management is not feasible or recommended. This approach applies across the entire province, whether or not the locations are within a GMA or other mapped designation.
- These sites may serve to increase potential connectivity between and within block management areas, and provide reproductive sites in the vicinity of blocked management areas that can interact at a demographic level with those management areas. This is particularly important in the northern portion of this province where connection between the Western Oregon Cascades and Oregon Coast Ranges is possible.
- Spotted owl site management, due to its smaller size when compared to block management, provides a wider range of options for landowner contribution to barred owl managements, particularly smaller landowners.

Selection of spotted owl sites for management

Although greatly reduced from historical numbers, the Oregon Klamath Province retains a comparatively large number of occupied spotted owl territories. The primary focus of spotted owl site management in this province is on active, or recently active sites, where recolonization

of sites after barred owl removal is more likely. This is reflected in the priorities for site management.

Spotted Owl Site Management Priorities.

Priority	Spotted Owl Site Condition
A	Sites that have are occupied by resident spotted owls (pair or single), or where there have been detections of spotted owls (not reaching resident status).
B	Sites that are not currently occupied by resident spotted owls (pair or single) but have been in the past five years.
C	Sites with spotted owl occupancy between 5 to 10 years ago, whether or not they have been surveyed recently.
D	Areas with sufficient high-quality habitat to support a spotted owl site, whether surveyed recently or not.

Other considerations for selection of spotted owl sites for management:

If site management cannot be initiated on all sites, we recommend the following be considered in selecting the specific spotted owl sites for management.

- Focus first on sites with recent occupancy by pairs, then singles, then detections.
- Consider past reproductive history of the site. Select sites with a history of reproduction on the site where surveys are available.
- Consider the condition of habitat in the area, particularly loss of habitat to fire or other actions since the last surveys. Sites where much of the habitat has been removed, from high severity fire or timber harvest, would be a lower priority.

A4.7.B.1.b Management Recommendations:

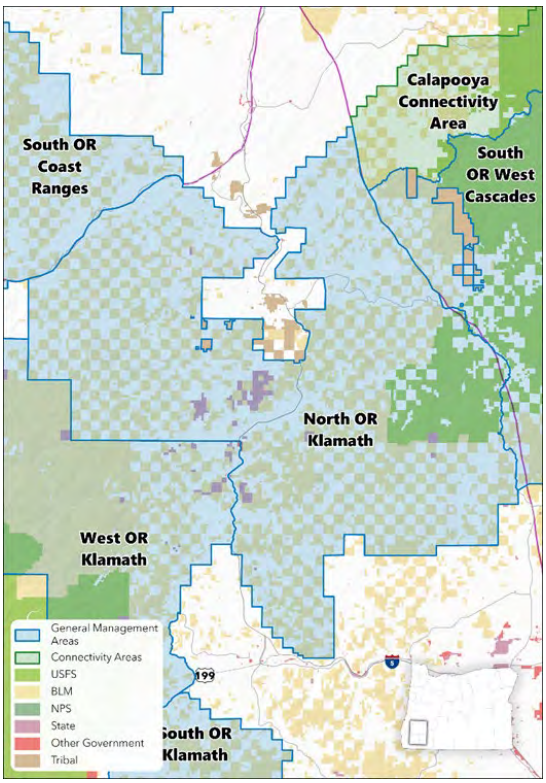
Within each individual site, remove barred owls from an area between 7,645 and 13,592 acres. This represents the area in a circle of 1.5 and 2 home range radii (Table 1). This can be distributed in a circle around the core area, or implementers can use local knowledge, topography, and habitat condition to design an area of the appropriate size that provides the best conditions for barred owl management.

In areas where spotted owl sites are isolated, and particularly for sites in Priority A condition (see table above), we recommend a larger management area, up to 30,582 acres (3 home range radii).

A4.7.B.2 General Management Areas

A4.7.B.2.a North Oregon Klamath GMA- Priority B

The North Oregon Klamath GMA is in the northern part of the province straddling I-5 and bounded by the Oregon coast Range province to the west and the West Cascades Province to the east. It includes 45 percent Federal lands (BLM and Forest Service) 1 percent State land and the remainder primarily in private ownership.



This GMA was mapped for the following reasons:

- Considered important area for inter-province movement of spotted owls between the Western Oregon Cascades and Oregon Coast Ranges.
- Comparatively large remaining population of northern spotted owl based on demography data and BLM clearance surveys.
- The GMA includes Klamath Owl Demography Study Area, with its historic and recent spotted owl data. This area is already slated for higher level monitoring (20 percent ARU-based), providing additional future data on both spotted and barred owls. This also allows for higher levels of monitoring.

Description of the elements considered in mapping: In mapping the boundaries of the North Oregon Klamath GMA we used information on the following elements.

Spotted Owl Data:

- Klamath DSA occupancy and clearance survey data from Roseburg and Medford BLM.
- Maximize current "habitat" forest cover type to forest capable ratio.
- Expectation of higher probability of persistence (than other provinces; Yackulic et al. 2019, USDI BLM 2016 [FEIS]).
- Barred owl presence in occupied sites appears high (BLM Unpublished data – See Poor Windy BA for summary) but not as dense as in other areas (e.g. Coast Range).
- Expect sufficient existing population that natural rates of survival, colonization and recruitment could stabilize population and provide for expansion.
- Overlaps Klamath DSA/Union Myrtle BLM monitoring area.

Conditions:

- Includes extensive BLM and Forest Service managed lands, with both contiguous and checkerboard ownership patterns.
- High availability of access via roads and trails in most of this area.

- The location of neighboring GMAs, and the ability of this GMA to provide connectivity to GMAs in the Oregon Coast Range, Western Oregon Cascades and south through the Klamath Province.

Other Considerations:

- Excludes non-forest valley bottoms and developed areas when practical while minimizing perimeter/interior rations.
- Heterogenous forest cover and mixed patch sizes limited ability to draw independent but still logical GMA, resulting in fairly contiguous individual GMA.

Focal Management Areas (FMAs)

In this GMA, we recommend developing FMAs large enough to potentially support 50 spotted owl pair sites and generally spaced no further than 12 to 15 miles from another FMA when feasible.

The Oregon Klamath province is considered a mixed-severity, frequent fire regime. We recommend that FMA locations take fire refugia and uncharacteristic fuel conditions into account in order to include areas more likely to retain forest cover conditions associated with spotted owl habitat.

Generally, larger blocky areas provide a smaller edge-to-area ratio, and this may help reduce the influx of barred owls from outside the FMA in the future. However, where the landscape or forest conditions do not allow this, smaller or more sinuous areas may be appropriate; particularly when considering fire refugia locations.

Where smaller areas are developed due to topography, forest condition, access, funding limitations, or other reasons, we recommend these be closer together and multiple areas designed with the intent of encouraging exchange of spotted owls between these smaller areas. Where possible, when setting up smaller areas due to funding, design them such that they could be expanded in the future if funding becomes available.

Priorities: The following is our recommended priorities for defining and selecting FMAs within the North Oregon Klamath GMA. The following are in general priority order, however, local expertise will be important in applying these to specific FMA boundary designs.

1. Build FMAs around current occupied spotted owl sites. This provides a nucleus of spotted owls for the potential recolonization of sites within the FMA as barred owl numbers are reduced.

2. Focus on areas with reasonable access, in terms of road networks where available, and trail systems where roads do not exist. Avoid large areas without roads or trails. Closed roads may be used similar to a trail system if they can be safely walked.

3. Consider fire risk in mapping the boundaries of the FMAs. Resistance to uncharacteristic wildfire should be considered in placing boundaries. Placement of multiple FMAs within the GMA would reduce the risk of complete loss.

4. Place blocks where the best spotted owl habitat remains, and on blocks allowing for the maximum number of spotted owls to be supported. Focus on areas with the potential for at least 20 spotted owl pairs, though 50 pair sized areas are the target where possible.

5. Include lands of interested or willing landowners or land managers. A focus on areas where landowners have expressed interest in barred owl management will speed the implementation of actual barred owl management and encourage involvement.

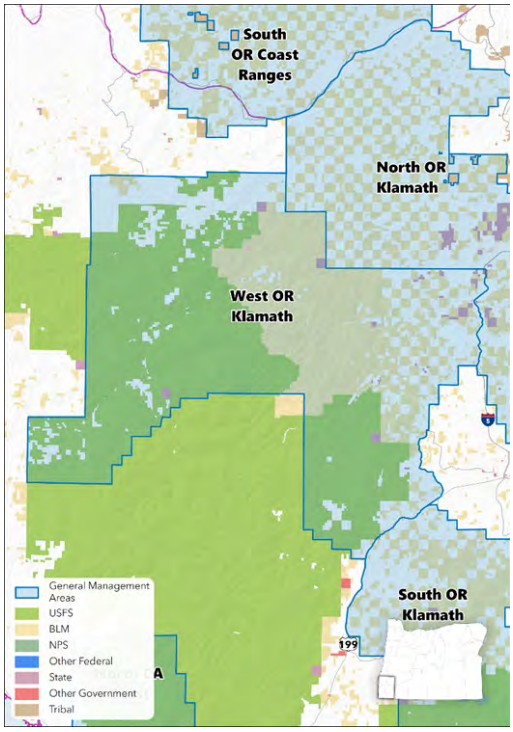
6. Include areas with high-quality historic spotted owl sites (sites with no confirmed occupancy in the last five years or more). These are areas that have been shown by past use to be attractive to spotted owls and therefore more likely to be reoccupied as spotted owl populations.

7. Consider the potential for connection to other FMAs in the GMA, and to neighboring GMAs. Placement of FMAs within close proximity to other GMAs, and where there is forest that may provide connection to the Oregon Coast Ranges and Western Oregon Cascades provinces, can connect populations in these areas.

8. Consider the presence of areas already designated for spotted owl management, such as Late Successional Reserves under the Northwest Forest Plan/BLM RMPs. Including these areas provides support for spotted owls and limits impacts on other resources. As many of these have been managed for older forest over the last decades, this is the likely location of some of the best habitat conditions.

A4.7.B.2.b West Oregon Klamath GMA – Priority B

Bounded by I-5 along the west, the West Oregon Klamath GMA occupies the central portion of the Province. It includes 79 percent Federal lands (National Forest and BLM), 1 percent State land and the remainder primarily in private ownership.



This GMA was mapped for the following reasons:

- The GMA includes large contiguous blocks of national forest and BLM land.
- It provides the only forested connection from provinces to north to those to the south.
- Spotted owl population rate of decline appears to be lower here than in other provinces.
- Relatively contiguous large patches of older forest cover.

Description of the elements considered in mapping: In mapping the boundaries of the West Oregon Klamath GMA we used information on the following elements.

Spotted Owl Data:

- Maximization of current "habitat" forest cover type to forest capable ratio.
- Relative density of nesting-roosting cover type data from Northwest Forest Plan spotted owl effectiveness monitoring.
- Occupied site data from clearance surveys.

Conditions:

- Includes extensive BLM and Forest Service managed lands, includes both contiguous and checkerboard ownership patterns.
- The location of neighboring GMAs, and the ability of this GMA to provide connectivity to the south.

Other Considerations:

- Expectation of higher probability of persistence (than other provinces; Yackulic et al. 2019, USDI BLM 2016 [FEIS]).
- Expect sufficient existing population that natural rates of survival, colonization and recruitment could stabilize population and provide for expansion.
- Excludes non-forest valley bottoms and developed areas when practical while minimizing perimeter/interior ratios.
- Heterogenous forest cover and mixed patch sizes limited ability to draw independent but still logical GMA, resulting in fairly contiguous individual GMA.

Focal Management Areas (FMAs)

In this GMA, we recommend developing FMAs large enough to potentially support 50 spotted owl pair sites and generally spaced no further than 12 to 15 miles from another FMA when feasible.

The Oregon Klamath Province is considered a mixed-severity, frequent fire regime. We recommend that FMA locations take fire refugia and uncharacteristic fuel conditions into account in order to include areas more likely to retain forest cover conditions associated with spotted owl habitat.

Generally, larger blocky areas provide a smaller edge-to-area ratio, and this may help reduce the influx of barred owls from outside the FMA in the future. However, where the landscape or forest conditions do not allow this, smaller or more sinuous areas may be appropriate; particularly when considering fire refugia locations.

Where smaller areas are developed due to topography, forest condition, access, funding limitations, or other reasons, we recommend these be closer together and multiple areas designed with the intent of encouraging exchange of spotted owls between these smaller areas. Where possible, when setting up smaller areas due to funding, design them such that they could be expanded in the future if funding becomes available.

Particularly in the western portion of the GMA consider access (roads and trails) as this includes areas with limited accessibility.

Priorities: The following is our recommended priorities for defining and selecting FMAs within the West Oregon Klamath GMA. The following are in general priority order, however, local expertise will be important in applying these to specific FMA boundary designs.

1. Build FMAs around current occupied spotted owl sites. This provides a nucleus of spotted owls for the potential recolonization of sites within the FMA as barred owl numbers are reduced.

2. Focus on areas with reasonable access, in terms of road networks where available, and trail systems where roads do not exist. Avoid large areas without roads or trails. Closed roads may be used similar to a trail system if they can be safely walked.

3. Consider fire risk in mapping the boundaries of the FMAs. Resistance to uncharacteristic wildfire should be considered in placing boundaries. Placement of multiple FMAs within the GMA would reduce the risk of complete loss.

4. Place blocks where the best spotted owl habitat remains, and on blocks allowing for the maximum number of spotted owls to be supported. Focus on areas with the potential for at least 20 spotted owl pairs, though 50 pair sized areas are the target where possible.

5. Include lands of interested or willing landowners or land managers. A focus on areas where landowners have expressed interest in barred owl management will speed the implementation of actual barred owl management and encourage involvement.

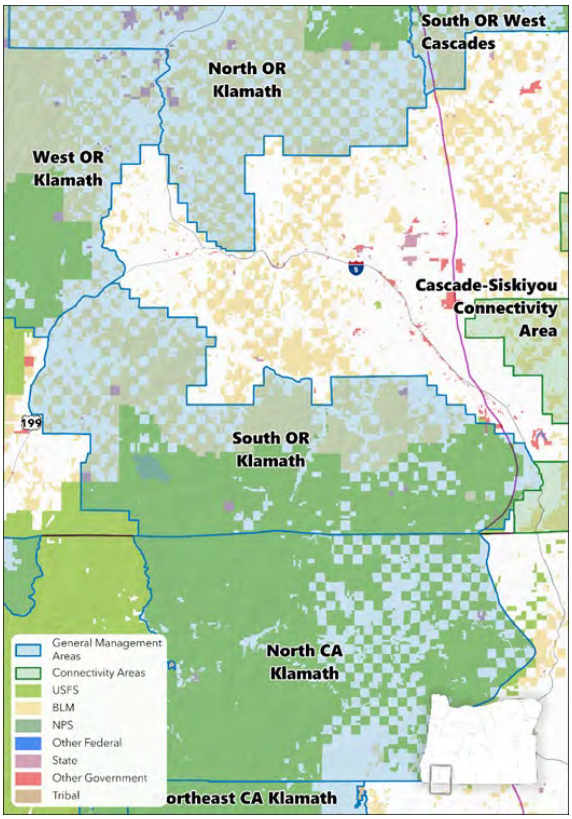
6. Include areas with high-quality historic spotted owl sites (sites with no confirmed occupancy in the last five years or more). These are areas that have been shown by past use to be attractive to spotted owls and therefore more likely to be reoccupied as spotted owl populations.

7. Consider the potential for connection to other FMAs in the GMA, and to neighboring GMAs. Placement of FMAs within close proximity to other GMAs can connect populations in these areas.

8. Consider the presence of areas already designated for spotted owl management, such as Late Successional Reserves under the Northwest Forest Plan. Including these areas provides support for spotted owls and limits impacts on other resources. As many of these have been managed for older forest over the last decades, this is the likely location of some of the best habitat conditions.

A4.7.B.2.c South Oregon Klamath GMA – Priority B

The South Oregon Klamath GMA extends south from the Klamath West GMA to the Oregon/California border. It includes 73 percent Federal lands (National Forest and BLM), 1 percent State land and the remainder primarily in private ownership.



This GMA was mapped for the following reasons:

- Includes BLM checkerboard (Medford District) and Forest Service (Rogue-Siskiyou NF) managed lands.
- Western and western part of southern boundary were mapped against historic and recent fire perimeters.
- Excludes non-forest valley bottoms and developed areas when practical while minimizing perimeter/interior rations.
- Heterogenous forest cover and mixed patch sizes limited ability to draw independent but still logical GMA, resulting in fairly contiguous individual GMA.
- Maximize current “habitat” forest cover type to forest capable ratio.
- Provide E-W and N-S connectivity (Part of the Cascades/Klamath/Oregon Coast “mega GMA”.

- The GMA includes large contiguous blocks of national forest and BLM land.
- It provides the only forested connection from provinces to north to those to the south.
- Spotted owl population rate of decline appears to be lower here than in other provinces.

Description of the elements considered in mapping: In mapping the boundaries of the South Oregon Klamath GMA we used information on the following elements.

Spotted Owl Data:

- Maximization of current "habitat" forest cover type to forest capable ratio.
- Relative density of nesting-roosting cover type data from Northwest Forest Plan spotted owl effectiveness monitoring.
- Occupied site data from clearance surveys.

Conditions:

- Includes extensive BLM and Forest Service managed lands, includes both contiguous and checkerboard ownership patterns.
- The location of neighboring GMAs, and the ability of this GMA to provide connectivity to the south.

Other Considerations:

- Large, burned area along the western boundary
- Expectation of higher probability of persistence (than other provinces; Yackulic et al. 2019, USDI BLM 2016 [FEIS]).
- Expect sufficient existing population that natural rates of survival, colonization and recruitment could stabilize population and provide for expansion.
- Excludes non-forest valley bottoms and developed areas when practical while minimizing perimeter/interior rations.
- Heterogenous forest cover and mixed patch sizes limited ability to draw independent but still logical GMA, resulting in fairly contiguous individual GMA.

Focal Management Areas (FMAs)

In this GMA, we recommend developing FMAs large enough to potentially support 50 spotted owl pair sites and generally spaced no further than 12 to 15 miles from another FMA when feasible.

The Oregon Klamath province is considered a mixed-severity, frequent fire regime. We recommend that FMA locations take fire refugia and uncharacteristic fuel conditions into account in order to include areas more likely to retain forest cover conditions associated with spotted owl habitat.

Generally, larger blocky areas provide a smaller edge-to-area ratio, and this may help reduce the influx of barred owls from outside the FMA in the future. However, where the landscape or

forest conditions do not allow this, smaller or more sinuous areas may be appropriate; particularly when considering fire refugia locations.

Where smaller areas are developed due to topography, forest condition, access, funding limitations, or other reasons, we recommend these be closer together and multiple areas designed with the intent of encouraging exchange of spotted owls between these smaller areas. Where possible, when setting up smaller areas due to funding, design them such that they could be expanded in the future if funding becomes available.

Priorities: The following is our recommended priorities for defining and selecting FMAs within the West Oregon Klamath GMA. The following are in general priority order, however, local expertise will be important in applying these to specific FMA boundary designs.

1. Build FMAs around current occupied spotted owl sites. This provides a nucleus of spotted owls for the potential recolonization of sites within the FMA as barred owl numbers are reduced.

2. Focus on areas with reasonable access, in terms of road networks where available, and trail systems where roads do not exist. Avoid large areas without roads or trails. Closed roads may be used similar to a trail system if they can be safely walked.

3. Consider fire risk in mapping the boundaries of the FMAs. Resistance to uncharacteristic wildfire should be considered in placing boundaries. Placement of multiple FMAs within the GMA would reduce the risk of complete loss.

4. Place blocks where the best spotted owl habitat remains, and on blocks allowing for the maximum number of spotted owls to be supported. Focus on areas with the potential for at least 20 spotted owl pairs, though 50 pair sized areas are the target where possible.

5. Include lands of interested or willing landowners or land managers. A focus on areas where landowners have expressed interest in barred owl management will speed the implementation of actual barred owl management and encourage involvement.

6. Include areas with high-quality historic spotted owl sites (sites with no confirmed occupancy in the last five5 years or more). These are areas that have been shown by past use to be attractive to spotted owls and therefore more likely to be reoccupied as spotted owl populations.

7. Consider the potential for connection to other FMAs in the GMA, and to neighboring GMAs or connectivity areas. Placement of FMAs within close proximity to other GMAs or connectivity areas, and where there is forest that may provide connection can connect populations in these areas.

8. Consider the presence of areas already designated for spotted owl management, such as Late Successional Reserves under the Northwest Forest Plan. Including these areas provides support for spotted owls and limits impacts on other resources. As many of these have been

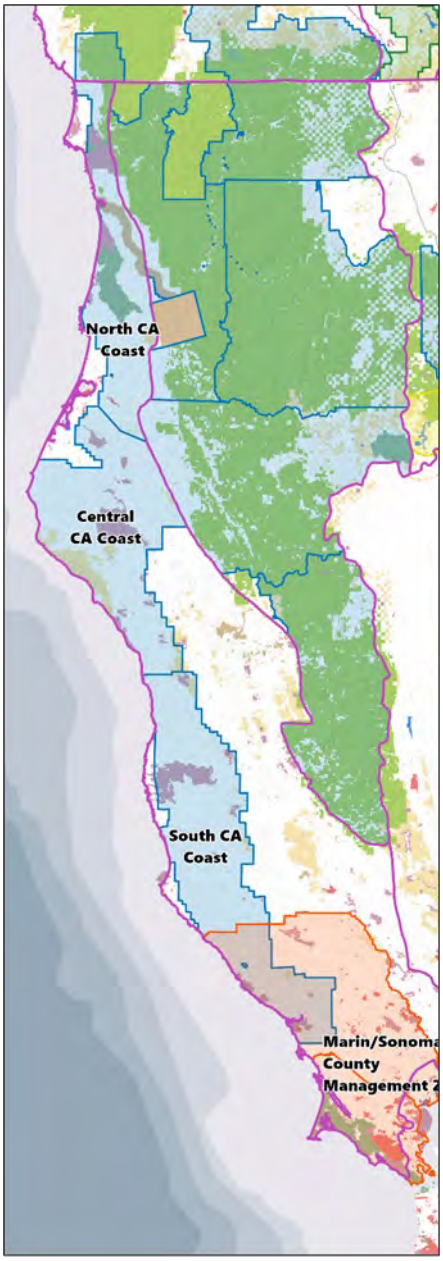
managed for older forest over the last decades, this is the likely location of some of the best habitat conditions.

A4.8. California Coast Province

A4.8.A Background:

A4.8.A.1 Spotted Owl Condition in the California Coast Province:

The California Coast Province includes the southern most extent of the range of the northern spotted owl. The province extends from the Oregon California border south to the San Francisco Bay area. Forest capable land in the province is predominantly privately owned. There is a smaller percentage of Federal lands; with one percent being managed by the Forest Service, three percent by the National Park Service, five percent by the BLM. Approximately one percent is under Tribal management with nice percent in State and local government. Federally managed land is concentrated in the northern portion of the province. Federal lands in the province include approximately 127,902 acres of northern spotted owl NRF habitat.



Forest cover in the province is dominated by coastal redwood and mixed evergreen or Douglas-fir-tanoak communities. Forest cover is more contiguous in the northern portion of the province and becomes more limited by topographic conditions in the southern portions, with drier and hotter south aspect slopes more commonly grassland or shrubland. In the far southern portion of the province this results in discrete patches of forest cover.

The Green Diamond Demography Study Area provides the most relevant inference on spotted owl population trends in the province. Experimental barred owl removal began on a subset of the Demography Study Area in 2009 (Diller et al. 2016). Monitoring efforts indicate that spotted owl occupancy at historic territories have declined substantially in the control parts of the Demography Study Area and are expected to reflect general trends in the northern to-thirds of the province (Franklin et al. 2021).

Spotted owl densities show a strong gradient of low numbers in the north with some areas experiencing local extirpation (e.g. Redwood National Park) and higher densities in the south. The southern portion of the northern spotted owl range in Marin County supports a stable population of northern spotted owl. The break in forested habitat between Marin and Sonoma and Napa Counties to the north may

limit northern spotted owl gene flow and also provide a possible factor in the slow growth in the number of barred owls in Marin.

A4.8.A.2 Barred Owl Condition in the Province:

There are no barred owl specific population estimates available; however various studies in the province give some inference. Barred owl numbers appear to have steadily increased in the northern parts of the province as their apparent southward migration progresses (Franklin et al. 2021), but become less common in the south, with Marin County apparently relatively barred owl free.

A4.8.B Management Strategy

A4.8.B.1 Site management in California Coast Province

A4.8.B.1.a Background:

Maintaining the existing northern spotted owl population to the maximum extent possible will provide for greater potential for recruitment and population expansion. In addition, preventing establishment of a barred owl population in Sonoma and Marin Counties will support the maintenance of spotted owl populations there and should be more effective than waiting to control barred owls until they have a measurable effect on spotted owl populations (See Sonoma and Marin Special Management Area below)

- Managing occupied spotted owl sites retains the existing population and increases the potential for recruitment of young.
- Managing barred owls in occupied northern spotted owl sites provide the nexus for source populations for recolonization of areas where barred owl management occurs (e.g. FMA).
- Maintaining spotted owl sites distributed across the province, whether within block management areas or not, will reduce the risk of loss of spotted owls in the province from catastrophic events, such as wildfire, by spreading sites across the area. Managing spotted owl sites also provides the opportunity for maintaining spotted owls in areas where block management is not feasible or recommended. This approach applies across the entire province, whether or not the locations are within a GMA or other mapped designation.
- These sites may serve to increase potential connectivity between and within block management areas, and provide reproductive sites in the vicinity of blocked management areas that can interact at a demographic level with those management areas.
- Spotted owl site management, due to its smaller size when compared to block management, provides a wider range of options for landowner contribution to barred owl managements, particularly smaller landowners.

Selection of spotted owl sites for management

Although greatly reduced from historical numbers, the California Coast Province retains a comparatively large number of occupied spotted owl territories. The primary focus of spotted owl site management in this province is on active, or recently active sites, where recolonization of sites after barred owl removal is more likely. This is reflected in the priorities for site management.

Spotted Owl Site Management Priorities

Priority	Spotted Owl Site Condition
A	Sites that have are occupied by resident spotted owls (pair or single), or where there have been detections of spotted owls (not reaching resident status).
B	Sites that are not currently occupied by resident spotted owls (pair or single) but have been in the past five years.
C	Sites with spotted owl occupancy between five to ten years ago, whether or not they have been surveyed recently.
D	Areas with sufficient high-quality habitat to support a spotted owl site, whether surveyed recently or not.

Other considerations for selection of spotted owl sites for management:

If site management cannot be initiated on all sites, we recommend the following be considered in selecting the specific spotted owl sites for management.

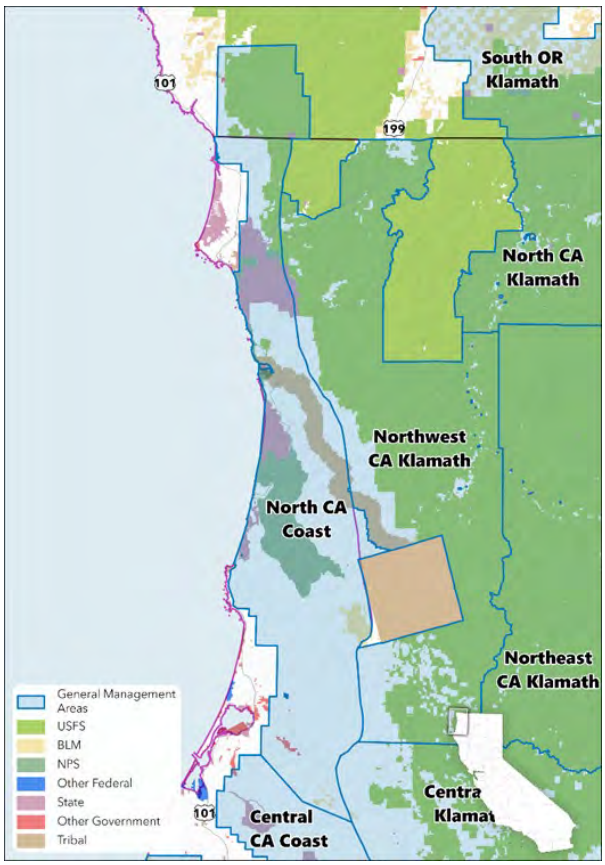
- Focus first on sites with recent occupancy by pairs, then singles, then detections.
- Consider past reproductive history of the site. Select sites with a history of reproduction on the site where surveys are available.
- Consider the condition of habitat in the area, particularly loss of habitat to fire or other actions since the last surveys. Sites where much of the habitat has been removed, from high severity fire or timber harvest would be a lower priority.

A4.8.B.1.b. Management Recommendations:

Within each individual site, remove barred owls from an area at least 2,217 acres in the redwood zone and 7,645 acres in the mixed-conifer zone and. This represents the area in a circle of 1.5 times the home range radii (Table 1). This can be distributed in a circle around the core area, or implementers can use local knowledge, topography, and habitat condition to design an area of the appropriate size that provides the best conditions for barred owl management. In areas where spotted owl sites are isolated, and particularly for sites in Priority A condition (see table above), we recommend a larger management area, 8,867 to 20,582 acres (3 home range radii).

A4.8.B.2 General Management Areas

A4.8.B.2.a North California Coast GMA- Priority A



This GMA includes a small portion of the Oregon Klamath province that is otherwise isolated from other large forest patches. The GMA is bounded by the California Coastal range along the east, the Pacific Ocean along the west, and extends to just south of Arcata. It includes 29 percent Federal forest capable lands primarily National Park Service and National Forest, 8 percent State land and the remainder in private ownership. Although dominated by private ownership, this GMA includes the largest areas of Federal lands in the California Coast Province, including Redwood National Park. It also includes several large California State Parks.

This GMA was mapped for the following reasons:

- Considered important area for inter-Province movement of spotted owls.
- Presence of State and National Parks.
- Includes portions of the Green Diamond Demography Study Area.
- Includes areas where historic and ongoing experimental barred owl removal has occurred.

Description of the elements considered in mapping: In mapping the boundaries of the North California Coast GMA we used information on the following elements.

Spotted Owl Data:

- Maximize current "habitat" forest cover type to forest capable ratio.
- Spotted owl habitat extent from Northwest Forest Plan Northern Spotted Owl Effectiveness Monitoring program.
- Green Diamond population study area and barred owl removal experimental treatment.

Conditions:

- Availability of access via roads and trails in most of this area.
- The location of neighboring GMAs, and the ability of this GMA to provide connectivity to GMAs in the Oregon and California Klamath Provinces
- Federal and State ownership.

Other Considerations:

- Excludes non-forest valley bottoms and developed areas when practical while minimizing perimeter/interior rations.
- Heterogenous forest cover and mixed patch sizes limited ability to draw independent but still logical GMA, resulting in fairly contiguous individual GMA.

Focal Management Areas (FMAs)

In this GMA, we recommend developing FMAs large enough to potentially support 50 spotted owl pair sites and generally spaced no further than 12 to 15 miles from another FMA when feasible.

Generally, larger blocky areas provide a smaller edge-to-area ratio, and this may help reduce the influx of barred owls from outside the FMA in the future. However, where the landscape or forest conditions do not allow this, smaller or more sinuous areas may be appropriate; particularly when considering fire refugia locations.

Where smaller areas are developed due to topography, forest condition, access, funding limitations, or other reasons, we recommend these be closer together and multiple areas designed with the intent of encouraging exchange of spotted owls between these smaller areas. Where possible, when setting up smaller areas due to funding, design them such that they could be expanded in the future if funding becomes available.

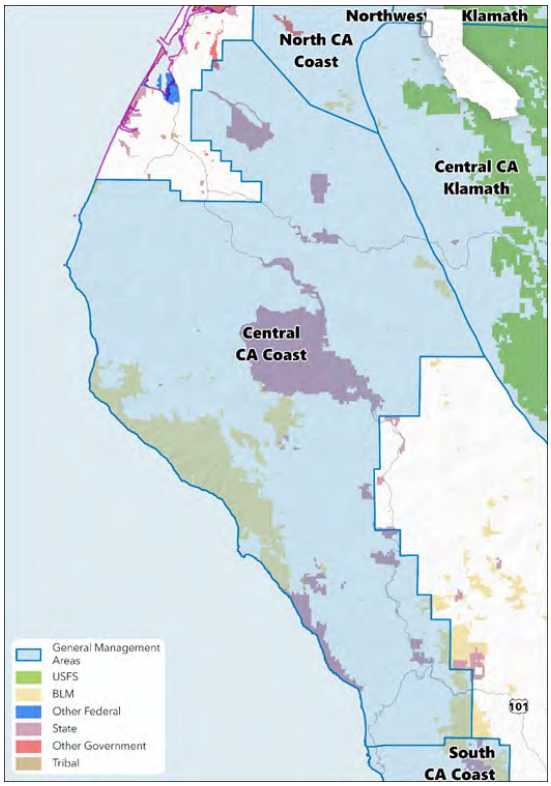
Priorities: The following is our recommended priorities for defining and selecting FMAs within the North California Coast GMA. The following are in general priority order, however, local expertise will be important in applying these to specific FMA boundary designs.

1. Build FMAs around current occupied spotted owl sites. This provides a nucleus of spotted owls for the potential recolonization of sites within the FMA as barred owl numbers are reduced.
2. Focus on areas with reasonable access, in terms of road networks where available, and trail systems where roads do not exist. Avoid large areas without roads or trails. Closed roads may be used similar to a trail system if they can be safely walked.
3. Consider fire risk in mapping the boundaries of the FMAs. Resistance to uncharacteristic wildfire should be considered in placing boundaries. Placement of multiple FMAs within the GMA would reduce the risk of complete loss.
4. Place blocks where the best spotted owl habitat remains, and on blocks allowing for the maximum number of spotted owls to be supported. Focus on areas with the potential for at least 20 spotted owl pairs, though 50 pair sized areas are the target where possible.
5. Include lands of interested or willing landowners or land managers. A focus on areas where landowners have expressed interest in barred owl management will speed the implementation of actual barred owl management and encourage involvement.

6. Include areas with high-quality historic spotted owl sites (sites with no confirmed occupancy in the last five years or more). These are areas that have been shown by past use to be attractive to spotted owls and therefore more likely to be reoccupied as spotted owl populations.
7. Consider the potential for connection to other FMAs in the GMA, and to neighboring GMAs. Placement of FMAs within close proximity to other GMAs, and where there is forest that may provide connection to the Western Washington Cascades through low passes, can connect populations in these areas.
8. Consider the presence of areas already designated for spotted owl management, such as Late Successional Reserves under the Northwest Forest Plan. Including these areas provides support for spotted owls and limits impacts on other resources. As many of these have been managed for older forest over the last decades, this is the likely location of some of the best habitat conditions.

A4.8.B.2.b Central California Coast – Priority B

39This GMA is contiguous with the North California GMA on the north, bounded by the California Coastal range along the east, the Pacific Ocean along the west and is contiguous with the south California coast GMA. Land ownership in the area is predominantly private with small amounts of BLM (11%) and State (9%) forest capable lands.



This GMA was mapped for the following reasons:

- It provides east-west connection to the forested areas in the adjacent province.
- It provides north south connection between GMA in the Province.
- It includes relatively contiguous large patches of older forest cover.

<u>Description of the elements considered in mapping:</u>
In mapping the boundaries of the California Coast GMA we used information on the following elements.

Spotted Owl Data:

- Maximization of current "habitat" forest cover type to forest capable ratio.
- Relative density of nesting-roosting cover type data from Northwest Forest Plan spotted owl effectiveness monitoring.

Conditions:

- The location of neighboring GMAs, and the ability of this GMA to provide connectivity to the south.
- Patchy forest cover/forest capable lands along the eastern boundary of the GMA.

Other Considerations:

- Excludes non-forest valley bottoms and developed areas when practical while minimizing perimeter/interior rations.
- Heterogenous forest cover and mixed patch sizes limited ability to draw independent but still logical GMA, resulting in fairly contiguous individual GMA.

Focal Management Areas (FMAs)

In this GMA, we recommend developing FMAs large enough to potentially support 50 spotted owl pair sites and generally spaced no further than 12 to 15 miles from another FMA when feasible.

Generally, larger blocky areas provide a smaller edge-to-area ratio, and this may help reduce the influx of barred owls from outside the FMA in the future. However, where the landscape or forest conditions do not allow this, smaller or more sinuous areas may be appropriate; particularly when considering fire refugia locations.

Where smaller areas are developed due to topography, forest condition, access, funding limitations, or other reasons, we recommend these be closer together and multiple areas designed with the intent of encouraging exchange of spotted owls between these smaller areas. Where possible, when setting up smaller areas due to funding, design them such that they could be expanded in the future if funding becomes available.

Particularly in the western portion of the GMA consider access (roads and trails).

Priorities: The following is our recommended priorities for defining and selecting FMAs within the California Coast GMA. The following are in general priority order, however, local expertise will be important in applying these to specific FMA boundary designs.

1. Build FMAs around current occupied spotted owl sites. This provides a nucleus of spotted owls for the potential recolonization of sites within the FMA as barred owl numbers are reduced.
2. Focus on areas with reasonable access, in terms of road networks where available, and trail systems where roads do not exist. Avoid large areas without roads or trails. Closed roads may be used similar to a trail system if they can be safely walked.
3. Recognize gradient in barred owl densities. In moderate-high density areas identify block management areas to initiate barred owl removal and northern spotted owl recovery, followed by efforts to expand area removals and/or site-specific management outside of

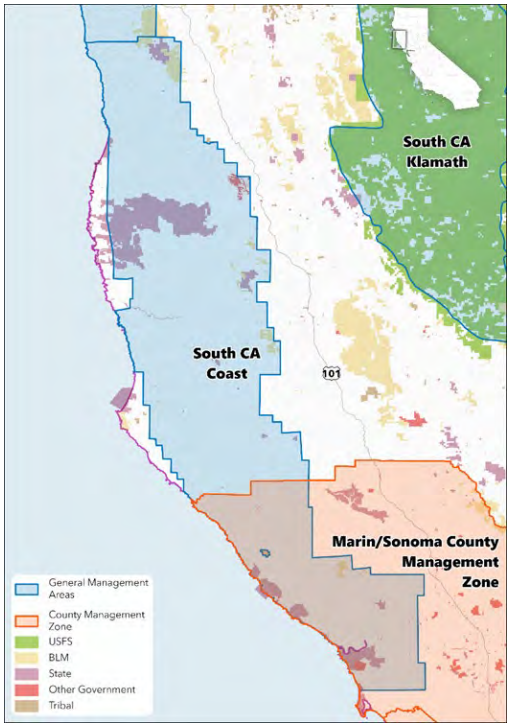
initial blocks. Consider spatial isolation/connectivity of northern spotted owl areas to facilitate dispersal and recolonization.

4. Place blocks where the best spotted owl habitat remains, and on blocks allowing for the maximum number of spotted owls to be supported. Focus on areas with the potential for at least 20 spotted owl pairs, though larger is better.
5. Include lands of interested or willing landowners or land managers. A focus on areas where landowners have expressed interest in barred owl management will speed the implementation of actual barred owl management and encourage involvement.
6. Include areas with high-quality historic spotted owl sites (sites with no confirmed occupancy in the last five years or more). These are areas that have been shown by past use to be attractive to spotted owls and therefore more likely to be reoccupied as spotted owl populations.
7. Consider the potential for connection to other FMAs in the GMA, and to neighboring GMAs. Placement of FMAs within close proximity to other GMAs, and where there is forest that may provide connection to the Western Washington Cascades through low passes, can connect populations in these areas.
8. Consider the presence of areas already designated for spotted owl management, such as Late Successional Reserves under the Northwest Forest Plan. Including these areas provides support for spotted owls and limits impacts on other resources. As many of these have been managed for older forest over the last decades, this is the likely location of some of the best habitat conditions.

A4.8.B.2.c. South California Coast GMA – Priority C

The South California Coast GMA is contiguous with the Central California Coast GMA in the north to approximately the southern extent of Sonoma County. There is very little Federal land (2%) or State/local government managed land (17%) in this GMA, with 82% of forest land in private ownership.

- Excludes non-forest areas and developed areas when practical while minimizing perimeter/interior rations.
- Heterogenous forest cover and mixed patch sizes limited ability to draw independent but still logical GMA, resulting in fairly contiguous individual GMA.
- Maximize current “habitat” forest cover type to forest capable ratio.
- Provide North-South connectivity.



Description of the elements considered in mapping:
In mapping the boundaries of the South California Coast GMA we used information on the following elements.

Spotted Owl Data:

- Maximization of current "habitat" forest cover type to forest capable ratio.
- Relative density of nesting-roosting cover type data from Northwest Forest Plan spotted owl effectiveness monitoring.

Conditions:

- Predominantly privately owned lands Only small areas of Federal lands or State/local government-managed lands.
- The location of neighboring GMAs, and the ability of this GMA to provide connectivity to the south.

Other Considerations:

- Excludes non-forest valley bottoms and developed areas when practical while minimizing perimeter/interior rations.
- Heterogenous forest cover and mixed patch sizes limited ability to draw independent but still logical GMA, resulting in fairly contiguous individual GMA.

Focal Management Areas (FMAs)

In this GMA, we recommend developing FMAs large enough to potentially support 50 spotted owl pair sites and generally spaced no further than 12 to 15 miles from another FMA when feasible.

Generally, larger blocky areas provide a smaller edge-to-area ratio, and this may help reduce the influx of barred owls from outside the FMA in the future. However, where the landscape or forest conditions do not allow this, smaller or more sinuous areas may be appropriate; particularly when considering fire refugia locations.

Where smaller areas are developed due to topography, forest condition, access, funding limitations, or other reasons, we recommend these be closer together and multiple areas designed with the intent of encouraging exchange of spotted owls between these smaller areas. Where possible, when setting up smaller areas due to funding, design them such that they could be expanded in the future if funding becomes available.

Priorities: The following is our recommended priorities for defining and selecting FMAs within the Central California Coast GMA. The following are in general priority order, however, local expertise will be important in applying these to specific FMA boundary designs.

1. Include lands of interested or willing landowners or land managers. A focus on areas where landowners have expressed interest in barred owl management will speed the implementation of actual barred owl management and encourage involvement.

2. Build FMAs around current occupied spotted owl sites. This provides a nucleus of spotted owls for the potential recolonization of sites within the FMA as barred owl numbers are reduced.

3. Recognize gradient in barred owl densities. In moderate-high density areas identify block management areas to initiate barred owl removal and northern spotted owl recovery, followed by efforts to expand area removals and/or site-specific management outside of initial blocks. Consider spatial isolation/connectivity of northern spotted owl areas to facilitate dispersal and recolonization.
4. Focus on areas with reasonable access, in terms of road networks where available, and trail systems where roads do not exist. Avoid large areas without roads or trails. Closed roads may be used similar to a trail system if they can be safely walked.

5. Consider fire risk in mapping the boundaries of the FMAs. Resistance to uncharacteristic wildfire should be considered in placing boundaries. Placement of multiple FMAs within the GMA would reduce the risk of complete loss.

6. Place blocks where the best spotted owl habitat remains, and on blocks allowing for the maximum number of spotted owls to be supported. Focus on areas with the potential for at least 20 spotted owl pairs, though larger is better.

7. Include lands of interested or willing landowners or land managers. A focus on areas where landowners have expressed interest in barred owl management will speed the implementation of actual barred owl management and encourage involvement.

8. Include areas with high-quality historic spotted owl sites (sites with no confirmed occupancy in the last five years or more). These are areas that have been shown by past use to be attractive to spotted owls and therefore more likely to be reoccupied as spotted owl populations.

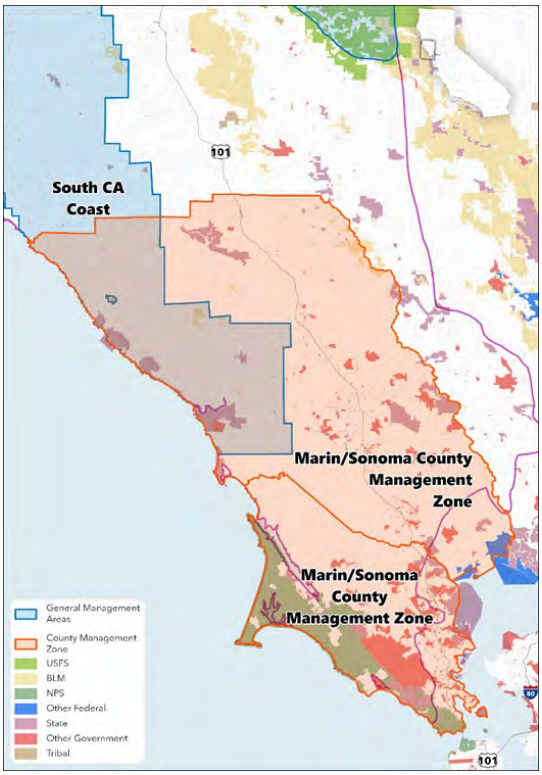
9. Consider the potential for connection to other FMAs in the GMA, and to neighboring GMAs. Placement of FMAs within close proximity to other GMAs, and where there is forest that may provide connection to the Western Washington Cascades through low passes, can connect populations in these areas.

10. Consider the presence of areas already designated for spotted owl management, such as Late Successional Reserves under the Northwest Forest Plan. Including these areas provides support for spotted owls and limits impacts on other resources. As many of these have been managed for older forest over the last decades, this is the likely location of some of the best habitat conditions.

A4.8.B.3 Special Designated Areas:

A4.8.B.3.a Marin/Sonoma County Management Zone. Priority A

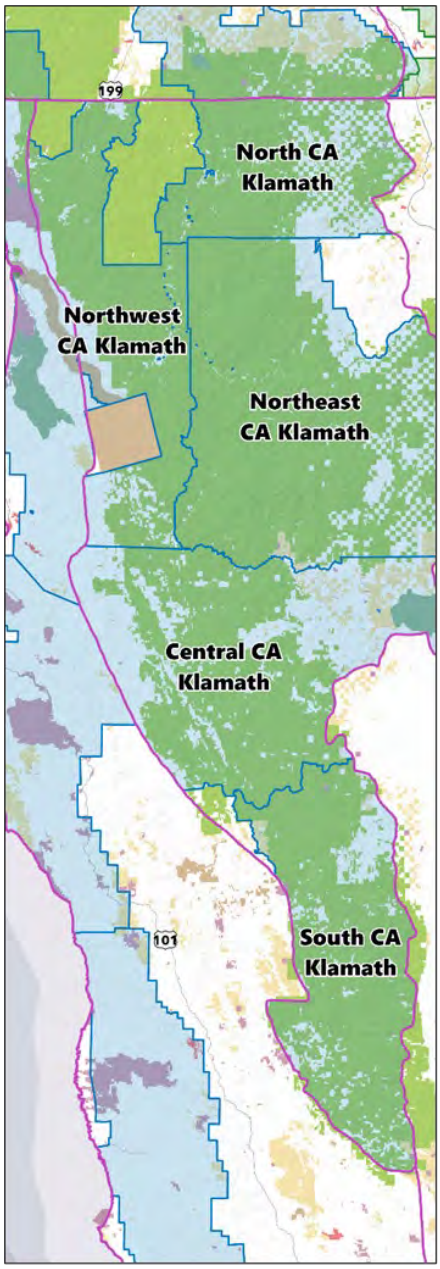
Conditions in Marin and Sonoma County are substantially different than the rest of the northern spotted owl range. Barred owls are present in small numbers and have not yet established significant populations. The remaining spotted owl habitat is found in blocks of limited size managed by different agencies and landowners. Management focus in this area is on preventing barred owls from becoming established and displacing the remaining spotted owls. Therefore, barred owls should be removed from the land of willing landowners and land managers anywhere within these counties when they are detected, regardless of presence of northern spotted owls or historic use of an area.



A4.9. California Klamath Province

A4.9.A Background:

A4.9.A.1 Spotted Owl Condition in the California Klamath Province:



This physiographic province for the northern spotted owl is the largest in California, encompassing approximately six million acres. It extends from the Oregon border south to the Clear Lake Basin in the Inner Coast Range. It lies between the California Coast and California Cascades Provinces and is bordered to the north by the Oregon Klamath Province. Most of the lands in both past and current large-scale conservation plans are considered essential to the owl's conservation. This is because these areas help maintain habitat linkages, provide demographic support among populations, support dispersal, maintain the potential for genetic interchange between populations, and temper (to a certain extent) the adverse impacts from interference competition with barred owls.

Land management is primarily Federal (Forest Service, Bureau of Land Management (Redding BLM) and the National Park Service (Whiskeytown National Recreation Area)). There are several moderate to large-sized wilderness areas in the western extent on Forest Service lands. Private industrial timberlands are also intermixed, resulting in an extensive checkerboard ownership pattern throughout the eastern extent of the province. In addition, there are numerous non-industrial timber land managers and private landowners. Approximately nine percent of the province is managed by the Forest Service, Bureau of Land Management, and National Park Service. Approximately six percent is managed by the State, with the remainder being in private lands. Based on an assessment of habitat conditions after the 2021 wildfire season, there is an approximate 1.6 million acres of nesting/roosting habitat and 915,373 acres of foraging habitat in the California Klamath province on Federal lands (Davis et al. 2022).

The forest landscapes in this province are unique due to complex interactions among topography, land surface forms (e.g., forests, grasslands), forest and vegetation types, and regional climate. The steep, dissected topography dominates much of this landscape, generally resulting in more flammable fuels on southwest aspects and in upper slope positions, where more severe fires occur (Taylor and Skinner 1998 pp. pp. 291-292). There are cool wet winters and hot dry summers. These conditions result in productive forests that historically experienced frequent fires that ranged in severity and size. Forests on the eastside of

the province is more fragmented, and characterized by a checkerboard of Federal and private ownerships where management regimes have exacerbated habitat fragmentation.

Northern spotted owls in this region are associated with landscapes containing mosaics of vegetation types. Occupied sites, in particular, show a high degree of vegetative heterogeneity with more variable patch sizes and more perimeter edge than other regions (Franklin and Gutiérrez 2002 p. 212). In the Klamath region, ecotones, or edges between older forests and other seral stages, likely contribute to improved access to prey (Franklin and Gutiérrez 2002 p. 215).

There have been a series of larger mixed severity fires between 2014 and 2023. Several high severity fires have occurred in 2020. The monitoring of spotted owl nesting/roosting cover type shows an "even" trend in the loss of nesting/roosting forest and an increase in this same cover type from ingrowth between 1986 and 2017, though habitat fragmentation has increased (Davis et al. 2022, Figure 7, p. 15).

The Northwestern California Demography Study Area is the only long-term demography study area in the province. The study area associated with the Hoopa Valley Reservation also provides important population trend data. In 2014, the northern spotted owl population in the province was considered a source population for the range, as barred owl density was relatively low to moderate compared to other provinces (Schumaker et al. 2014 p. 587). The most recent meta-analysis reflected this trend with a decrease in northern spotted owls and increase in barred owls beginning shortly before 2013 (Franklin et al. 2021-Figure 9). In California, the estimated population sizes in 2017 had declined by approximately 50 percent relative to those in 1995 for the demography study area (Franklin et al. 2021). When discontinued in 2022, there were 19 pairs of owls on the Northwestern California Demography Study Area demographic study area, with 74 territories were presumed unoccupied (Franklin et al. 2022, p. 18, Table 2).

A4.9.A.2 Barred Owl condition in the California Klamath Province:

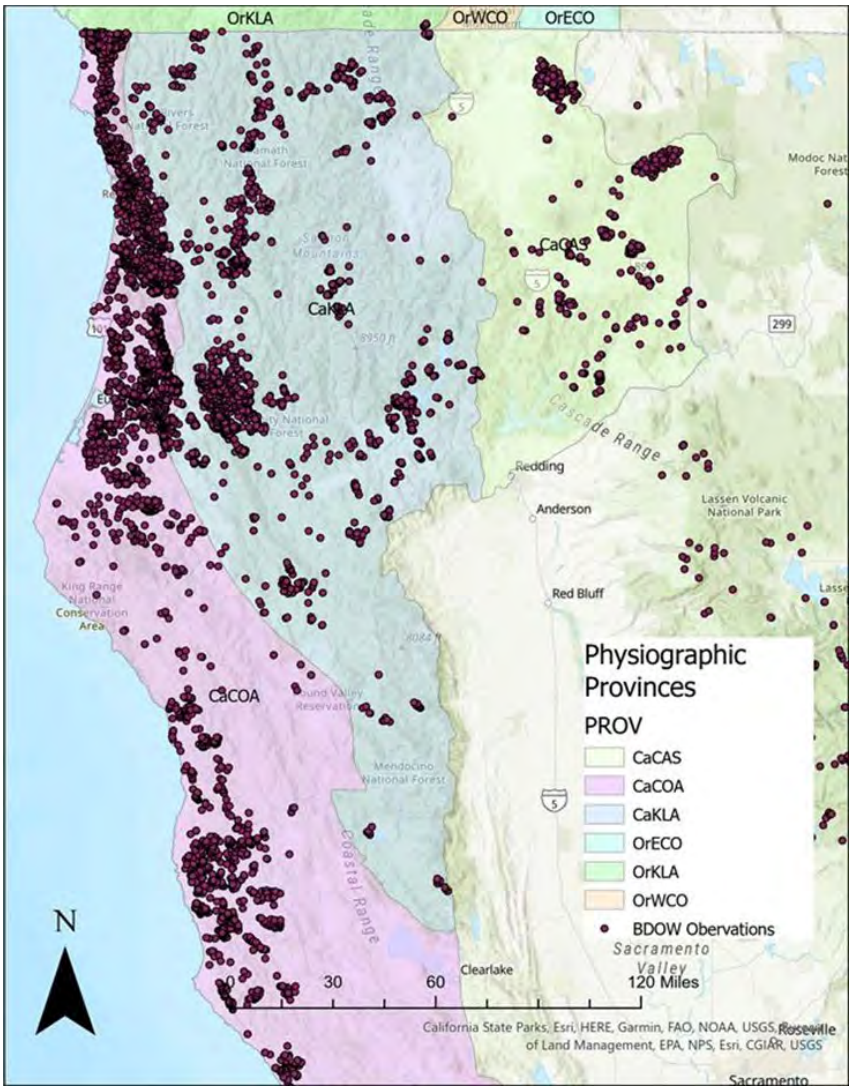
There are no barred owl specific population estimates available; however various studies in the province provide some inference. Barred owls were first detected in the Northwest California Demography Study Area in 1991 with the first nesting pair detected in 1999 (Franklin et al. 2022, p. 10). Their numbers in the province have steadily increased as their apparent southward and eastward migration from the California Coastal province has progressed (Franklin et al. 2022, 2021, Lesmeister et al. 2022, Wiens et al. 2021). In 2021, 53 spotted owl territories in the Northwest California Demography Study Area had barred owl detections, an increase from 2019 and 2020.

In the Northwest California Demography Study Area, the number of barred owl sites has increased dramatically over the last decade, with current detections in almost 75 percent of the Study Area. Based on the results from consistent barred owl surveys from 2009 to 2019, there appeared to be a continued increase in the number of barred owls detected and an increase in the number of northern spotted owl territories where barred owls were also detected. The number of spotted owls in the study area did decline further in 2020 however, suggesting the stability between 2014 and 2020 was short term. Based on raw numbers alone, 20 individual northern

spotted owls (10 pairs) were detected in 2021, representing a 73 percent reduction in their population since 1991 when barred owls were first detected (Franklin et al. 2022, p. 12).

Based on the above data and continued work in the Hoopa Demography Study Area, that barred owl densities continue to increase in the province, with an observed trend in dispersal/movement from the California Coastal Province along the Trinity and Klamath Rivers to areas inland. Similar trends may be occurring in the southern portion of the province on the Mendocino National Forest. Project-level survey detections on Forest Service lands in the northern extent of the province have increased over the last five years (J. Allen, pers. comm., January 11, 2023). Barred owl removal experiments have been ongoing for 10 years on the Hoopa Valley Reservation and on Sierra Pacific Industries lands since 2014.

Map A4-1. Barred owl detections in the California Klamath Province 1990 to 2022. This distribution partially reflects the location of survey efforts for spotted owls.



A4.9.B Management Strategy

A4.9.B.1 Site management in the California Klamath Province

A4.9.B.1.a Background:

Maintaining the existing northern spotted owl population to the maximum extent possible will provide for greater potential for recruitment and population expansion.

- Managing occupied northern spotted owl sites retains the existing population and increases the potential for recruitment of young.
- Managing barred owls in occupied northern spotted owl sites provides the nexus for source populations that can contribute to recolonization of areas where barred owl management occurs (e.g. FMA).
- Maintaining northern spotted owl sites distributed across the province, whether in block management areas or not, will reduce the risk of losing northern spotted owls in the province from catastrophic events, such as wildfire, by spreading sites across the area.
- Managing northern spotted owl sites also provides an opportunity for maintaining northern spotted owls in areas where block management is not feasible or recommended. This approach applies across the entire province, whether or not the locations are in a GMA or other mapped designation.
- These sites may serve to increase potential connectivity between and within block management areas, and provide reproductive sites in the vicinity of block management areas that can interact at a demographic level. This is considered particularly important in the northern and northwestern portion of the California Klamath province where connection between the California Coast and Oregon Klamath provinces occurs.
- Site management for northern spotted owls, due to its smaller size when compared to block management, also provides a wider range of options for landowner contribution to barred owl managements, particularly smaller landowners.

Selection of northern spotted owl Sites for Management

Although reduced from its historical numbers by both land management actions (timber harvest) and larger intense wildfires between 2014 and 2023, the California Klamath Province retains a comparatively large number of occupied northern spotted owl territories. The primary focus of northern spotted owl site management in the province is on active, or recently active sites, where recolonization of sites after barred owl removal is more likely. This is reflected in the priorities for site management.

Spotted Owl Site Management Priorities

Priority	Spotted Owl Site Condition
A	Sites that have are occupied by resident spotted owls (pair or single), or where there have been detections of spotted owls (not reaching resident status).
B	Sites that are not currently occupied by resident spotted owls (pair or single) but have been in the past five years.
C	Sites with spotted owl occupancy between five to ten years ago, whether or not they have been surveyed recently.
D	Areas with sufficient high-quality habitat to support a spotted owl site, whether surveyed recently or not.

Other considerations for selection of spotted owl sites for management:

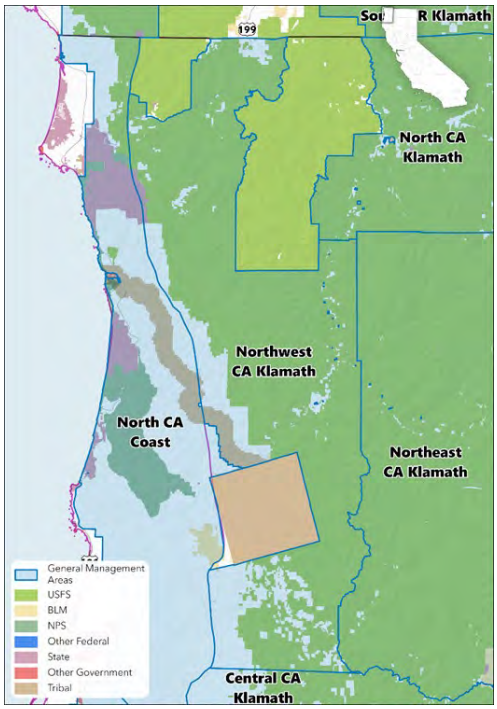
If site management cannot be initiated on all sites, we recommend the following be considered in selecting the specific spotted owl sites for management.

- Focus first on sites with recent occupancy by pairs, then singles, then detections.
- Consider past reproductive history of the site. Select sites with a history of reproduction on the site where surveys are available.
- Consider the condition of habitat in the area, particularly loss of habitat to fire or other actions since the last surveys. Sites where much of the habitat has been removed, from high severity fire or timber harvest, would be a lower priority.

A4.9.B.1.b Management Recommendations:
Within each individual site, remove barred owls from an area between 7,645 and 13,592 acres. This represents the area in a circle of 1.5 and 2 home range radii (Table 1). This can be distributed in a circle around the core area, or implementers can use local knowledge, topography, and habitat condition to design an area of the appropriate size that provides the best conditions for barred owl management.

A4.9.B.2 General Management Areas in the California Klamath Province

A4.9.B.2.a Northwest California Klamath GMA – Priority A



The Northwest California Klamath GMA includes approximately 817,400 acres. It is located in the northwestern extent of the province with the California Coast province to the west and the Oregon Klamath province to the north. It includes 82 percent Federal lands (BLM and Forest Service) and the remainder primarily in private ownership.

This GMA was mapped for the following reasons:

- Relatively robust northern spotted owl populations.
- Current northern spotted owl occupancy information in most places.
- There are ongoing barred owl research in portions of the GMA which can be continued and easily expanded.
- The California Department of Fish and Wildlife's Barred Owl Science Team identified the Six Rivers National Forest as the highest priority for barred owl removal in the interim removal strategy.
- The Northwest California Klamath GMA overlaps a portion of the Northwestern California Demography Study Area, with its historic and recent spotted owl data.
- It is considered Priority A in order to implement actions immediately to prevent extinction or extirpation of northern spotted owls in a significant area of the province. This allows for focus on areas at the highest risk in the province.

Description of the elements considered in mapping: In mapping the boundaries of the Northwest California Klamath GMA we used information on the following elements.

Spotted Owl Data:

- Relatively robust northern spotted owl populations.
- Current, annual reporting on northern spotted owl occupancy in some places from the Forest Service and private industrial timberland managers.
- Overlaps a portion of the Northwestern California Demography Study Area.

Conditions:

- Key location adjacent the California Coastal province.
- Potential for connectivity across three provinces.
- Most compact GMA total area and habitat value is high.

Other Considerations:

- Proximity to existing barred owl management areas (Green Diamond Resource Company, Hoopa Valley Tribal Forestry).
- Includes northwestern portion of the Klamath National Forest, and a portion of the Six Rivers National Forest.

Focal Management Areas (FMAs) for the Northwest California Klamath GMA

In the Northwest California Klamath GMA, we recommend developing FMAs large enough to potentially support 50 spotted owl pair sites and generally spaced no further than 12 to 15 miles from another FMA when feasible. Generally, larger block areas provide a smaller edge-to-area ratio. This may help reduce the influx of barred owls from outside an FMA in the future. However, where the landscape or forest conditions do not allow this, smaller or more sinuous areas may be appropriate; particularly when considering fire refugia locations.

Where smaller FMAs are developed due to topography, forest condition, access, funding limitations, or other reasons, we recommend these be closer together and multiple areas designed with the intent of encouraging exchange of spotted owls between these smaller areas. Where possible, when setting up smaller areas due to funding, design them such that they could be expanded in the future if funding becomes available.

As described in the background section, the California Klamath province is considered a mixed-severity, frequent fire regime. We recommend FMA locations take fire refugia and uncharacteristic fuel conditions into account in order to include areas more likely to retain forest cover conditions associated with northern spotted owl habitat.

Priorities: The following is our recommended priorities for defining and selecting FMAs within the Northwest California Klamath GMA. The following are in general priority order, however, local expertise will be important in applying these to specific FMA boundary designs.

1. Build FMAs around current occupied northern spotted owl sites. This provides a nucleus of northern spotted owls for the potential recolonization of sites in the FMA as barred owl numbers are reduced.

2. Focus on areas with reasonable access, in terms of road networks where available, and trail systems where roads do not exist. Avoid large areas without roads or trails. Closed roads may be used similar to a trail system if they can be safely walked.

3. Consider fire risk when mapping FMA boundaries. Resistance to uncharacteristic wildfire should be considered in boundary placement. Placement of multiple FMAs in the GMA could reduce the risk of complete loss.

4. Place FMA blocks where the best northern spotted owl habitat remains, and areas which allow for the maximum number of northern spotted owls to be supported. Focus on designating FMAs in areas with the potential for at least 20 northern spotted owl pairs, though larger is better.

5. Include lands of interested or willing landowners or land managers. A focus on areas where landowners have expressed interest in barred owl management can help expedite implementation of barred owl management and encourage involvement.

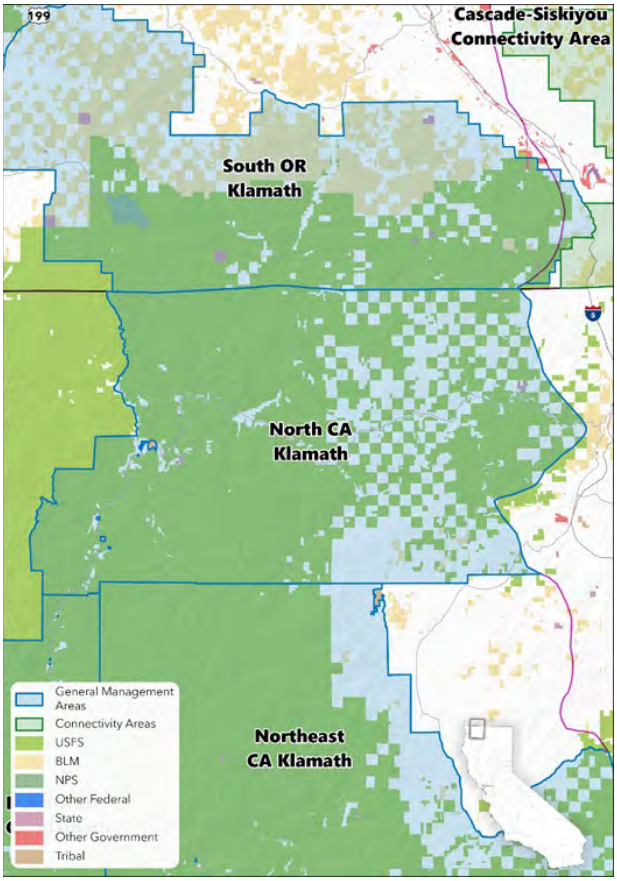
6. Include areas with high-quality historic northern spotted owl sites (sites with no confirmed occupancy in the last five years or more). These are areas that have been shown by past use to be attractive to northern spotted owls and therefore more likely to be reoccupied as populations recover.

7. Consider the potential for connection to other FMAs in the GMA, and to neighboring GMAs. Placement of FMAs in close proximity to other GMAs, and where there is forest that may provide connectivity to the California Coast and interior Klamath Region, can connect populations in these areas.

8. Consider the presence of areas already designated for northern spotted owl habitat management, such as Late-Successional Reserves under the Northwest Forest Plan or the Northern California BLM Resource Management Plan. Including these areas provides support to northern spotted owl and limits impacts on other resources. As many of these have been managed for older forest over the last decades, these are the likely locations higher value habitat.

A4.9.B.2.b North California Klamath GMA – Priority B

The North California Klamath GMA includes approximately 657,293 acres. It is located in the northern part of the province west of Interstate 5 and bounded by the Oregon Klamath province to the north and the California Cascades province to the east. It includes 76 percent Federal lands (BLM and Forest Service) and the remainder primarily in private ownership.



This GMA was mapped for the following reasons:

- Relatively robust northern spotted owl populations.
- Provides connection across and within province and to north Oregon Klamath Province.
- The stabilization of populations here could provide larger nexus with control efforts in the adjacent GMA to west on Green Diamond Resource Company

lands and the Hoopa Valley Reservation.
- Areas affected by large and repeat fires, removing barred owls from areas likely to be fire resistant (refugia) likely to have an out-sized effect on northern spotted owl populations.
- It is considered Priority B in order to implement actions as soon as possible to slow spotted owl population declines in at least some areas.

Description of the elements considered in mapping: In mapping the boundaries of the North California Klamath GMA we used information on the following elements.

Spotted Owl Data:

- Current northern spotted owl occupancy information from the Forest Service and private industrial timberland managers.
- Current, annual reporting on northern spotted owl occupancy in some places.

Conditions:

- Potential for connectivity between two provinces.
- Relative habitat density is low overall and patchily distributed due to vegetation communities, past timber harvest, and fire.

Other Considerations:

- Potential to expand upon existing barred owl monitoring and management efforts.
- Includes the northern portion of Klamath National Forest and just south of the Rogue River-Siskiyou National Forest.

Focal Management Areas (FMAs) for the North California Klamath GMA

In the North California Klamath GMA, we recommend developing FMAs large enough to potentially support 50 spotted owl pair sites and generally spaced no further than 12 to 15 miles from another FMA when feasible. Generally, larger block areas provide a smaller edge-to-area ratio. This may help reduce the influx of barred owls from outside an FMA in the future. However, where the landscape or forest conditions do not allow this, smaller or more sinuous areas may be appropriate; particularly when considering fire refugia locations.

Where smaller FMAs are developed due to topography, forest condition, access, funding limitations, or other reasons, we recommend these be closer together and multiple areas designed with the intent of encouraging exchange of spotted owls between these smaller areas. Where possible, when setting up smaller areas due to funding, design them such that they could be expanded in the future if funding becomes available.

As described in the background section, the California Klamath province is considered a mixed-severity, frequent fire regime. We recommend FMA locations take fire refugia and uncharacteristic fuel conditions into account in order to include areas more likely to retain forest cover conditions associated with northern spotted owl habitat.

Priorities: The following is our recommended priorities for defining and selecting FMAs within the North California Klamath GMA. The following are in general priority order, however, local expertise will be important in applying these to specific FMA boundary designs.

1. Build FMAs around current occupied northern spotted owl sites. This provides a nucleus of northern spotted owls for the potential recolonization of sites in the FMA as barred owl numbers are reduced.

2. Focus on areas with reasonable access, in terms of road networks where available, and trail systems where roads do not exist. Avoid large areas without roads or trails. Closed roads may be used similar to a trail system if they can be safely walked.

3. Consider fire risk when mapping FMA boundaries. Resistance to uncharacteristic wildfire should be considered in boundary placement. Placement of multiple FMAs in the GMA could reduce the risk of complete loss.

4. Place FMA blocks where the best northern spotted owl habitat remains, and areas which allow for the maximum number of northern spotted owls to be supported. Focus on designating FMAs in areas with the potential for at least 20 northern spotted owl pairs, though larger is better.

5. Include lands of interested or willing landowners or land managers. A focus on areas where landowners have expressed interest in barred owl management can help expedite implementation of barred owl management and encourage involvement.

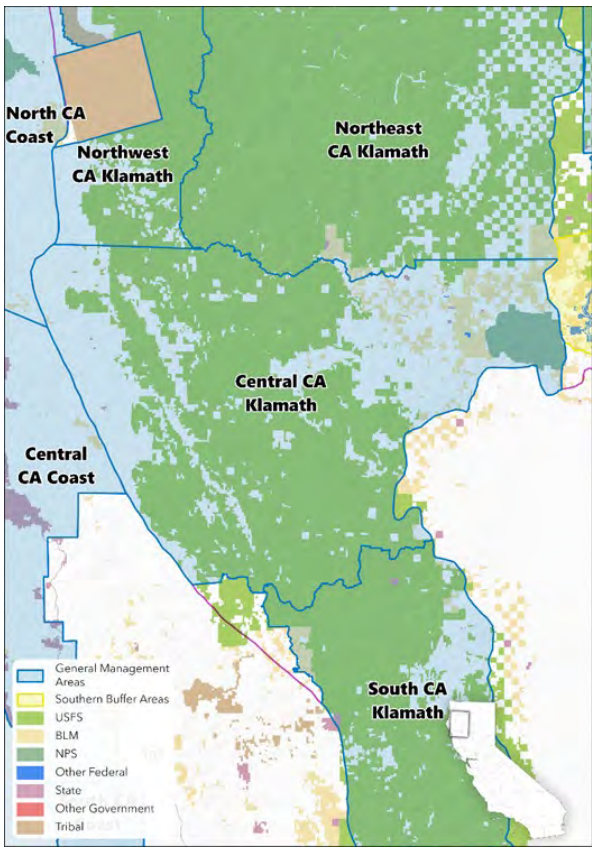
6. Include areas with high-quality historic northern spotted owl sites (sites with no confirmed occupancy in the last five years or more). These are areas that have been shown by past use to be attractive to northern spotted owls and therefore more likely to be reoccupied as populations recover.

7. Consider the potential for connection to other FMAs in the GMA, and to neighboring GMAs. Placement of FMAs in close proximity to other GMAs, and where there is forest that may provide connectivity to the California Coast and interior Klamath Region, can connect populations in these areas.

8. Consider the presence of areas already designated for northern spotted owl habitat management, such as Late-Successional Reserves under the Northwest Forest Plan or the Northern California BLM Resource Management Plan. Including these areas provides support to northern spotted owl and limits impacts on other resources. As many of these have been managed for older forest over the last decades, these are the likely locations higher value habitat.

A4.9.B.2.c Central California Klamath GMA - Priority B

The Central California Klamath GMA includes approximately 1,383,736 acres. It is located in the central extent of the province between Eureka and Redding. It is bounded to the west by the California Coast province and to the northeast by the California Cascades province. It includes 66 percent Federal lands (BLM and Forest Service) and the remainder primarily in private ownership.



This GMA was mapped for the following reasons:

- Areas affected by large and repeat wildfires.
- Site-specific management of occupied sites likely to provide same or better population and movement benefits.
- Adjacent ongoing, high priority barred owl research efforts and northern spotted owl monitoring sites.
- Could provide a buffer against southerly movement by barred owls into higher priority areas.
- Considered an important area to delay or prevent the need for future intensive barred owl management.
- The northwestern extent of the Central California Klamath GMA overlaps a portion of the Northwestern California Demography Study Area, with its historic and recent spotted owl data.
- It is considered Priority B in order to implement actions as soon as possible to slow spotted owl population declines in at least some areas.

Description of the elements considered in mapping: In mapping the boundaries of the Central California Klamath GMA we used information on the following elements.

Spotted Owl Data:

- Current northern spotted owl occupancy information from the Forest Service, private industrial timberland managers, and BLM.
- Overlaps a portion of the Northwestern California Demography Study Area.

Conditions:

- Majority of lands in southern Shasta-Trinity and the Mendocino National Forest with Redding BLM and Sierra Pacific Industries lands in the eastern extent.

- Actual habitat amount substantially lower than the total GMA size.
- Habitat for northern spotted owl is patchy with continuous high value areas predominantly situated near the western border of the GMA.
- Extensive areal extent to capture widely distributed habitat patches.

Other Considerations:

- Maintain areas for North/South population movement.
- Maintain areas for East/West population movement.

Focal Management Areas (FMAs) for the Central California Klamath GMA

In the Central California Klamath GMA, we recommend developing FMAs large enough to potentially support 50 spotted owl pair sites and generally spaced no further than 12 to 15 miles from another FMA when feasible. Generally, larger block areas provide a smaller edge-to-area ratio. This may help reduce the influx of barred owls from outside an FMA in the future. However, where the landscape or forest conditions do not allow this, smaller or more sinuous areas may be appropriate; particularly when considering fire refugia locations.

Where smaller FMAs are developed due to topography, forest condition, access, funding limitations, or other reasons, we recommend these be closer together and multiple areas designed with the intent of encouraging exchange of spotted owls between these smaller areas. Where possible, when setting up smaller areas due to funding, design them such that they could be expanded in the future if funding becomes available.

As described in the background section, the California Klamath province is considered a mixed-severity, frequent fire regime. We recommend FMA locations take fire refugia and uncharacteristic fuel conditions into account in order to include areas more likely to retain forest cover conditions associated with northern spotted owl habitat.

Priorities: The following is our recommended priorities for defining and selecting FMAs within the Central California Klamath GMA. The following are in general priority order, however, local expertise will be important in applying these to specific FMA boundary designs.

1. Build FMAs around current occupied northern spotted owl sites. This provides a nucleus of northern spotted owls for the potential recolonization of sites in the FMA as barred owl numbers are reduced.

2. Focus on areas with reasonable access, in terms of road networks where available, and trail systems where roads do not exist. Avoid large areas without roads or trails. Closed roads may be used similar to a trail system if they can be safely walked.

3. Consider fire risk when mapping FMA boundaries. Resistance to uncharacteristic wildfire should be considered in boundary placement. Placement of multiple FMAs in the GMA could reduce the risk of complete loss.

4. Place FMA blocks where the best northern spotted owl habitat remains, and areas which allow for the maximum number of northern spotted owls to be supported. Focus on designating FMAs in areas with the potential for at least 20 northern spotted owl pairs, though larger is better.

5. Include lands of interested or willing landowners or land managers. A focus on areas where landowners have expressed interest in barred owl management can help expedite implementation of barred owl management and encourage involvement.

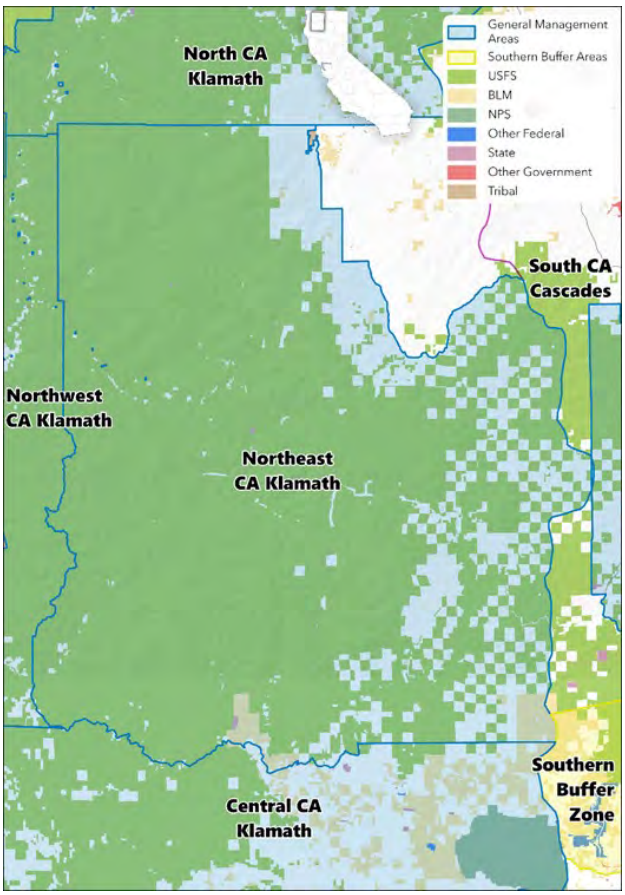
6. Include areas with high-quality historic northern spotted owl sites (sites with no confirmed occupancy in the last five years or more). These are areas that have been shown by past use to be attractive to northern spotted owls and therefore more likely to be reoccupied as populations recover.

7. Consider the potential for connection to other FMAs in the GMA, and to neighboring GMAs. Placement of FMAs in close proximity to other GMAs, and where there is forest that may provide connectivity to the California Coast and interior Klamath Region, can connect populations in these areas.

8. Consider the presence of areas already designated for northern spotted owl habitat management, such as Late-Successional Reserves under the Northwest Forest Plan or the Northern California BLM Resource Management Plan. Including these areas provides support to northern spotted owl and limits impacts on other resources. As many of these have been managed for older forest over the last decades, these are the likely locations higher value habitat.

A4.9.B.2.d Northeast California Klamath GMA – Priority C

The Northeast California Klamath GMA includes approximate 1,607,456 acres. It is the largest GMA in the province, located in the northcentral portion with Interstate 5 to the east and the California Cascades province. It includes 82 percent Federal lands (BLM and Forest Service) and the remainder primarily in private ownership.



This GMA was mapped for the following reasons:

- The majority of the lands are under Federal management (Klamath and Shasta Trinity National Forests), National Park Service (Whiskeytown National Recreation Area) and Redding BLM.
- There are extensive Sierra Pacific Industries lands with an existing HCP on which to supplement barred owl management efforts in the eastern extent of the GMA and provide a buffer to the California Cascades province.
- Areas have been affected by large and repeat wildfires and habitat is patchy, but well-distributed.
- Extensive wilderness areas.
- Site-specific management of occupied sites is likely to provide same or better population and movement benefits.
- The Northeast California Klamath GMA overlaps a portion of the Northwestern California Demography Study Area, and its long-term northern spotted owl data.
- It is considered Priority C in order to implement actions in the near future to establish areas for northern spotted owl populations to stabilize and increase to sustainable levels. This includes efforts to stop ongoing population loss in some management areas and provide opportunities for recolonization.

Description of the elements considered in mapping: In mapping the boundaries of the Northeast California Klamath GMA we used information on the following elements.

Spotted Owl Data:

- Current northern spotted owl occupancy information from the Forest Service and private industrial timberland managers.
- Overlaps a portion of the Northwestern California Demography Study Area.

Conditions:

- Actual habitat amount substantially lower than total GMA size.
- Extensive areal extent to capture habitat patches.
- Relative habitat density is low overall and patchily distributed due to vegetation communities, past timber harvest, and fire.

Other Considerations:

- Maintain areas for north/south population movement.
- Best connection to the California Cascades province.

Focal Management Areas (FMAs) for the Northeast California Klamath GMA

In the Northeast California Klamath GMA, we recommend developing FMAs large enough to potentially support 50 spotted owl pair sites and generally spaced no further than 12 to 15 miles from another FMA when feasible. Generally, larger block areas provide a smaller edge-to-area ratio. This may help reduce the influx of barred owls from outside an FMA in the future. However, where the landscape or forest conditions do not allow this, smaller or more sinuous areas may be appropriate; particularly when considering fire refugia locations.

Where smaller FMAs are developed due to topography, forest condition, access, funding limitations, or other reasons, we recommend these be closer together and multiple areas designed with the intent of encouraging exchange of spotted owls between these smaller areas. Where possible, when setting up smaller areas due to funding, design them such that they could be expanded in the future if funding becomes available.

As described in the background section, the California Klamath province is considered a mixed-severity, frequent fire regime. We recommend FMA locations take fire refugia and uncharacteristic fuel conditions into account in order to include areas more likely to retain forest cover conditions associated with northern spotted owl habitat.

Priorities: The following is our recommended priorities for defining and selecting FMAs within the Northeast California Klamath GMA. The following are in general priority order, however, local expertise will be important in applying these to specific FMA boundary designs.

1. Build FMAs around current occupied northern spotted owl sites. This provides a nucleus of northern spotted owls for the potential recolonization of sites in the FMA as barred owl numbers are reduced.

2. Focus on areas with reasonable access, in terms of road networks where available, and trail systems where roads do not exist. Avoid large areas without roads or trails. Closed roads may be used similar to a trail system if they can be safely walked.

3. Consider fire risk when mapping FMA boundaries. Resistance to uncharacteristic wildfire should be considered in boundary placement. Placement of multiple FMAs in the GMA could reduce the risk of complete loss.

4. Place FMA blocks where the best northern spotted owl habitat remains, and areas which allow for the maximum number of northern spotted owls to be supported. Focus on designating FMAs in areas with the potential for at least 20 northern spotted owl pairs, though larger is better.

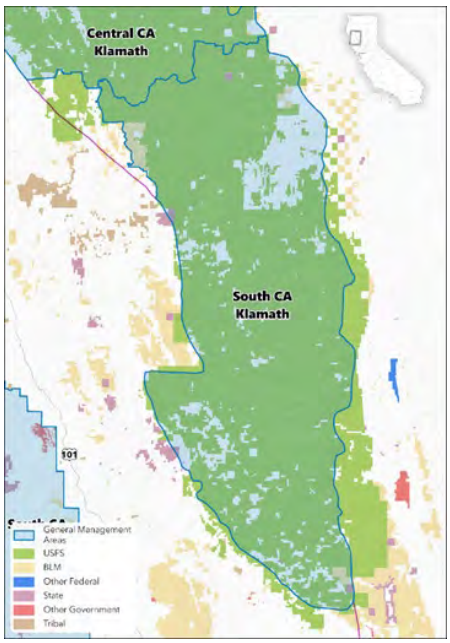
5. Include lands of interested or willing landowners or land managers. A focus on areas where landowners have expressed interest in barred owl management can help expedite implementation of barred owl management and encourage involvement.

6. Include areas with high-quality historic northern spotted owl sites (sites with no confirmed occupancy in the last five years or more). These are areas that have been shown by past use to be attractive to northern spotted owls and therefore more likely to be reoccupied as populations recover.

7. Consider the potential for connection to other FMAs in the GMA, and to neighboring GMAs. Placement of FMAs in close proximity to other GMAs, and where there is forest that may provide connectivity to the California Coast and interior Klamath Region, can connect populations in these areas.

8. Consider the presence of areas already designated for northern spotted owl habitat management, such as Late-Successional Reserves under the Northwest Forest Plan or the Northern California BLM Resource Management Plan. Including these areas provides support to northern spotted owl and limits impacts on other resources. As many of these have been managed for older forest over the last decades, these are the likely locations higher value habitat.

A4.9.B.2.e South California Klamath GMA - Priority C



The South California Klamath GMA includes approximately 987,327 acres. It is a narrow, linear GMA with limited habitat or connectivity to the west or east. It includes 86 percent Federal lands (BLM and Forest Service) and the remainder is primarily in private ownership.

This GMA was mapped for the following reasons:

- This area may have more importance as a removal area for barred owls to reduce the rate of southward migration than for northern spotted owl recovery. For spotted owl management, focusing on site management should be a priority.
- Areas have been affected by large and repeat fires and there is a very low habitat density.
- Site-specific management of occupied sites is likely to provide the same or better population and movement benefits.
- It is considered Priority C in order to implement actions in the near future to establish areas for northern spotted owl populations to stabilize and increase to sustainable levels. This includes efforts to stop ongoing population loss in some management areas and provide opportunities for recolonization.

Description of the elements considered in mapping: In mapping the boundaries of the South California Klamath GMA we used information on the following elements.

Spotted Owl Data:

- Northern spotted owl occupancy information primarily from the Forest Service.

Conditions:

- Actual habitat amount in terms of quality is the lowest proportionally to other GMAs in the California Klamath province.
- Northern spotted owl habitat throughout the GMA is predominantly of equal quality, with few higher quality patches remaining due to wildfire impacts.
- Extensive areal extent to capture widely distributed habitat patches.

Other Considerations:

- Maintain areas for North/South population movement.
- Majority of lands are on the Mendocino National Forest.

Focal Management Areas (FMAs) for the South California Klamath GMA

In the South California Klamath GMA, we recommend establishing FMAs in the northern portions which are focused on population management. In the southern extent, FMAs should be established and managed to focus efforts toward limiting barred owl expansion into the Sierra Nevada and California spotted owl range as well as south into Sonoma and Marin Counties where barred owls are still in very low numbers.

In the northern portion of the South California Klamath GMA, we recommend developing FMAs large enough to potentially support 50 spotted owl pair sites and generally spaced no further than 12 to 15 miles from another FMA when feasible. Generally, larger block areas provide a smaller edge-to-area ratio. This may help reduce the influx of barred owls from outside an FMA in the future. However, where the landscape or forest conditions do not allow this, smaller or more sinuous areas may be appropriate; particularly when considering fire refugia locations.

Where smaller FMAs are developed due to topography, forest condition, access, funding limitations, or other reasons, we recommend these be closer together and multiple areas designed with the intent of encouraging exchange of spotted owls between these smaller areas. Where possible, when setting up smaller areas due to funding, design them such that they could be expanded in the future if funding becomes available.

As described in the background section, the California Klamath province is considered a mixed-severity, frequent fire regime. We recommend FMA locations take fire refugia and uncharacteristic fuel conditions into account in order to include areas more likely to retain forest cover conditions associated with northern spotted owl habitat.

In the southern portion of the South California Klamath GMA, FMAs of similar or smaller size are still recommended, but placed to limit southward and eastward movements of barred owls.

Priorities: The following is our recommended priorities for defining and selecting FMAs within the South California Klamath GMA. The following are in general priority order, however, local expertise will be important in applying these to specific FMA boundary designs.

1. Build FMAs around current occupied northern spotted owl sites. This provides a nucleus of northern spotted owls for the potential recolonization of sites in the FMA as barred owl numbers are reduced.

2. Focus on areas with reasonable access, in terms of road networks where available, and trail systems where roads do not exist. Avoid large areas without roads or trails. Closed roads may be used similar to a trail system if they can be safely walked.

3. Consider fire risk when mapping FMA boundaries. Resistance to uncharacteristic wildfire should be considered in boundary placement. Placement of multiple FMAs in the GMA could reduce the risk of complete loss.

4. Place FMA blocks where the best northern spotted owl habitat remains, and areas which allow for the maximum number of northern spotted owls to be supported. Focus on designating FMAs in areas with the potential for at least 20 northern spotted owl pairs, though larger is better.

5. Include lands of interested or willing landowners or land managers. A focus on areas where landowners have expressed interest in barred owl management can help expedite implementation of barred owl management and encourage involvement.

6. Include areas with high-quality historic northern spotted owl sites (sites with no confirmed occupancy in the last five years or more). These are areas that have been shown by past use to be attractive to northern spotted owls and therefore more likely to be reoccupied as populations recover.

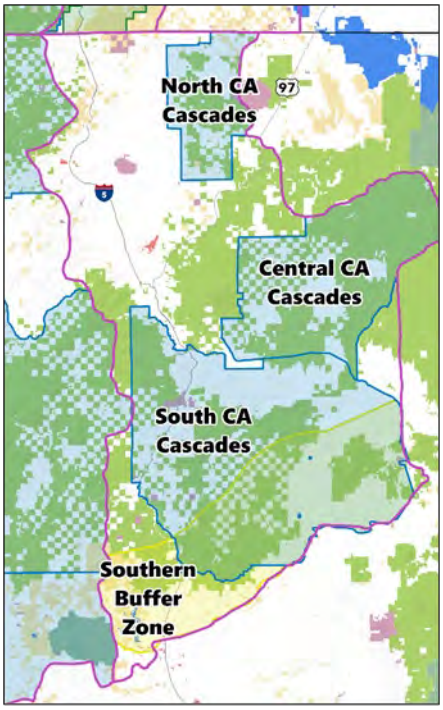
7. Consider the potential for connection to other FMAs in the GMA, and to neighboring GMAs. Placement of FMAs in close proximity to other GMAs, and where there is forest that may provide connectivity to the California Coast and interior Klamath Region, can connect populations in these areas.

8. Consider the presence of areas already designated for northern spotted owl habitat management, such as Late-Successional Reserves under the Northwest Forest Plan or the Northern California BLM Resource Management Plan. Including these areas provides support to northern spotted owl and limits impacts on other resources. As many of these have been managed for older forest over the last decades, these are the likely locations higher value habitat.

A4.10. California Cascades Province

A4.10.A Background:

A4.10.A.1 Spotted Owl Condition in the California Cascades Province:



This physiographic province for the northern spotted owl encompasses approximately 2.5 million acres. It is located at the eastern extent of the northern spotted owl range in California. It has relatively gentle terrain, low annual precipitation, and dry forest types; influencing the distribution and quality of suitable nesting, roosting, and foraging habitat (USDA and USDI 1994a, b). It lies south of the Oregon Eastern and Western Cascades, and east of the California Klamath Province.

The province is fragmented by large landscape features such as Mount Shasta, Shasta Valley, and the giant crater lava flows associated with the Medicine Lake Highlands. There are large expanses of volcanic and dry soils, and naturally marginal, low-quality habitats (e.g., uniform ponderosa pine stands). While low population numbers and low amounts of poorly distributed nesting, roosting, and foraging habitat limit the overall province's contribution to northern spotted owl recovery, important objectives include providing local demographic stability to known and future pairs and individuals and maintaining the link between the northern spotted owl and California spotted owl range (USFWS 1992). The interchange between the two subspecies ranges provides for genetic richness and variation.

The lower and drier elevation areas of the eastern extent of the province are dominated by ponderosa pine or western juniper (e.g., the McCloud Flats, Tennant area) that do not typically support long-term northern spotted owl territories but likely provide for dispersal and connectivity to the northern provinces. In the eastern extent of the province, habitat value for nesting, roosting, and foraging increases with elevation and water availability. These areas, as well as the western and southern extent of the province, are characterized by ponderosa pine/white fir, mixed conifer, and red fir forest types, occupied and used by resident single northern spotted owls, nonterritorial northern spotted owls, and territorial pairs. As in the warmer, drier physiographic provinces (i.e., the Washington and Oregon Eastern Cascades, the California Cascades, and the Oregon and California Klamath Provinces), fire is more frequent and is an integral part of the internal dynamics of a typical stand. The east side of the province is characterized by a more fragmented landscape than what is observed in the southern and western areas, and by a checkerboard of Federal and private ownerships where management regimes have exacerbated habitat fragmentation.

Land management is a mix of Federal (Forest Service and BLM) and private industrial timberlands, resulting in an almost complete checkerboard ownership pattern throughout the

province. In addition, there are numerous small, private non-industrial timber land managers and private inholdings. While not included in the province, the Modoc National Forest is located to the east and does support a limited distribution of both northern and California spotted owls. Approximately 46 percent of the province is managed by the Forest Service and Bureau of Land Management. Approximately one percent is managed by the State, with the remainder primarily in private lands.

Over the past 25 years in the California Cascades province, wildfires were typically frequent and small; suppressed fairly quickly due to the expansive road network, with the exception of the 2021 Antelope Fire which removed a significant portion of the spotted owl habitat in the northeastern extent of the province, reducing even further its capability to support northern spotted owl. Based on an assessment of habitat conditions after the 2021 wildfires, there is an approximate 294,906 acres of nesting/roosting and 503,600 acres of foraging habitat in the California Cascades province on Federal lands (Davis et al. 2022-Northwest Forest Plan Habitat Monitoring Maps for the northern spotted owl).

There are no demographic study areas for the northern spotted owl in the California Cascades province. The closest study area in terms of distance, climate, vegetation and habitat similarity is the Southern Cascades Study Area in southern Oregon (Dugger et al. 2016, Franklin et al. 2021 for the most recent annual reports). Prior to the 2021 Antelope Fire there were approximately 30 northern spotted owl territories on the Goosenest Ranger District of the Klamath National Forest in the northern extent of the province. There were approximately 30 to 40 territories on the Shasta-McCloud Management Unit of the Shasta-Trinity National Forest. Most of these territories are confirmed to be consistently occupied by single northern spotted owls, or northern spotted owl pairs from 1989 through 2023 (USDA FS 1989-2019 NRIS data records). There are two long-term occupied territories on the western edge of the province in and near the South Fork Sacramento watershed which function as a source population for both the California Cascades and California Klamath provinces. In short, the sites occupied by northern spotted owls have remained consistently occupied, if not affected by high severity fire, as those habitats are considered the ‘best available’.

A4.10.A.2 Barred Owl condition in the California Cascades Province:

There are no barred owl specific population estimates available for the province, but barred owls have been detected in the province since the mid-1990s. Their numbers in the California provinces have steadily increased as their apparent southward and eastward migration from the California Coastal province has progressed (Franklin et al. 2022, 2021, Lesmeister et al. 2022, Wiens et al. 2020).

While their density remains relatively low as of August 2022 in the California Cascades province in comparison to the other two California provinces and overall range, this province is considered a key area to manage in order to reduce the movement and expansion of barred owls into the Sierra Nevada and the range of the California spotted owl. The annual surveys and monitoring on both Forest Service, BLM, and private lands, as well as the large landscape Eastside Spotted Owl Resource Plan, may allow for faster implementation and focus of barred owl management actions.

A4.10.B Management Strategy

A4.10.B.1 Site management in the California Cascades Province

A4.10.B.1.a Background:

Maintaining the existing northern spotted owl population to the maximum extent possible will provide for greater potential for recruitment and population expansion.

- Managing barred owls in occupied northern spotted owl sites can help retain the existing northern spotted owl population and increase the potential for recruitment of northern spotted owl young.

- Managing barred owls in occupied northern spotted owl sites provides the nexus for source northern spotted owl populations that can contribute to recolonization of areas where barred owl management occurs (e.g. FMA).

- Maintaining northern spotted owl sites distributed across the California Cascades province, whether in block management areas or not, may reduce the risk of losing northern spotted owls in the province from catastrophic events, such as wildfire, by spreading sites across the area.

- Maintaining northern spotted owl sites distributed across the California Cascades province, whether in block management areas or not, may reduce the risk of losing northern spotted owls in the province from catastrophic events, such as wildfire, by spreading sites across the area.

- Managing barred owls in northern spotted owl sites also provides an opportunity for maintaining northern spotted owls in areas where block management is not feasible nor recommended. This approach applies across the entire province, whether or not the northern spotted owl sites are in a GMA or other mapped designation.

- These sites may serve to increase potential connectivity between and within block management areas, and provide reproductive sites in the vicinity of block management areas that can interact at a demographic level. This is considered particularly important in the north and central California Cascades where there is connection between the Oregon Klamath and California Klamath provinces.

- Site management for northern spotted owls, due to its smaller size when compared to block management, also provides a wider range of options for landowner contribution to barred owl managements, particularly smaller landowners.

Selection of northern spotted owl Sites for Management

Although reduced from historical numbers by both land management actions (timber harvest) and the 2021 Antelope Fire, the California Cascades province still contains a comparable number of long-term occupied northern spotted owl territories. As described above, the western and central extent of the province contains higher value habitat and long-term sites; and sites in the northern extent do remain occupied but with a reduced distribution of nesting, roosting, foraging, and dispersal habitat because of the 2021 fire.

The primary focus of northern spotted owl site management in the California Cascades province is on active, or recently active sites, where recolonization of sites after barred owl removal is more likely. This is reflected in the priorities for site management below.

Spotted Owl Site Management Priorities

Priority	Spotted Owl Site Condition
A	Spotted owl sites that are occupied by resident spotted owls (pair or single), or where there have been detections of spotted owls (not reaching resident status).
B	Spotted owl sites that are not currently occupied by resident spotted owls (pair or single) but have been in the past five years.
C	Spotted owl sites with spotted owl occupancy between five to ten years ago, whether or not they have been surveyed recently.
D	Areas with sufficient high-quality habitat to support a spotted owl site, whether surveyed recently or not.

Other considerations for selection of spotted owl sites for management:

If site management cannot be initiated on all sites, we recommend the following be considered in selecting the specific spotted owl sites for management.

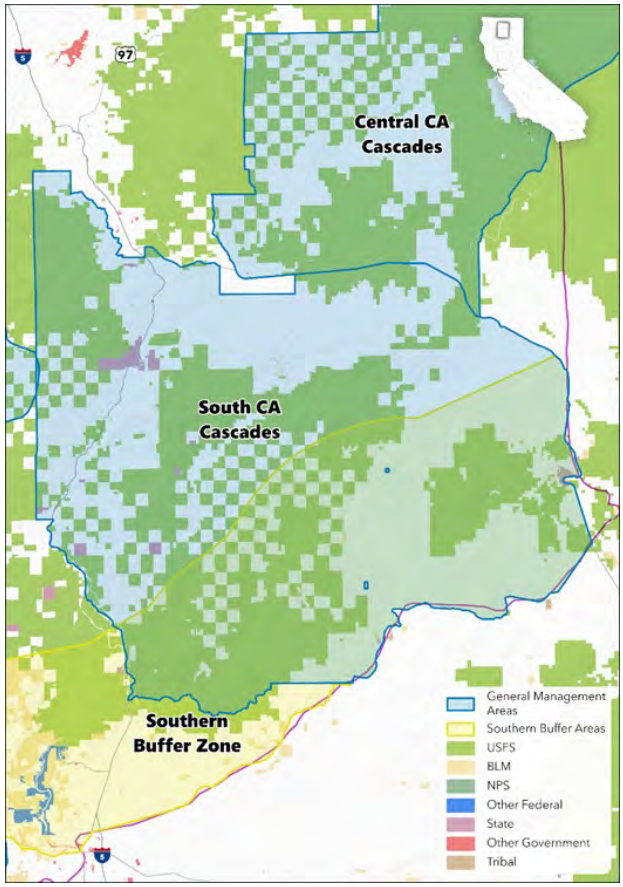
- Focus first on spotted owl sites with recent occupancy by pairs, then singles, then detections.
- Consider past reproductive history of the spotted owl site. Select spotted owl sites with a history of reproduction on the site where surveys are available.
- Consider the condition of habitat in the area, particularly loss of habitat to fire or other actions since the last surveys. Spotted owl sites where much of the habitat has been removed, from high severity fire or timber harvest, would be a lower priority.

A4.10.B.1.b Management Recommendations:

Within each individual site, remove barred owls from an area between 7,645 and 13,592 acres. This represents the area in a circle of 1.5 and 2 home range radii (Table 1). This can be distributed in a circle around the site and core area, or implementers can use local knowledge, topography, and habitat condition to design an area of the appropriate size that provides the best conditions for barred owl management.

A4.10.B.2 General Management Areas

A4.10.B.2.a South California Cascades GMA – Priority B



The South California Cascades GMA includes approximately 819,675 acres. It is located in the southcentral portion extending from Highway 89 in the north south past the Pit River. Approximately 50 percent of this GMA is under Federal land management by the Shasta-Trinity National Forest, with about five percent in State lands and the remainder in private ownership.

This GMA was mapped for the following reasons:

- Densest concentration of nesting, roosting, and foraging habitat in the California Cascades province.
- Provides connectivity to the west and the California Klamath province.
- Relative to barred owls, this is the most likely primary invasion pathway into the California spotted owl range.
- Encompasses the southeastern extent of the northern spotted owl range.
- Considered important in terms of proximity to the hybridization zones with the California spotted owl.
- Provides for connectivity to Sierra Nevada.
- Overall checkerboard ownership pattern in this GMA with Sierra Pacific Industries and their HCP which includes barred owl research and management.
- It is considered Priority B in order to implement actions as soon as possible to slow spotted owl population declines in at least some areas.

Description of the elements considered in mapping: In mapping the boundaries of the South California Cascades GMA we used information on the following elements.

Spotted Owl Data:

- Current northern spotted owl occupancy information from the Forest Service and private industrial timberland managers.

Conditions:

- Patchy and limited nature of habitat results in no clear breaks and the mapped GMA is inclusive rather than exclusive.
- Relative habitat density is low overall and patchily distributed due to vegetation communities and past timber harvest.

Other Considerations:

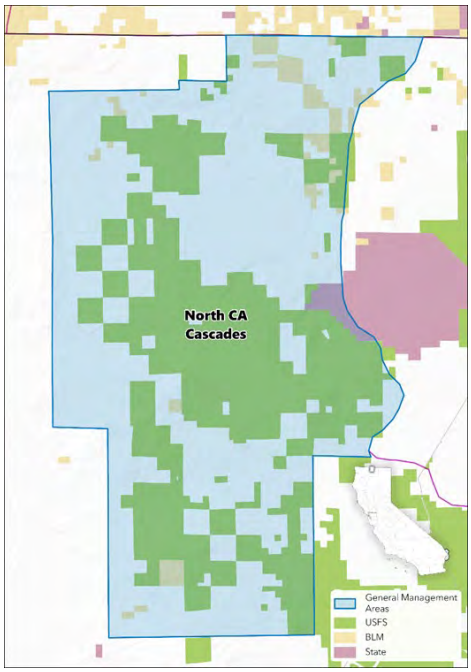
- Good connection to the hybridization zone with the California spotted owl.
- Potential to expand upon existing barred owl monitoring and management efforts being undertaken by Sierra Pacific Industries.

Focal Management Areas (FMAs) for the South California Cascades GMA

Because of the patchy and limited distribution of spotted owl habitat in this GMA, we do not recommend developing large FMAs. Rather, we recommend focusing on site management or small clusters of sites where possible. Clusters of two or more sites in close proximity are likely to be more stable and provide more efficient management efforts.

A4.10.B.2.b North California Cascades – Priority C

The North California Cascades GMA includes approximately 155,053 acres. It is located at the northern extent of the province, northeast of State Highway 97. The Oregon Klamath province and Cascade-Siskiyou Connectivity Area are to the north. Approximately forty percent of this GMA is under Federal land management by the BLM and Forest Service, and the remainder is under private ownership; primarily Acer Klamath (managed by FWS Forestry).



This GMA was mapped for the following reasons:

- Currently and historically considered important for northern spotted owl in terms of providing connectivity northwest to the Oregon Klamath and north to the East Cascades.
- May provide for generational dispersal.
- Isolated area with limited current habitat.
- Isolation may support barred owl exclusion success.
- It is considered Priority C in order to implement actions in the near future to establish areas for northern spotted owl populations to stabilize and increase to sustainable levels. This includes efforts to stop ongoing population loss in some management areas and provide opportunities for recolonization.

Description of the elements considered in mapping: In mapping the boundaries of the North California Cascades GMA we used information on the following elements.

Spotted Owl Data:

- Though few northern spotted owl populations, it contains long-term occupied sites.
- Contains the Goosenest Late-Successional Reserve and long-term northern spotted owl occupancy.
- Current, annual reporting on northern spotted owl occupancy from the Forest Service.

Conditions:

- Considered a 'connectivity' area or bridge to southwestern Oregon; based on the 2006 Goosenest Adaptive Management Area analysis completed by the Klamath National Forest.
- Considered a 'connectivity' area to south-central Oregon and the East Cascades.

Other Considerations:

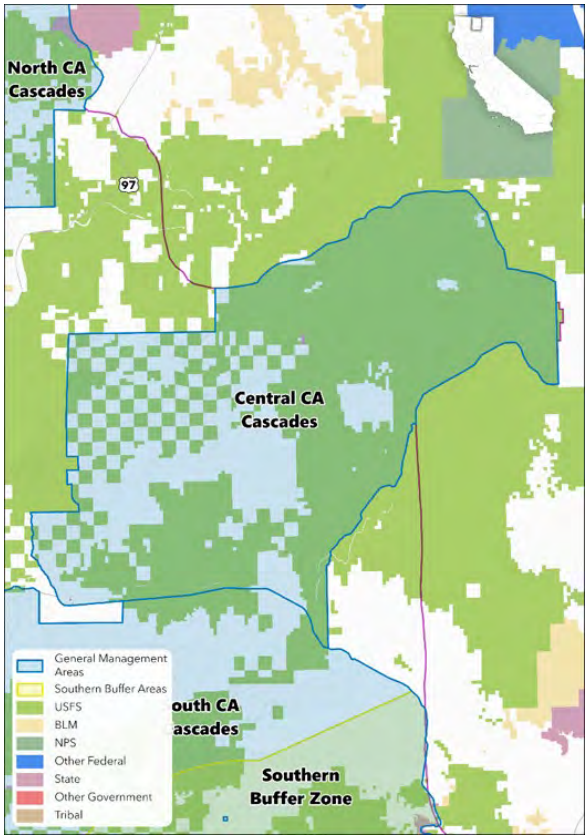
- Largely isolated patch increases the potential for barred owl removal and exclusion.

Focal Management Areas (FMAs) for the North California Cascades GMA

Because if the patchy and limited distribution of spotted owl habitat in this GMA, we do not recommend developing large FMAs. Rather, we recommend focusing on site management or small clusters of sites where possible. Clusters of two or more sites in close proximity are likely to be more stable and provide more efficient management efforts.

A4.10.B.2.c Central California Cascades GMA – Priority C

The Central California Cascades GMA includes approximately 411,841 acres. It is located in the northeastern part of the province south of Highway 97 and north of Highway 89. This GMA was the most impacted by the 2021 Antelope Fire, but still contains occupied sites as of 2023 and well-dispersed nesting, roosting, foraging, and dispersal habitat. Approximately 60 percent of this GMA is under Federal land management by Forest Service with the remainder in private ownership.



This GMA was mapped for the following reasons:

- While the amount and distribution of nesting/roosting habitat was impacted by the 2021 Antelope Fire, northern spotted owls in the California Cascades province tend to nest in lower quality foraging habitat and there remains an abundant amount of intermixed nesting, roosting, and foraging habitat and occupied northern spotted owl sites in 2022 and 2023 in this GMA.
- Currently and historically considered important for northern spotted owl in terms of providing connectivity to areas to the southwest and north.
- It is considered important in terms of the proximity to the hybridization zones with the California spotted owl.
- Extensive checkerboard ownership pattern with industrial timberland managers may help with barred owl management. The GMA includes the Eastside Spotted Owl Resource Plan area, and lands managed by Sierra Pacific Industries, Hearst, Campbell-Global, and other private land managers.
- It is considered Priority C in order to implement actions in the near future to establish areas for northern spotted owl populations to stabilize and increase to sustainable levels. This includes efforts to stop ongoing population loss in some management areas and provide opportunities for recolonization.

Description of the elements considered in mapping: In mapping the boundaries of the Central California Cascades GMA we used information on the following elements.

Spotted Owl Data:

- Current northern spotted owl occupancy information from the Forest Service and private industrial timberland managers.

Conditions:

- Relative habitat density is low overall and patchily distributed due to vegetation communities, past timber harvest, and fire.
- This patchy and limited nature of habitat resulted in no clear breaks and the GMA boundaries are inclusive rather than exclusive.

Other Considerations:

- Potential to expand upon existing barred owl monitoring and management efforts being undertaken by Sierra Pacific Industries.

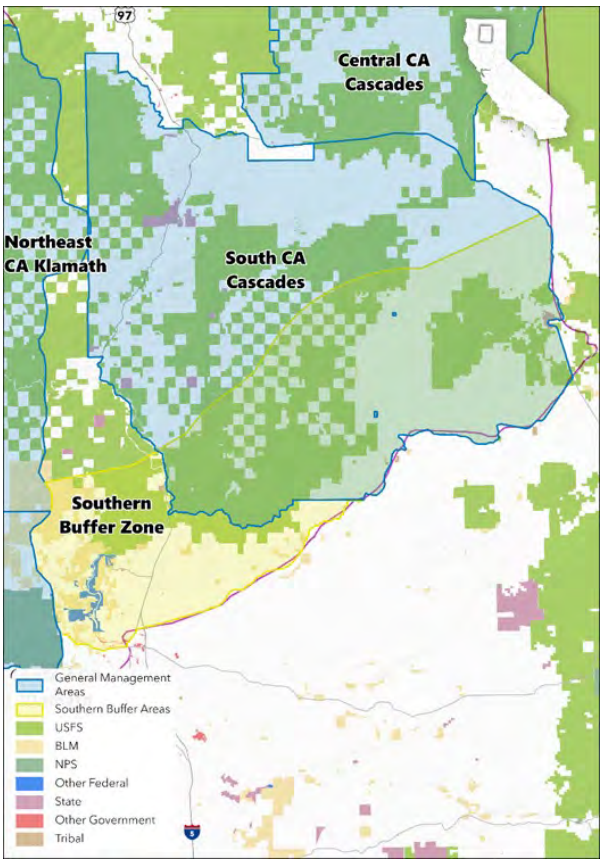
Focal Management Areas (FMAs) for the Central California Cascades GMA

Because if the patchy and limited distribution of spotted owl habitat in this GMA, we do not recommend developing large FMAs. Rather, we recommend focusing on site management or small clusters of sites where possible. Clusters of two or more sites in close proximity are likely to be more stable and provide more efficient management efforts.

A4.10.B.3 Special Designated Areas:

A4.10.B.3.a Southern Buffer Zone – Priority A

The Southern Buffer Zone includes approximately 540,758 acres. It is located near and along the Pit River in the hybridization zone for the northern spotted owl and California spotted owl. Approximately 47 percent is under Federal land management (BLM and Forest Service) and the remainder primarily in private ownership. This zone overlaps with the South California Cascades GMA.



This buffer zone was mapped for the following reasons:

- This is the transition zone between the northern spotted owl and the California spotted owl.
- Preventing or at least slowing southward movement of barred owls is a critical component of maintaining California spotted owl populations.
- It is considered Priority A in order to implement actions as soon as possible to slow the invasion of barred owls into the California spotted owl range. Evidence

indicates this area functions as the primary invasion corridor for barred owls into the California spotted owl's range.

Description of the elements considered in mapping: In mapping the boundaries of the Southern *Buffer Zone, we used information on the following elements.*

Spotted Owl Data:

- Current northern spotted owl occupancy information from the Forest Service and private industrial timberland managers.

Conditions:

- 15-mile-wide area buffered off the southern boundary of the California Cascades province and the northern spotted owl range.

Other Considerations:

- Best connection to the hybridization zone with the California spotted owl.
- Potential to expand upon existing barred owl monitoring and management efforts being undertaken by Sierra Pacific Industries.

Management Recommendations for the Southern Buffer Zone:

There are a variety of approaches to managing barred owls in the Southern Buffer Zone to reduce the potential invasion of barred owls from the California Cascades Province and areas farther north. The removal of barred owls in this area would create empty territories that may attract invading birds and cause them to settle rather than continue long-distance movement into the California spotted owl range.

If resources are available, we recommend extensive survey and monitoring across this area and immediate removal of barred owls that are located. Alternatively, intensive survey and removal activity could be focused in the southern portion of the buffer zone initially, and moved north as areas are "cleared" of barred owls.

A4.11 California Spotted Owl
A4.11.A Sierra Nevada population

The Sierra Nevada population of California spotted owls is found in the Sierra Nevada Mountain Ranges and foothills in California and western Nevada.

Barred owls were first identified in the Sierra Nevada in 1989. By 2017, the cumulative number of barred and barred owl/spotted owl hybrid detections in the Sierra Nevada increased to approximately 145 (Keane et al. 2018, p. 7), with another 2.6-fold increase between 2017 and 2018 (Wood et al. 2020, p. 4). This is a cumulative number, and not all of these sites remained active. A population of barred and hybrid owls developed in the northern Sierra Nevada, from which 65 owls were removed during an experiment between 2018 and 2020. Removal of detected barred owls continues as part of ongoing research in the Sierra Nevada at a rate of 10 to 15 barred owls per year (2020-2022).

At the current time, most barred owl detections appear to be dispersers that are detected one time and then are not detected on subsequent follow-up surveys. The primary dispersal corridor into the province is through the northern Sierra Nevada, with a secondary potential for movement across the Central Valley of California.

A4.11.A.1 Specific Provincial Goals for Barred Owl Management:

1. Prevent colonization and population establishment of barred owl or hybrids across the Sierra Nevada, with the goal of maintaining barred owls at such low numbers they do not become a population-level threat to California spotted owl in the Sierra Nevada Province.

2. Focus specific attention on the key dispersal pathway in the northern Sierra Nevada from the Shasta-Trinity and Modoc National Forests and surrounding area.

3. Respond quickly to reduce barred owl populations that may become established.

Management Strategy:
There are two primary components to the Strategy in the Sierra Nevada area, inventory and monitoring for the presence of invading barred owls and removal of any barred owls located as soon as practicable from the lands of willing landowners or land managers.

1. Inventory and monitoring for barred owls. Focused and long-term monitoring in these potential dispersal areas will create an early detection system along the northern border of the province to allow for rapid removal of any detected barred owls. We recommend using PAM methodology, or other methods that become available. Initially these areas may not require annual surveys but could be visited on a five-year revolving window

schedule to inventory and monitor for barred owls. Extension of efforts to reduce barred owl dispersal across key dispersal corridors can reinforce efforts with the Sierra Nevada Province to lower immigration rates and prevent population establishment.

a. Monitor all information sources for barred owl detections across the Sierra Nevada population range. **Priority A**

    i. Use broad-scale systematic sampling, such as the ongoing Passive Acoustic Monitoring (PAM) effort, to monitor for barred owl detections and occupancy at the province scale. Use focal monitoring at sentinel spotted owl research sites, such as demographic study areas, on public and private lands to monitor for barred owl detection and effects at localized study scales. Collate barred owl detections recorded during short-term project-level surveys and anecdotal observations.

    ii. Maintain and continue established monitoring network for the detection of barred and spotted owls across the Sierra Nevada.

b. Develop a sampling design to inventory barred owls in areas that function as dispersal pathways into the Sierra Nevada. Establish an extensive survey network:

    i. across the region of the Shasta-Trinity dispersal corridor, in conjunction with barred owl management efforts in the northern spotted owl range in the California Cascades province. **Priority A**

    ii. in suitable habitat across the Modoc National Forest and other public lands. **Priority A**

c. Expand inventory and monitoring in select Great Basin mountain ranges with suitable habitat to the north and east of the Sierra Nevada (e.g., Warner Mountains). This is a potential invasion pathway, though not currently of primary concern. **Priority C**

d. Expand initial inventory and monitoring efforts to include lands not included in initial survey efforts.

    i. In the northern Sierra Nevada – Develop an enhanced sampling design to monitor barred owl detections and occupancy. This is the area of highest risk of barred owl invasion, and has been a pathway in the past. **Priority A**

    ii. In the central Sierra Nevada - Develop an enhanced sampling design to monitor barred owl detections and occupancy. Remove all barred owls detected, from the lands of willing landowners. These areas are more removed from the potential invasion source and pathway, though barred owls may disperse long distances and reach these areas. Remove all barred owls detected from the lands of willing landowners. **Priority B**

    iii. In the southern Sierra Nevada - Develop an enhanced sampling design to monitor barred owl detections and occupancy. Remove all barred owls detected, from the

lands of willing landowners. These areas are more removed from the potential invasion source and pathway, though barred owls may disperse long distances and reach these areas. Remove all barred owls detected from the lands of willing landowners. **Priority B**

iv. Monitor all sources of information on barred owl detections within the Central Valley, an alternative source for barred owl dispersal into the Sierra Nevada. **Priority C**

1. If barred owls or hybrids are detected twice at a location, and the landowner is willing, schedule a follow up survey with a removal team and remove any barred owls or hybrids detected.
2. If the number of barred owls reported in an area increases, establish additional monitoring to locate and remove, as possible, resident barred owls.

e. Develop an interactive database and rapid-response system to collate all barred owl detections that are identified through ongoing demographic and research projects, project-level management surveys and anecdotal observations within both the Sierra Nevada province and the key dispersal pathway areas. Develop an interagency database where records can be submitted that can facilitate a rapid-response follow-up to any detection. Develop a web-based portal where individual outside of agencies may voluntarily provide data on locations of barred owls in this area, including educational and outreach material to encourage its use by the general public. Experimental studies have demonstrated that an early warning system consisting of extensive systematic PAM efforts and follow-up surveys and lethal removal are effective for reducing barred owl population expansion in the Sierra Nevada. **Priority A**

2. Lethal removal of detected barred owls.

a. Conduct lethal removal of all barred owls located on surveys or otherwise identified in the Sierra Nevada population range and potential invasion pathways described above as soon as practicable from the lands of willing landowners. Non-lethal removal may be used where lethal removal is not possible, though barred owls should not be released back into the wild. **Priority A**

b. Establish and maintain response team capacity to follow-up on barred owl detections and conduct lethal removal of all barred owls. Support a rapid response capacity so that follow-up surveys and lethal removals can be conducted as soon as possible following reports of barred owl detections. **Priority A**

3. Response to the establishment of barred owl populations.

a. The goal in the Sierra Nevada is to prevent self-sustaining barred owl populations from becoming established and creating a source of additional barred owls to colonize within the California spotted owl range. However, it may not be possible to detect and remove all barred owls.

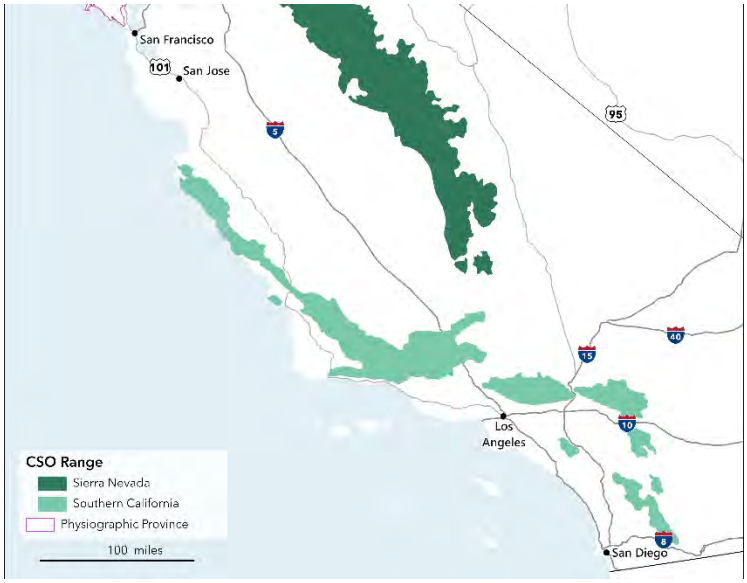
b. Using current and future research results, establish a survey occupancy level that indicates barred owl populations are becoming self-sustaining and impacts to California spotted owls are eminent. Based on research in the northern Sierra Nevada, we recommend a starting threshold occupancy value of 0.10, though this would be modified as new information becomes available. PAM or other systematic regional monitoring results can be used to track the occupancy level. This should be evaluated at the scale of the province, as well as, at the individual scales of the north, central and south zones within the province.

c. If annual surveys or inventory in the Sierra Nevada indicate that barred owl occupancy has increase beyond the occupancy trigger threshold within the entire Sierra Nevada or the segments described above, then more intensive efforts should be implemented both within the province and in the surrounding dispersal pathways. **Priority A**

A4.11.B. Coastal-Southern California population

The Coastal-Southern California population of California spotted owls is found in the Coast, Transverse and Peninsular Ranges of California.

Habitat within the Coastal-Southern range is considered to be naturally fragmented, with little dispersal occurring between subpopulations due to discontinuous mountain ranges. California spotted owl populations in this area are further geographically isolated from each other by development and habitat loss in the greater Southern California area.



There are currently no known territorial barred owls in this area, and only a few confirmed detections in the central coast and the southern portion of the Sierra Nevada to the north. These represent potential invasion pathways for barred owls into the Coastal-Southern California range. Detections of barred owls in coastal forests in the Santa Cruz Mountains in San Mateo County, California suggest that the invasion may be on the horizon.

The Los Padres National Forest runs north-south along the California Coast Ranges. The Angeles and the northern part of the San Bernardino National Forests run east-west along the Transverse Ranges. The southern portion of the San Bernardino National Forest – San Jacinto Ranger District and the Cleveland National Forest – run north-south along the Peninsular Range.

The BLM, California Desert District, manages public land, including designated wilderness, adjacent to the eastern and western boundaries of the San Bernardino and Cleveland National Forests in the Peninsular Range. The BLM and Forest Service co-manage the Sand to Snow National Monument which spans the San Bernardino, Santa Rosa and San Jacinto Mountain Ranges, and the Santa Rosa and Santa Jacinto Mountains National Monument.

The Santa Rosa Wildlife Area spans portions of the Santa Rosa and San Jacinto Mountains, Mount San Jacinto State Park and Magnesia Spring Ecological Reserve are located within the San Jacinto Mountains, and Peninsular Ranges Ecological Reserve and the Santa Rosa Mountains State Wilderness Area are located within the Santa Rosa Mountains all within the Peninsular Range. The Cuyamaca Rancho State Park and Cuyamaca Mountain State Wilderness are located within the Cuyamaca Mountains of the Peninsular Range.

A4.11.B.1 Specific Provincial Goals for Barred Owl Management:

1. Prevent declines in California spotted owls from barred owl competition (short and long term).
2. Limit the invasion of barred owls into the Coastal-Southern California portion of the range of the subspecies (short term).
3. Respond quickly to reduce barred owl populations that may become established (long term).

Management Strategy:
There are two primary components to the Strategy in the Coastal-Southern California area, inventory and monitoring for the presence of invading barred owls and removal of any barred owls located as soon as practicable from the lands or willing landowners or land managers.

1. Inventory and monitoring for barred owls

    a. Leverage all information sources to monitor for barred owl detections across the Coastal-Southern California range, and within potential invasion pathways. Monitor all sources of information on barred owl detections, including broad-scale systematic sampling, focal monitoring at sentinel spotted owl research sites, and barred owl detections recorded during short-term project-level surveys and anecdotal observations. **Priority A**

    b. Conduct an extensive initial inventory of barred owl status and distribution in the Coastal-Southern California population across the area on all public, and willing private lands, to establish baseline of current barred owl status and distribution across area.

        The highest priority is to conduct extensive surveys on public, and willing private, lands in likely invasion pathways between the Coastal-Southern California and Sierra Nevada California spotted owl ranges as well as the coastal area south of San Francisco (including, but not limited to riparian corridors, forested and

woodland habitat along the Coast Range). This includes lands in San Mateo, Santa Clara, Santa Cruz, Monterey, San Benito, San Luis Obispo, and Santa Barbara Counties on the coast, as well as southern Kern County and northern Los Angeles County in appropriate/suitable habitats on all public lands and accessible private lands with suitable habitat. **Priority A**

c. Extend initial inventory efforts to all suitable habitat in the southern California mountains and suitable habitat throughout the rest of the area. Expand the initial inventory effort to other ownerships and jurisdictions such as National, State Park, local government lands and willing private lands not involved in the initial effort. **Priority B**

d. Develop an interactive database and rapid-response system to collate all barred owl detections that are identified through ongoing demographic and research projects, project-level management surveys and anecdotal observations. Provide opportunities for the public to provide locations. Develop an interagency database where records can be submitted that can facilitate a rapid-response follow-up to any detection. **Priority A**

e. Develop focused long-term monitoring, with particular emphasis on early detection surveys (ARU or other methods) in areas along any potential barred owl dispersal and invasion corridors into the northern portion of the area along the border closest to the Sierra Nevada province and in the central coast near the border with the southern end of the California Coast province. **Priority B**

   This should be conducted at the approximately a 100,000-to-200,000-acre scale on National Forest, BLM, and surrounding State and private lands within barred owl habitat. In the coastal range, surveys could start on the Los Padres NF – Monterey and Mt. Pinos Ranger Districts as these districts are the closest to the Sierra Nevada province and the southern end of the California physiographic provinces in the northern spotted owl range. Within the Coastal-Southern California area, the northern edge of the Angeles National Forest is closest to the area of Lake Isabella, Paiute Mountains/Tehachapi Range of Kern County, where a barred owl pair has been confirmed (the northwestern edge of the Los Angeles Gateway RD). In the Sierra Nevada province, surveys are needed in barred owl habitat in the BLM Bakersfield Field Office which has land surrounding Lake Isabella and south, and to the eastern portion of the Tehachapi range. Allow each land manger and owner to adjust survey intensity commensurate with location, available habitat, and barred owl threat. Focused surveys can move southerly along the National Forests, BLM and State lands as needed.

   Focused and long-term monitoring will create an early detection system along the northern border of the province at key potential invasion corridors to allow for rapid removal of any detected barred owls before populations can become establishment. Allowing flexibility in ARU survey intensity commensurate with potential barred owl colonization will allow investment of available funding

where the barred owl threat is highest and reduce unneeded survey efforts elsewhere. Coordination with neighboring provinces, as well as developing partnerships with private entities will contribute to detection of barred owls in areas adjacent to Federal and State lands.

2. Lethal removal of detected barred owls

    a. Conduct lethal removal of all barred owls located on surveys or otherwise identified in the Coastal-Southern California population range and potential invasion pathways described above as soon as practicable from the lands of willing landowners. Non-lethal removal may be used where lethal removal is not possible, though barred owls should not be released back into the wild. **Priority A**

    b. Establish and maintain response team capacity to follow-up on barred owl detections and conduct lethal removal of all barred owls. Support a rapid response capacity so that follow-up surveys and lethal removals can be conducted as soon as possible following reports of barred owl detections. **Priority B**

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Personal Communications:

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J. Allen, pers. comm., January 11, 2023

Appendix 5. Monitoring Plan for the Barred Owl Management Strategy

This section includes the **Implementation** and **Effectiveness Monitoring**. Implementation monitoring would be focused on documenting that actions taken under the Barred Owl Management Strategy (Strategy) are consistent with the described Strategy. Effectiveness monitoring would be focused on assessing the success of the management effort and providing information on the effectiveness of management under different conditions. For both types of monitoring, the Service, as the permit-holder, would be responsible for assembling data contributed by designated implementing entities. In outlining this Monitoring Plan, we emphasize the information needed to document the implementation and effectiveness of the management efforts, rather than the particular methods used to gather the information.

A5.1. Implementation Monitoring for the Barred Owl Management Strategy

The overall purpose of the Implementation Monitoring Plan would be to ensure that the management actions occurring under the aegis of the Barred Owl Management Strategy (Strategy) were consistent with the requirements of the barred owl removal protocol (Appendix 2) and the management plan outlined in the Strategy. Reporting the dates, locations, and numbers of barred owls taken, and their subsequent disposition would be a requirement for authorization under the Migratory Bird Treaty Act (MBTA).

The implementation monitoring plan was developed by reviewing the requirements in the removal protocol and information required to document those requirements, as well as that required for the annual reporting forms associated with Special Purpose MBTA permits.

A5.1.1 Annual report information required during implementation of barred owl removal.

Each group or individual implementing the Strategy shall submit annual reports including the information described below.

A5.1.1.1 Barred owl removal results: For each attempt to remove a barred or hybrid owl, summarize the following information:

- Date and time.
- Location, preferably in Universal Transverse Mercator coordinates, and also listing state and county.
- Species targeted (barred owl or identified hybrid)
- Name of removal specialist and any other persons assisting or observing
- For each carcass collected, provide the following information, recorded prior to burying or transmitting the carcass:
    - Body mass

- Foot-pad length
- Sex (if known)
- A photograph of each of the following:
    - front of the bird, including head, chest, and tail, with a good view of the lower abdomen,
    - underside of the tail, flared out, and
    - underside of the spread wings.
- Disposition of the carcass (not found, located but could not be safely accessed, buried on site, or retained and transmitted to an interested entity with the appropriate permits). Note that all owls identified as hybrids (whether the identification occurred before removal, after the carcass was in hand, or both) should be retained until released by USFWS. For carcasses retained and transmitted to other permitted entities, identify the entity to whom the carcass was transmitted.
- For each carcass that could not be found, an incident report describing the situation, including any information regarding the likelihood that the shot may have missed, or that the bird was injured and escaped.

A5.1.1.2 For any injury or mortality of non-target species

If any non-target species is injured or killed during an attempt to remove a barred owl, the protocol requires that this be reported immediately to the designated Service contact, that any injured animal other than a barred owl be transported to a licensed rehabilitation facility, and that a written incident report be submitted to the Service within 3 days. A copy of this report should also be appended to the annual report and should include:

- Species identity of the animal injured or killed.
- Nature of the injury (including death).
- Circumstances surrounding the unintended injury or death, including pictures if available.
- If the animal was injured but not killed, the name and contact information of the rehabilitation facility to which it was transported.

If non-target threatened or endangered species is injured or killed during an attempt to remove a barred owl, the protocol requires that this be reported immediately to the designated Service contact, that any injured animal be transported to a veterinarian or licensed rehabilitation facility, no further removal activities may be conducted until the Service reviews the incident report and authorizes such activities to resume.

A5.1.1.3 Summary of changes from previous annual report

Include a list of all removal specialists authorized, and summary of any ongoing requests for changes in removal specialists. Include any changes in boundary or personnel completed or requested since the pervious annual report (A2.1.1 and A2.1.2).

A5.2 Effectiveness Monitoring for the Barred Owl Management Strategy

The overall purpose of the Effectiveness Monitoring Plan is to assess status and trends in populations of spotted owls and barred owls in areas managed under the Strategy. Monitoring data would be used to assess the success of the management effort and provide information on the effectiveness of management under different conditions across the range of the northern and California spotted owl.

A key component of the monitoring plan is integration with monitoring of northern spotted owl populations and old forests on Federal lands under the Northwest Forest Plan Effectiveness Monitoring Plan, where feasible (Lint et al. 1999, Davis et al. 2022, Lesmeister et al. 2021, 2022, Lesmeister and Jenkins 2022). Use of this passive acoustic monitoring (PAM) network as a platform for evaluating Strategy effectiveness would be anticipated to reduce cost and effort associated with monitoring requirements on Federal lands. However, integration with Northwest Forest Plan Effectiveness Monitoring would not be feasible in all areas where barred owls may be managed. Additionally, some potentially willing landowners or managers may not wish to integrate monitoring on their lands with Northwest Forest Plan Effectiveness Monitoring. In these cases, we would accept monitoring data obtained by other means or by similar means not integrated with the Northwest Forest Plan Effectiveness Monitoring, as long as it provided the necessary information. In this way, we would avoid creating barriers for potential participants who would be able and willing to provide the necessary monitoring information, but not able or willing to integrate with Northwest Forest Plan Effectiveness Monitoring.

The development of the effectiveness monitoring plan was based on the following five steps (adapted from Lint et al. 1999, pp. 1):

1. Specify monitoring goals, questions, and objectives.
2. Identify and evaluate population indicators that best represent changes to the status and trend of spotted owls (and barred owls) in managed areas.
    - informed by long-term demographic studies (Franklin et al. 2021), barred owl removal experiments (Diller et al. 2014, 2016, Wiens et al. 2021, Hofstader et al. 2022), and existing monitoring of spotted owls (Lesmeister and Jenkins 2022, Kelly et al. 2023).
3. Based on steps 1 and 2, recommend a monitoring approach to measure population status and trend of both species in areas identified for management (e.g. Focal Management Areas).
4. Recommend a framework to manage monitoring data and periodically analyze results.
5. Ensure feedback between monitoring data, data analyses, and future management decision-making.

A5.2.1 Monitoring Goal, Questions, and Objectives

The goal of the monitoring plan is to provide data that can be used to: 1) evaluate management actions in areas selected for management of barred owls; and 2) periodically evaluate the success of the Strategy in meeting the purpose and need to:

1. stop or slow northern spotted owl population declines caused by barred owls in selected treatment areas in the short term;
2. increase northern spotted owl populations over the longer term;
3. provide spotted owl habitat that is free of, or with reduced competition from, invasive barred owls;
4. limit the invasion of barred owls into the range of the California spotted owl by preventing the establishment of barred owl breeding populations;

Monitoring questions:
The monitoring plan is designed to address *population-level* questions specific to the status of spotted owls and barred owls **in managed areas specified** under the Strategy under block management areas (e.g., areas capable of supporting at least 30 pairs of spotted owls). Key questions for each species include:

Spotted owls:

- Has the Strategy implementation met the goal of slowing or stopping population declines (or increasing the annual population growth rate) of northern spotted owls relative to population status in the same area prior to management, or in comparable areas without management?
- What is the status and trend in abundance, site occupancy/site use, or local (site or territory) colonization/extinction rates of spotted owls in managed areas relative to conditions prior to management or in comparable areas without management?

Barred owls:

- Has the Strategy implementation reduced the abundance of, or site use by, barred owls, thereby providing habitats for northern spotted owls with reduced competition from barred owls?
- Has the Strategy implementation limited the colonization and establishment of barred owls into the range of California spotted owls?
- What is the status and trend in abundance, site occupancy/site use, or colonization rates of barred owls in managed areas?

Monitoring objectives:
The following objectives were specified to achieve the above monitoring goals and address key questions associated with management decision-making.

- Assess annual occurrence of spotted owls and barred owls at sites or areas selected for barred owl management.
- Assess changes in the population status or trend of spotted owls in managed areas.

    - e.g., annual change in the proportion of survey sites with one or more detections of spotted owls (Lesmeister and Jenkins 2022).
    - for spotted owls, occupancy surveys completed prior to management implementation can expedite estimation of management effectiveness and population status and trend. In some cases, these monitoring data may already exist.
- Assess changes in barred owl populations to quantify effectiveness of management in limiting their re-establishment (northern spotted owl) or establishment (California spotted owl) in managed areas.
    - for barred owls, occupancy surveys completed prior to implementation can expedite estimation of effectiveness of management. In some cases, these monitoring data may already exist.

A5.2.2 Potential Population Indicators

Desired indicators of management effectiveness reflect ecologically quantifiable progress towards achievement of monitoring objectives. Desired population-level indicators should (modified from Lint et al. 1999, pp. 5)

- Be based on methods with high detectability of focal owl species.
- Reflect the state of managed owl populations.
- Be quantifiable, cost-effective, and easily repeated over time.
- Show sufficient power in detecting changes in managed populations.
- Be readily distinguishable from background variation not related to barred owl management, such as habitat loss.

We narrowed the range of possible population indicators for each owl species based on the following considerations:

- Current availability of monitoring data on spotted owls and barred owls (e.g., detection/non-detection data used to estimate probability of site use from PAM; Duchac et al. 2020 entire, Appel et al. 2022 entire).
- Indicators for spotted owls must be measurable population characteristics of spotted owls known to be sensitive to competition from barred owls: adult survival (Franklin et al. 2021 entire, Wiens et al. 2021 entire), site occupancy, colonization, and local extinction (Franklin et al. 2021), breeding dispersal and pair status (Jenkins et al. 2019 entire, 2021 entire, Wiens et al. 2021).
- For barred owls, removal data collected during management activities may be used to directly measure population changes over time without additional surveys (e.g., see methods described by Link et al. 2018, Udell et al. 2022). Quantitative methods for this approach for barred owls are currently under development (D. Wiens pers. comm.)

Population indicators applicable to spotted owls and barred owls
We recommend using non-invasive (passive) survey methods to monitor and track changes in population status of spotted owls and barred owls simultaneously in areas targeted for management. These methods provide the information needed to monitor implementation of the

Strategy while avoiding injury to spotted owls. In using passive monitoring, we recommend focusing on the following population vital rates:

Territory occupancy (detection/non-detection data)

- For northern spotted owls, territories are approximated by provincial core use areas and home ranges, or defined by polygons depicting historical use areas (e.g., demographic monitoring by Franklin et al. 2021, entire).
- For California spotted owls, territories are approximated by Protected Activity Centers.
- Historically, territory occupancy has been determined through call-broadcast surveys or mark-resight studies. Targeted use of PAM within known high-use portions of a territory can also provide data regarding territory occupancy.

Site use (detection/non-detection data)

- Where survey sites are randomly placed (e.g., in hexagon survey plots used for existing PAM programs), site use is distinct from territory occupancy in that it provides information on spotted owl presence and absence, but not necessarily on-site fidelity or pair status
    - For northern spotted owls, sites have been defined as 5-km^2 survey hexagons (e.g., PAM by Lesmeister and Jenkins 2022, entire)
    - For California spotted owls, sites have been defined as 4-km^2 survey hexagons.

Population size/abundance (numbers of territorial individuals)

- This is not typically estimated in spotted owl demographic studies or monitoring programs, but see Davis et al. 2022 pp. 18-19 for example of habitat-based estimates of number of occupied territories. Note that habitat-based estimates of occupancy also rely on existing information regarding occupancy rate (see above).
- This can be estimated using count-based models (e.g., *N*-mixture abundance estimation; Royle 2004 entire, Duarte et al. 2018 entire, see Wiens et al. 2017 pp. 13–14 for application with barred owls), or multistate occupancy models for estimation of relative abundance and population trends (Steen et al. 2023 entire).
- For barred owls, abundance can be estimated directly from lethal removal activities (e.g., number detected vs. number removed per visit to each sample site; see Rodriguez de Rivera and McCrea, 2021, pp. 18–19)

Population indicators specific to spotted owl demographic studies:
Previous demographic monitoring of spotted owl populations was based on call-broadcast survey methods to detect the presence of territorial owls, followed by capture-mark-resight methods to mark individuals and track their survival and reproduction over time (Franklin et al. 1996, 2021 entire). While these demographic monitoring methods have been largely discontinued and replaced with non-invasive surveys, some groups may opt to conduct demographic studies for a variety of reasons, and may wish to use this information to evaluate the effectiveness of barred owl management. In such cases, we recommend focusing on the following population vital rates:

Adult survival (i.e., apparent survival; Franklin et al. 2021 entire)

- Adult survival is typically estimated with mark-resight data (but see Rossman et al. 2016 entire).
- Estimates of adult survival are typically focused on breeding/territorial birds.
- Barred owls are known to disproportionately impact adult survival of spotted owls (Wiens et al. 2021:6-7).
- Adult survival has a disproportionate contribution to changes in population growth rate relative to other population vital rates (Noon and Biles 1990, Dugger et al. 2016, Franklin et al. 2021, Diller et al. 2016, Wiens et al. 2021).

Reproductive rate/number of young fledged (NYF)

- One measure is the proportion of sites monitored with ≤1 fledgling (e.g., reproductive rate defined by Rockweit et al. 2023).
    - This measure can be estimated without capture-mark-resight data based on the proportion of monitored sites where at least 1 fledging was detected.
- A more precise measure is fecundity (number of female fledglings produced per territorial female; Franklin et al. 2021).
    - This measure requires capture-mark-resight data from territorial birds.
    - Reproduction is known to be sensitive to fluctuations in local weather and regional climate (Glenn et al. 2011a, b entire), and less responsive to barred owl presence relative to other population characteristics like adult survival and territory occupancy (Diller et al. 2016 pp. 11–12, Wiens et al. 2021 pp. 4–5).

A5.3 Management Scales and Data Needs

Species-specific monitoring is important across multiple spatial scales of management action identified in the Strategy. Below we describe each scale and identify corresponding minimum data requirements needed to determine effectiveness of management actions.

Individual site (territory) scale

At this scale, management may occur at individual territories recently or historically used by spotted owls. The primary indicators of management effectiveness at this scale are territory occupancy or site use, based on detection/non-detection data collected within the provincial home-range radius of the site for both owl species. Counts of individual spotted owls or barred owls detected on each survey occasion are desirable if using survey methods that provide such information. For PAM survey methods (see below), we recommend reporting the number of repeated sampling occasions with positive vocal detections to help differentiate territory occupancy from infrequent use of the site (see Watson et al. 2023 entire). Note that methods to estimate numbers of individuals or territorial pairs using PAM are under development (Kelly et al. 2023 entire, D. Lesmeister pers. comm.)

Small block scale (e.g. 30 pair size areas or larger)

At this scale, management occurs across areas capable of supporting multiple (at least 30) territorial pairs of spotted owls. Indicators of population status at this scale include site occupancy/use (i.e., proportion of historical territories or PAM sites surveyed with positive

detections), reproductive rate, or population size/abundance. PAM sites may include hexagons (i.e., groups of 3-4 autonomous recorder units [ARUs] within a hexagon), or ARU stations within hexagons. Note that some management areas may be larger than a single site but smaller than a 30-pair area, and these would be monitored using the same methods used for individual sites.

Large block or provincial scale: Includes larger General Management Areas (particularly those that overlap study areas used for Northwest Forest Plan monitoring) or entire provinces (i.e., a collection of sites and/or multiple Focal Management Areas). Indicators at this scale include site occupancy/use, reproductive rate, population size/abundance. This scale includes areas with and without barred owl management, providing monitoring data that can be compared with data from managed areas to increased inference on management effectiveness.

Range-wide scale
Includes all provinces within the northern and California spotted owl geographic ranges. This facilitates testing of Strategy effectiveness using all managed areas combined within range-wide meta-analysis, similar to that completed by Wiens et al. 2021. Indicators include site use or occupancy; reproductive rate; population size/abundance.

A5.4 Recommended Monitoring Approach

Established and standardized monitoring protocols are recommended initially for the focal owl species (spotted and barred owls), but the monitoring plan can accommodate future changes associated with the development of existing or new methods. Below we provide descriptions of recommended monitoring methods that satisfy permitting requirements while providing inference on management effectiveness at one or more of the spatial scales identified above.

Passive Acoustic Monitoring (applicable across all management scales)
Over the past several years, population monitoring of northern spotted owls and California spotted owls on Federal lands has transitioned from traditional call-playback and mark-resight demographic studies to a broad-scale PAM sampling design **(**Fig. 1; Lesmeister et al. 2021 entire, Lesmeister and Jenkins 2022 entire). The monitoring design uses autonomous recording units (ARUs) to measure owl use at recording stations (~250-m radius around ARUs) and sample sites in which three or four ARUs are placed (5-km^2 hexagons for northern spotted owls, 4-km^2 for California spotted owls). Sample hexagons are monitored over a six-week period during the breeding season, and colonization and extinction rates of those sites are estimated using occupancy modeling to track changes in populations of spotted owls and barred owls and estimate population trend. Now fully implemented as of 2023, the PAM sampling network (used for effectiveness monitoring of northern spotted owls under the Northwest Forest Plan) includes 20% coverage of Federal forest lands (i.e., forested lands of all age classes, including recently burned, harvested, or otherwise disturbed areas) in seven historical spotted owl demographic study areas, and 2% coverage of Federal forest lands across the entire northern spotted owl range within the U.S. (Lesmeister and Jenkins 2022, entire, Figure 1).

The PAM sampling design for northern spotted owls (Lesmeister et al. 2021) has been shown to be effective for detecting the presence of spotted owls and barred owls while accounting for

uncertainties associated with the sampling design (e.g., effects of background noise levels on detectability; Duchac et al. 2020). More recently, data from the PAM network was used to estimate spotted owl sex (Dale et al. 2022, entire) and the probability of pair vocalizations at sample sites (Appel et al. 2023, entire). Further, these data can be integrated with traditional call-broadcast survey methods to estimate population trends for spotted owls (see Weldy et al. 2022 entire) or barred owls.

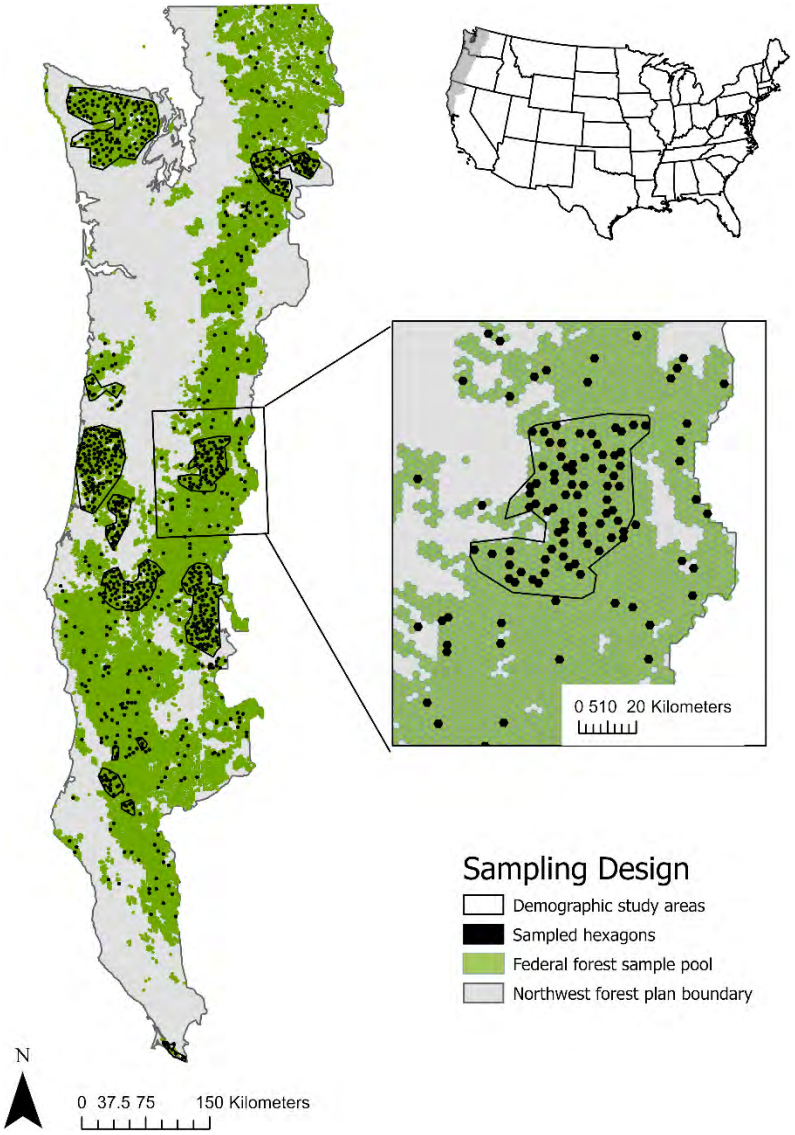

Figure 1 (*from Lesmeister and Jenkins, 2022*). Map of the planned passive acoustic monitoring network for northern spotted owls, barred owls, and other species in the Northwest Forest Plan area. Green area is the pool of 5-km^2 hexagons that are >50% forest cover and >25% under Federal land management. Black outlines are historical study areas for northern spotted owl demographic and territory occupancy monitoring. Black 5-km^2 hexagons are randomly selected from pool of green hexagons. Within historical study areas, 20% of hexagons were randomly selected, and outside those study

areas 2% of hexagons were randomly selected. The full network design will be implemented in 2023-24.

The PAM network would serve as a primary basis for effectiveness monitoring of both spotted owls and barred owls on Federal lands (Fig. 1). Monitoring data from areas managed under the Strategy (e.g., Focal Management Areas) can be coupled with PAM data collected outside of these areas to gauge the status of managed relative to unmanaged populations of spotted and barred owls. Such comparisons may expedite assessments of management effectiveness.

Use of PAM in the range of the California Spotted Owl:
The existing PAM network in the Sierra Nevada can be used to monitor for barred owls. Specific recommendations concerning monitoring in the California spotted owl range are to:

1. Maintain and continue established monitoring network for the detection of barred and spotted owls. Monitor all sources of information on barred owl detections, including broad-scale systematic sampling and focal monitoring at sentinel spotted owl research sites.

2. Initiate inventory and monitoring network within potential barred owl dispersal pathways into the Sierra Nevada from the northern spotted owl range in the northern Sierra Nevada area.

Use of PAM on non-Federal lands:
The Northwest Forest Plan PAM network uses established protocols to survey and monitor northern spotted owl and barred owls on Federal lands only. These protocols rely on a hexagon grid that includes both Federal and non-Federal lands in the range of the northern spotted owl (e.g., Fig. 1), though only Federal lands are monitored for the Northwest Forest Plan effectiveness monitoring. If non-Federal implementers choose to do so, they can initiate PAM monitoring that can be integrated into the broader network using established sampling and monitoring protocols.

Call-playback surveys (applicable at site- and block-management scales)
This method is also used for locating barred owls for removal activities (see barred owl removal protocol). This permits estimation of site occupancy and use by spotted owls and barred owls, but requires species-specific surveys to maximize detectability (Wiens et al. 2011). It is recommended that call-playback surveys also use the PAM hexagon grid, so that monitoring data may be integrated with broader PAM sampling to increase the scope of inference using integrated occupancy modeling (e.g., Doser et al. 2022, entire).

Mark-resight surveys (applicable at site and block scales)
Currently this is the only method that can reliably estimate adult apparent survival of spotted owls, a key indicator of management effectiveness. However, apparent survival can be estimated without mark-recapture methods (e.g., Rossman et al. 2016 entire), though such methods fail to account for territory turnover. Mark-resight methods permit estimation of survival, recruitment, and finite rate of annual population change (e.g., Franklin et al. 2021; Wiens et al. 2021). These methods have been discontinued in most areas, but remain an option for monitoring of non-

Federal barred owl management if the landowner or land manager choses to do so. In addition, the method is currently limited to spotted owls only.

Sampling considerations:
For site-level management, we recommend full coverage of managed provincial home range radius centered on last known activity center, using either PAM or call-broadcast survey methods.

For block-level management, we recommend a minimum of 20% coverage of a managed block area using the randomized hexagon grid design outlined by Lesmeister et al. 2021. In this case sampling sufficiency is based on expected landscape occupancy of spotted owls, with greater sampling effort required in areas with a lower occupancy rate in order to detect changes. Thus, in cases where spotted owl site occupancy (proportion of survey sites with detections) is known to be low (<20%), greater levels of coverage would be required to adequately detect changes in focal owl populations relative to areas where occupancy is expected to be higher (>20%).

To determine how monitoring resources should be allocated within a given management area, three pieces of information are required: 1) the level of acceptable precision of the occupancy estimate; 2) the expected probability of occupancy and detection; and 3) the maximum number of surveys that could be conducted (MacKenzie et al. 2006 pp. 165). Once this information is obtained, it is recommended to follow guidelines outlined for a standard occupancy study design in MacKenzie et al. 2006 (see pp. 167–173; Table 6.1) or Bailey et al. 2007 (entire). In general, as the detection probability decreases, the optimal number of sites and surveys per site increases.

For the provincial and range-wide scales, the range-wide PAM network would be used for inferences on overall population status of northern spotted owls and barred owls. These areas may also be useful for comparisons of populations between managed and unmanaged areas. Sites designated for PAM were randomly selected from a grid of hexagons. For spotted owls, which are expected to be rare in many areas, a randomly selected survey site would have a low probability of occupancy, thus requiring larger numbers of sites, and site-visits, to obtain precise estimates of occupancy (i.e., coefficient of variation less than 20%).

A5.5 Recommended Data Analysis and Reporting

Periodic assessments of monitoring data for barred owls and spotted owls

- Annual assessments: Data collected under the Monitoring Plan will be evaluated on an annual basis to update estimates of selected population indicators for each owl species. Annual reports will be submitted to Service that include basic results of annual monitoring efforts completed within established management areas (e.g., numbers of detections per sample site for each owl species; numbers of barred owls removed).
- Five-year assessments: Formal analyses and reporting of monitoring data and results will occur at regular, five-year intervals coincident with meta-analyses of northern spotted owl population trends under the Northwest Forest Plan Effectiveness Monitoring Plan. The forthcoming meta-analysis in 2024 is anticipated to provide baseline monitoring data on site-use of spotted owls and barred owls from the range-wide PAM network, first

implemented in 2023 (Fig. 1). These data will provide information on site use by spotted owls and barred owls in areas with and without management of barred owls, allowing for formal analyses of the effectiveness in meeting Strategy goals as management is implemented. We recommend that five-year assessments include the analyses specified below. In the northern spotted owl range, monitoring data collected outside of the Northwest Forest Plan PAM framework may still be incorporated into northern spotted owl population meta-analyses, if the designated entity agrees, and if methods are available to incorporate the data.

Two-species occupancy modeling (applicable to spotted and barred owls):
A two-species occupancy model (MacKenzie et al. 2017, entire) is the primary recommended modeling framework for determining population status and trend of northern spotted owls and barred owls, and for assessing the strength of evidence of management effects (see examples in Yackulic et al. 2014, Dugger et al. 2016, and Franklin et al. 2021). This approach also serves as the recommended primary modeling approach for decision analyses.

Site occupancy data collected under PAM or call-broadcast survey protocols are used (or integrated) under this approach to provide estimates of site-occupancy, colonization, and extinction rate of spotted owls and barred owls while accounting for imperfect detection and other uncertainties associated with the sampling design. The model has been used extensively to estimate the co-occurrence dynamics of spotted owls and barred owls (Diller et al. 2014, Yackulic et al. 2014, Franklin et al. 2021). Data for this approach are based on site-specific detection histories that use repeated survey detections (1) and nondetections (0) for both spotted owls and barred owls within and between years at survey sites (e.g., 5-km^2 sample hexagons or historical spotted owl territories). Parameters of initial site occupancy/use, colonization, extinction, and detection probabilities for both species may be evaluated as potential functions of management effort or intensity (see below). The model can include spatial covariates representing relevant site-specific changes in local habitat conditions (e.g., Yackulic et al. 2019), thereby providing a unified framework for inferences on management effectiveness for spotted owls and barred owls while accounting for underlying variation in habitat conditions.

Barred owl removal model (applicable to barred owls only):
For barred owls in block management areas, we recommend the use of an open-population removal model that uses barred owl removal data (e.g., numbers detected vs. removed per visit per site) to track change over time in abundance and distribution of managed populations and the success of management goals for barred owls. This method requires no additional survey cost for barred owls beyond that already required for barred owl removal. This method may be used in combination with the two-species occupancy analysis outlined above to provide detailed information on the effectiveness of management in limiting barred owls within and among different management areas.

Removal models specific to barred owls are currently under development and expected to be available in 2024 (D. Wiens pers. comm). For recent examples of removal models that may be applicable to removal data for barred owls see Udell et al. (2022), Davis et al. (2022), and Link et al. (2018).

Reproductive success/number of young fledged (spotted and barred owls):

- See examples in Dugger et al. 2016, Franklin et al. 2021, and Rockweit et al. 2023)
- Used in combination with two-species occupancy modeling and barred owl removal modeling to supplement assessments of management effectiveness.

Estimation of annual rate of population growth (λ_t) for spotted owls and barred owls:
Estimation of annual population growth rate may be based on site occupancy data (Lesmeister et al. 2021 entire, Steen et al. 2023 entire) collected under established PAM or call-broadcast survey protocols. Mark-resight data for estimation of population growth is also desirable as this would provide estimates of apparent survival and recruitment. However, it is recognized that these methods have been discontinued for monitoring spotted owls in most areas.

A5.6 Additional Considerations Beyond the Scope of the Monitoring Plan

Data management plan:
Organization and management of raw monitoring data and associated metadata used to track effectiveness of the Strategy management actions would be overseen by the Service. Landowners designated to act under the Service permit would be required to submit an annual report detailing all management and monitoring activities, along with relevant raw data in a standardized database format that can be queried for relevant data summaries.

Use of unmanaged areas (controls) as a baseline reference:
The extent to which controls (unmanaged) areas are included as references in analyses of management effectiveness would be addressed on a case-by-case basis. For valid comparisons, managed and unmanaged areas should be as similar as possible in terms of landscape conditions and status of owl populations prior to management action.

Before-After-Control-Impact vs. Before-After-Impact analyses:
We recommend a full Before-After-Control-Impact design for strong inference and applicability to the adaptive management framework, but recognize that pre-existing data may not always be available for selected management areas.

Duration of management actions:
We assume a minimum of five years of implementation would be used to determine local effectiveness of Strategy implementation. The specific length of time required to detect changes in populations of spotted owls barred owls, however, would depend on the relative density of barred owls and spotted owls in managed areas, landscape conditions in surrounding landscapes, and other environmental factors. In general, population-level response time of spotted owls to barred owl management is expected to decrease as the ratio of spotted owls to barred owls increases (see discussions by Wiens et al. 2021, Hofstadter et al. 2022).

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Appendix 6: Effect of Invasive Barred Owls on Northern and California Spotted Owls

The following are excerpts of the discussion of barred owl threats to northern and California spotted owls from recent U.S. Fish and Wildlife Service analyses. These excerpts provide more detailed information on the effect of barred owls on the northern and California spotted owl subspecies.

A6.1. Northern Spotted Owl

Excerpted from: U.S. Fish and Wildlife Service. 2022. Species Assessment and Listing Priority Assignment Form for the Northern Spotted Owl (*Strix occidentalis caurina)*. August 2022. Portland, Oregon. Pages 35-45.

Stressors related to other natural or manmade factors affecting the continued existence of northern spotted owl (Factor E):

A6.1.1. Barred Owl

"At the time of listing, the Service stated that the long-term impact of barred owls on the northern spotted owl was unknown but of considerable concern; the Service recommended continued examination of the role and impact of the barred owl as a congeneric intruder in historical spotted owl range and its relationship to habitat fragmentation, as well as examination of the potential for interbreeding (55 FR 26114; June 26, 1990). At the time of the Service's 2004 status review, the Service was convinced of the negative impact of barred owls on northern spotted owls and suggested the full impact of barred owls on the subspecies was yet to come. We expressed uncertainty in the 2011 review regarding the outcome of competition from barred owl because the relationship between the two species was highly variable across its entire range. We noted that although populations were declining at the time, northern spotted owls were still present across the majority of their range.

During the 20th century, barred owls expanded their range from eastern to western North America, and the range of the barred owl now completely overlaps that of the northern spotted owl (Gutiérrez et al. 1995, p. 3; Crozier et al. 2006, p. 761). Barred owls compete with northern spotted owls for habitat and resources for breeding, feeding, and sheltering, and the presence of barred owls has significant negative effects on northern spotted owl reproduction, survivorship, and successful occupation of territories. Barred owls first overlapped with the northern spotted owl in British Columbia, then spread south into western Washington in 1973 (Hamer et al. 1989, p. 2; Taylor and Forsman 1976, p. 560), Oregon in 1974 (Taylor and Forsman 1976, p. 560), and California in 1976 (Livezey 2009, p. 51).

Our understanding of the barred owl's expansion into the Pacific Northwest is largely based on data gathered incidental to conducting northern spotted owl surveys. Although northern spotted owl surveys were not designed to track barred owl populations, survey results have clearly documented the range expansion of the barred owl and an increase in the density of barred owls

observed on landscapes historically occupied by northern spotted owls (Forsman et al. 2011; Wiens et al. 2014; Dugger et al. 2016; Franklin et al. 2021, p. 17). In addition, barred owls now inhabit all forested areas throughout Washington, Oregon, and northern California where nesting opportunities exist, including areas outside of the specific range of the northern spotted owl (Kelly et al. 2003, Buchanan 2005, Gutiérrez et al. 1995 & 2007, Livezey 2009). Consequently, the Service estimates that barred owls now occur at some level in all areas used now or in the past by northern spotted owls. Biologists in the Arcata Fish and Wildlife Office conducted a mapping exercise using data from the California Department of Fish and Wildlife's Natural Diversity Database (CNDDB) to quantify the number and determine the locations of northern spotted owl territories in northern California for which there is at least one associated barred owl detection (AFWO 2016, pp. 1-9). In the CNDDB, 28.4 percent of all northern spotted owl territories in California comprised of a pair, nest or young (n = 2,597) had at least one barred owl detection located within the territory. Detections of barred owls occurred in a greater proportion of northern spotted owl territory core areas in the Coast Forest District (11.4 percent) than in the Northern Forest District (4.6 percent). The CNDDB report does not include barred owl detections, and thus the analysis represents a minimum of northern spotted owl territories and associated core areas impacted by barred owls.

Data provided by several areas in California shows both consistent encroachment of barred owls into northern spotted owl sites and reduced detections of northern spotted owl. Franklin et al. (2016, entire) studied northern spotted owls in two areas of northwestern California: a regional study area (RSA) and the Willow Creek Study Area (WCSA). Ninety-five territories previously occupied by northern spotted owls were surveyed on the RSA and WCSA in 2015; northern spotted owls were detected at 32 territories (33.7 percent) (Franklin et al. 2016, pp. 6-7). The proportion of surveyed northern spotted owl sites with barred owl detections in 2015 was 0.48, which had increased substantially over the previous 3 years (Franklin et al. 2016, p. 10). In northwestern California, one national park and three State parks comprise Redwood National and State Parks (RNSP), which are not managed under the NWFP. At RNSP, northern spotted owl detections have declined in recent years (RNSP 2015, p. 1). Conversely, a study of northern spotted owls in an area of California not yet colonized by barred owls showed that the number of territories occupied by northern spotted owl pairs remained relatively constant over a 25-year period (Kroll et al. 2016, p. 1).

With a few exceptions, surveys of historical northern spotted owl territories [in RNSP] have resulted in either no owl detections or barred owl only detections (RNSP 2015, p. 1). On lands owned and managed by Green Diamond Resource Company (GDRC), Humboldt County California, a minimum of 88 barred owl territories were estimated within the density study area for year 2016 and a minimum of 112 barred owl territories within the demographic study area, which is an 18 percent increase since the 2015 reporting period (GDRC 2017, p. 72). The number of monitored northern spotted owl sites has declined from 120 sites (year 2000) to 58 sites (year 2016) (GDRC 2017, p. 61). Finally, on lands owned and managed by Humboldt Redwood Company (HRC), Humboldt County, California, barred owl activity in the Habitat Conservation Plan area continues to indicate that there are established barred owl territories that are reproductively active (HRC 2016, p. 10). In 2015, there was an increase in the total number of barred owl detections, with 40 total detections, compared to 27 total detections in 2014 (HRC 2016, p. 10).

Barred owls in the Oregon Coast Ranges had a mean reproductive output that was 4.4 times greater than that of northern spotted owls over a 3-year period (Wiens et al. 2014, p. 35). While northern spotted owls typically nest every other year, barred owls frequently nest every year. Additionally, barred owls had higher annual survival than northern spotted owls (0.92 and 0.81, respectively). Increasing proportions of old forest within seasonal home ranges of both species had a positive effect on annual survival of both northern spotted owls and barred owls (Wiens et al. 2014, p. 36). Studies on effects from barred owls in other areas of the northern spotted owl's range are discussed below in the sections on Competition for Habitat and Decreases in Performance and Site Occupancy.

Effects of Barred Owls on Northern Spotted Owls

As noted by Wiens et al. (2014, pp. 37-38), the behavioral and life-history traits exhibited by barred owls, in addition to the barred owl's slightly larger body size, may give them a significant advantage over northern spotted owls when competing for critical resources such as territorial space, nesting and foraging habitat, and food. Evidence of a negative relationship between barred owl occurrence and population characteristics of northern spotted owls has been well documented and includes declines in occupancy rates of historical northern spotted owl territories where barred owls were detected (Kelly et al. 2003, p. 51; Olson et al. 2005, p. 928; Kroll et al. 2010, p. 1269; Dugger et al. 2011, p. 2463); negative relationships between the occurrence of barred owls and apparent survival of northern spotted owls (Anthony et al. 2006, pp. 18-19; Forsman et al. 2011, p. 38; Glenn et al. 2011a, p. 171; Sovern et al. 2014, p. 1439; Dugger et al. 2016, p. 87; Franklin et al. 2021, p. 11); negative relationships between the presence of barred owls and fecundity of northern spotted owls (Olson et al. 2004, p. 1048; Forsman et al. 2011, p. 24; Franklin et al. 2021, p. 9); and steeper declining rates of population change in portions of the northern spotted owl's range where barred owls have been present the longest (Anthony et al. 2006, p. 32; Forsman et al. 2011, p. 66; Dugger et al. 2016, p. 70; Franklin et al. 2021, p. 13). Finally, looking at an average measure of habitat suitability at annual northern spotted owl locations, there is a strong negative correlation between the increasing trend in the proportion of northern spotted owl territories with barred owl detections and the average habitat suitability at these sites (Davis et al. 2016, p. 14). In the following sections, we summarize current knowledge regarding the effects barred owls have on northern spotted owl populations in the Pacific Northwest.

Aggressive Interactions between Barred Owls and Northern Spotted Owls

Barred owls are on average 18 percent larger than northern spotted owls (Hamer et al. 1989, p. 58) and may attack and kill northern spotted owls. When interacting with northern spotted owls, barred owls are more likely to assume the dominant role (Van Lanen et al. 2011, p. 6). Northern spotted owl surveyors observed barred owls physically attacking northern spotted owls, and, in one instance, found that a barred owl may have killed a northern spotted owl (Gutiérrez et al. 2004, pp. 7-25; Leskiw and Gutiérrez 1998, entire). Barred owls have attacked surveyors imitating northern spotted owls (Gutiérrez et al. 2004, pp. 7-25). There is little overlap between adjacent barred owl home ranges, and barred owl territories are small, well defined, and easily defended. These characteristics are consistent with the aggressive territorial behavior reported

for barred owls (Singleton et al. 2010, p. 291). Barred owls are very aggressive towards other barred owls, even outside their breeding season (Nicholls and Fuller 1987, p. 126). When surveyors record barred owl calls, they often hear barred owls crash through branches of the lower forest canopy, behavior apparently meant to intimidate intruders (Wiens et al. 2011, p. 536). Northern spotted owl home ranges, in comparison, tend to overlap more broadly, particularly in areas more distant from the nest site or activity center foraging areas (Hamer et al. 2007, p. 763; Glenn et al. 2004, p. 41; Wiens et al. 2014, pp. 18-19). There are relatively few observations of northern spotted owls aggressively chasing or physically attacking a barred owl but those that exist include a nesting northern spotted owl pair aggressively confronting barred owls, a male northern spotted owl in a family group pursuing a barred owl out of an area, and a northern spotted owl pair responding in an agitated manner to a barred owl (Gutiérrez et al. 2004, pp. 7-25).

Competition for Food

As food generalists, barred owls may be more resilient than northern spotted owls to fluctuations in small mammal populations as they are less dependent on these prey items than northern spotted owls. Densities of dusky-footed woodrats, a dominant northern spotted owl prey species in the southern part of its range, can vary from year to year (Forsman et al. 2004, p. 222), as well as between and within owl territories (Ward et al. 1998, p. 79). Densities of northern flying squirrels can also vary considerably (Carey et al. 1992, p. 233; Forsman et al. 2004, p. 222). If prey populations were reduced, the limited ability of northern spotted owls, a food specialist, to switch prey would require them to expand their territory in search of their limited food. As generalists, barred owls can also forage in a wider variety of habitats than northern spotted owls. Barred owls can move into open areas outside of forested habitats to forage (Holt and Bitter 2007, p. 10), and are more apt to forage in meadow and riparian areas than northern spotted owls (Hamer et al. 2001, pp. 255-226; Wiens et al. 2014, pp. 21-22).

A comparison of prey from the analysis of northern spotted owl and barred owl pellets in western Washington showed that northern spotted owl and barred owl diets overlap by 76 percent, indicating they likely compete for food (Hamer et al. 2001, p. 221). Barred owl diets were dominated by terrestrial species and included a high proportion of diurnal prey. Their diet consisted of 74.5 percent mammals (mostly snowshoe hare (45 percent), Douglas' squirrel (14.1 percent), and northern flying squirrel (18.4 percent)); 19.4 percent birds; and 6.1 percent combined fish, amphibians, mollusks, and insects by weight (biomass) (Hamer et al. 2001, pp. 225-226). Of the northern spotted owl diet, 98.6 percent (by biomass) comprised mammals and the primary mammal species were northern flying squirrels (58.1 percent), snowshoe hares (13.4 percent), and bushy-tailed woodrats (11.6 percent). Because northern spotted owls are more specialized in their prey selection, and therefore are at greater risk if their prey populations are low, they may be vulnerable to food limitations. Northern spotted owl populations exhibit the behavior of food stressed populations (i.e., large home range, low and sporadic reproductive rates, low population densities, and nomadic tendencies during the winter), or ones in which even sufficient food resources cannot compensate for high metabolic costs of reproduction (Hamer et al. 1989, p. 60; Kroll 2017, pers. comm.).

In a study comparing diets between sympatric northern spotted owls and barred owls in western Oregon in 2007-2009 (Wiens et al. 2014, pp. 24-25), 1,223 prey items were identified from 15 territories occupied by pairs of northern spotted owls, and 4,299 prey items from 24 territories occupied by pairs of barred owls in western Oregon. Diets of both species were dominated by nocturnal mammals; however, barred owl diets included many terrestrial, aquatic, and diurnal prey species that were rare or absent in northern spotted owl diets. Important prey items for both species included northern flying squirrels, woodrats, and lagomorphs accounting for 81 percent and 49 percent of total dietary biomass for northern spotted owls and barred owls, respectively. Dietary overlap between pairs of spotted and barred owls in adjacent territories ranged from 28-70 percent (Wiens 2012, pp. 37-38). Because northern spotted owls have a more limited diet than barred owls, they require a larger territory to support their needs and likely expend more energy covering this larger territory while foraging than barred owls do while foraging.

The ability of barred owls to forage on a wider diversity of prey species and in a wider diversity of habitats may explain their reproductive success in comparison with northern spotted owls. In many owls, reproductive success is dependent upon availability or size of principal prey. Prey abundance has a strong effect on fecundity (the number of female offspring produced per adult female owl) in other owl and raptor species (multiple sources cited in Forsman et al. 2011, p. 61). The variation in reproductive behavior of northern spotted owls may be tied to the availability and abundance of preferred prey but the relationship is not entirely clear (Forsman et al. 1984, p. 33; Rosenberg et al. 2003, p. 1715).

Competition for Habitat and Territories

Barred owls and northern spotted owls often use the same areas in overlapping territories, although there is little overlap of home ranges during the breeding season (Hamer et al. 2007, p. 750). Northern spotted owls have home ranges that are three to four times larger than those of barred owls (Hamer et al. 2007, p. 750), which suggests that northern spotted owl preference for a relatively narrow range of nocturnal mammals necessitates ranging farther to gather sufficient prey. Conversely, barred owls can forage on a broad range of prey, including diurnal and aquatic species (Hamer et al. 2007, p. 750), consistent with their apparent ability to meet their food needs within a smaller range.

Because northern spotted owl habitat can support many more barred owls than northern spotted owls, barred owl densities are higher in these areas (Pearson and Livezey 2003, p. 272). A study near Eugene, Oregon, showed 82 pairs of barred owls and 15 pairs of northern spotted owls on the same landscape (Wiens et al. 2014, p. 39). Considering the dietary overlap between the two species, increased density of barred owls could result in less prey available to northern spotted owls (Gremel 2005, p.16), and increase the frequency of potentially aggressive interactions (Kelly et al. 2003, p. 49-50; Pearson and Livezey 2007, p. 159).

Based on a review of literature on barred owl habitat use in North America, barred owls prefer old or mature mixed deciduous-coniferous forests with high canopy closure (Livezey and Fleming 2007, p. 177). However, they also use a wider range of forest habitats than northern spotted owls, including suburban woodlots. The relatively open understory and low density of

trees in old mixed forests may contribute to the success of barred owls in capturing prey (Nicholls and Warner 1972, p. 222; Mazur et al. 1998, p. 752). In a study in the dry eastern Cascades, radio-tracked barred owls were observed using habitats similar to northern spotted owls in terms of canopy closure and tree size, although the home range sizes of barred owls were smaller and concentrated in gentle slopes in valley bottoms (Singleton et al. 2010, p. 285). Compared to northern spotted owl sites in the eastern Cascades, barred owl nest sites were located on gentle slopes or flat ground, closer to water, and included more hardwoods and a greater richness of tree species (Buchanan et al. 2004, p. 231). Barred owls nested in black cottonwoods, which are often found in riparian areas and rarely used by northern spotted owls for nesting. In the eastern Cascades, barred owl sites tended to be located more often in mixed riparian stands and in high-elevation moist coniferous forests than northern spotted owl sites (Herter and Hicks 2000, p. 279).

In western Washington, northern spotted owl sites tend to be located on steeper slopes and higher elevation areas when barred owls are present compared to when barred owls are absent (Pearson and Livezey 2003, p. 274). Similarly, Gremel (2005, p. 17) found this to be the case in Olympic National Park, where forests had never been logged, and at Mount Rainier National Park, spotted owl occupancy was higher at territories with steeper topography (Mangan et al. 2019, p. 10). Barred owl nests were found in low-elevation forests with relatively level slopes, with some proportion of deciduous trees, with wetlands (Gremel 2005, p. 17), and alongside reservoirs or tributaries (Hamer et al. 2007, p. 759). In the most recent analysis of the 11 long-term northern spotted owl study sites, barred owl colonization of northern spotted owl territories was positively associated with lower-elevation territories in most study areas (Franklin et al. 2021, pp. 13, 18). Herter and Hicks (2000, p. 283) found that barred owl sites in central Washington contained more deciduous and young forests than did northern spotted owl sites. While northern spotted owls may occur in landscapes where young forests predominate, they persist there at low densities and generally nest in patches of old forest (Forsman 1988, p. 67).

Wiens et al. (2014) investigated spatial relationships, habitat use, diets, survival, and reproduction of northern spotted owls and barred owls in a study area in western Oregon during 2007-2009, with the objective of determining the potential for and possible consequences of competition for space, habitat, and food between these two owl species. The study found that the average size of barred owl home ranges was considerably smaller (1,436 ac (581 ha)) than home ranges of northern spotted owls (4,554 ac (1,843 ha)), and while the outer portions of home ranges of the two species overlapped, there was minimal overlap of core use areas within the home ranges (p. 1). Results from Wiens et al. (2014, p. 30) supported the hypothesis that interference competition with barred owls for territorial space can constrain the availability of critical resources required for successful recruitment and reproduction of northern spotted owls (p. 38). Interference competition is defined as competition where one or more species interact directly with one another to exploit essential resources with a negative effect on fitness related characteristics of at least one of the species (Wiens 1989, p. 7). Availability of old forests and associated prey species appeared to be the most strongly limiting factors in the competitive relationship between the two species. Habitat loss or management actions that reduce prey availability may lead to increases in competitive pressure on northern spotted owls. Variation in northern spotted owl vital rates may arise not only from differences in the quality or abundance of forest habitat among northern spotted owl territories, but also from the spatial distribution of

barred owls. The study also found that northern spotted owls spent more time foraging on steep slopes dominated by old (>120-year-old) conifers while barred owls used a broader range of forest types and frequently used flatter, riparian areas with large hardwood and conifer trees; both species showed strong selection for older conifer forest (Wiens et al. 2014, pp. 32 and 39).

Jenkins et al. (2019; pp. 3-5) found evidence of fine-scale partitioning of complex, old-growth forest habitat use by northern spotted owls and barred owls, primarily differential use of canopy cover, understory vegetation densities, and terrain preferences. They hypothesized that the differences in habitat selection may be due to foraging behavior and prey availability or may reflect a behavioral response by northern spotted owls due to competition with barred owls.

Hybridization

Hybridization of northern spotted owls with barred owls has been confirmed through genetic research and field observations (Hamer et al. 1994, pp. 487-491; Dark et al. 1998, p. 52; Kelly 2001, pp. 33-34; Kelly and Forsman 2004, pp. 807-809; Funk et al. 2008, pp. 161-171; Wiens 2012, p. 1). Hybrids exhibit physical and vocal characteristics of both species (Hamer et al. 1994, p. 488). Reproductive viability has been confirmed in first generation hybrids, though the extent of viability in subsequent generations is uncertain (Kelly and Forsman 2004, p. 808). Although hybridization between barred owls and northern spotted owls has been documented throughout the range of the northern spotted owl, it does not occur frequently (Herter and Hicks 2000, p. 279; Kelly 2001, p. 33; Hamer et al. 1994, pp. 487-488). Kelly and Forsman (2004, p. 807) located 47 confirmed cases of hybrids (17 adults and 30 juveniles), including 16 second-generation hybrids. They confirmed six territories where male northern spotted owls were paired with female barred owls, 16 sites where hybrid adults were paired with barred owls, and one site where a hybrid was paired with a northern spotted owl. As with many owls, northern spotted owls and barred owls have reversed sexual dimorphism, e.g., males are smaller than females (Gutiérrez et al. 1995, p. 2; Mazur and James 2000, p. 7), which may explain the observations. Pairings of male northern spotted owls and female barred owls would retain the smaller male and larger female pattern, making them more likely to breed, than a male barred owl and female northern spotted owl, which are approximately the same size (Kelly and Forsman 2004, p. 807). Given the hundreds of sites monitored each year during this period, this is a small proportion of hybrid pairs.

Although increasing density of barred owls in northern spotted owl habitat might be assumed to increase the risk of hybridization, it may be that hybridization is more likely when barred owl populations are low. Individual barred owls may have trouble finding a conspecific mate and settle for a closely related northern spotted owl. It has been suggested that as barred owl numbers increase and they have more access to barred owl mates, hybridization will decrease (Kelly and Forsman 2004, p. 808). In addition, as northern spotted owls continue to become more uncommon relative to barred owls, the incidence of hybridization may again increase (Gutiérrez et al. 2007, p. 189).

Decreases in Northern Spotted Owl Demographic Performance and Site Occupancy

The four meta-analyses of northern spotted owl demographic data completed since 2006 (Anthony et al. 2006, Forsman et al. 2011, Dugger et al. 2016, Franklin et al. 2021) evaluated effects of barred owls on northern spotted owl demographic performance. Each of these analyses has identified increasingly widespread and pervasive effects of barred owls. Anthony et al. (2006, p. 32) found negative associations between presence of barred owls and northern spotted owl survival at three study areas. In addition to a negative association with northern spotted owl survival at six study areas, Forsman et al. (2011, p. 70) found that the presence of barred owls was negatively associated with northern spotted owl recruitment at most study areas, resulting in observed declining population trends (Forsman et al. 2011, p. 75). Of all the factors contributing to declines in the demographic rates of northern spotted owls, the presence of barred owls was the strongest and most consistent across study areas (Forsman et al. 2011, p. 75). Forsman et al. (2011, p. 60) hypothesized that barred owls may be displacing northern spotted owls from their territories causing them to become nonbreeders, and also determined that increased barred owl presence made northern spotted owls more difficult to detect using standard survey methods. They reported that northern spotted owls that remained on their territories continued to breed at historical levels; however, the reduced number of occupied territories produces fewer young northern spotted owls overall resulting in lower reproductive output of northern spotted owl populations included in this study. This explanation is consistent with the fact that observed northern spotted owl fecundity rates are not so different from barred owl rates and yet overall downward trends occur in northern spotted owl populations wherever barred owls are present at densities high enough to displace northern spotted owls from their territories.

Dugger et al. (2016, p. 58) observed strong evidence that barred owls negatively affected northern spotted owl populations, primarily by decreasing apparent survival and increasing local territorial extinction rates. The analysis also revealed that the amount of suitable owl habitat, local weather, and regional climatic patterns were also related to survival, occupancy, recruitment, and fecundity. There was, however, inconsistency regarding which covariates were important for particular demographic parameters and effects differed across study areas. In study areas where habitat was an important source of variation for northern spotted owl demographics, demographic rates were generally positively associated with greater amounts of suitable owl habitat. In the most recent meta-analysis, Franklin et al. (2021, pp. 11-13, 15-19) found that barred owl presence negatively affected all components of northern spotted owl demographic change, including fecundity, recruitment, apparent survival, and site occupancy. These effects were consistent and widespread across all study areas. They concluded that northern spotted owls would likely face extinction, throughout the subspecies' range, without management to address the impacts of barred owls.

The effects of barred owls on northern spotted owl territory (site) occupancy were first reported in 2003 in a retrospective study to determine if barred owls could be causing declines in northern spotted owl populations observed in the early 2000s (Kelly et al. 2003, entire). Northern spotted owl survey data was examined, including barred owl responses, and demonstrated that the presence of barred owls at historical northern spotted owl sites was associated with reduced northern spotted owl site occupancy (Kelly et al. 2003, p. 52). A

subsequent study analyzed existing data to determine if barred owls affect northern spotted owl site occupancy, location of activity centers, or productivity in the Olympic National Park in western Washington State (Gremel 2005, entire). The study confirmed that the presence of barred owls appeared to be both reducing northern spotted owl site occupancy at their historical sites, and increasing the detection distance between northern spotted owls and their original site centers. Barred owls were first detected in Olympic National Park (an area that had never been logged) in 1985. From 1992 to 2003, the number of barred owl detections per team day in northern spotted owl sites increased at a rate of 15 percent per year (Gremel 2005, p. 9). During the same period, the rate of northern spotted owl site occupancy where barred owls were present declined overall from a mean of 60.6 to 41.6 percent (Gremel 2005, p. 11). Northern spotted owls were located twice as far away from their established activity centers when compared with survey results for northern spotted owl territories without barred owls (Gremel 2005, p. 11), implying that northern spotted owls shifted their activity centers away from the presence of barred owls even if they did not abandon their territories. Northern spotted owl site centers that remained occupied despite the presence of barred owls also tended to be at higher elevations. These findings are consistent with the hypothesis that interference competition may be occurring and that barred owls may be displacing northern spotted owls (Gremel 2005, p. 16). The presence of barred owls may have a greater influence on whether northern spotted owls occupy a territory than whether an area is within a reserve (Pearson and Livezey 2003, p. 274).

Dugger et al. (2016) presented the first meta-analysis of northern spotted owl data to examine site occupancy across the range of the subspecies. The most consistent pattern in northern spotted owl territory occupancy dynamics found was a strong positive association between the presence of barred owls and territory extinction rates of northern spotted owls in all 11 study areas (Dugger et al. 2016, p. 74). Territory extinction rates (probability that a site occupied in one year will become unoccupied by the next year) were higher in all areas when barred owls were present. Occupancy rates for northern spotted owls were declining in all study areas (Dugger et al. 2016, p. 75). Site occupancy rates in Washington declined from 56-100 percent in 1995 to 11-26 percent in 2013. In Oregon, occupancy rates declined from 61-88 percent in 1995 to 28-48 percent in 2013. In California, between 1995 and 2013, occupancy rates declined from 75 percent to 38 percent at the Northwest California study area and from 79 percent to 47 percent at the Hoopa study area. In the area where barred owl removal did not occur on the Green Diamond study area, occupancy rates declined from 92 percent in 1999 to 55 percent in 2013. Franklin et al. (2021, pp. 13, 17, 18) similarly found, across all study areas, consistent negative effects of barred owl presence on spotted owl territory colonization and increased likelihood of spotted owl territory extinction with barred owl presence. Throughout the range, these effects have resulted in continued declines in spotted owl territory occupancy as barred owl presence has increased.

Northern spotted owls have a reduced response rate in the presence of barred owls (Crozier et al. 2006, p. 765; Van Lanen et al. 2011, p. 5); therefore, barred owls may disrupt certain behaviors important to northern spotted owls. Vocalizations are an important part of the northern spotted owl's territorial behavior. Detection of both barred owls and northern spotted owls was negatively influenced by the presence of other congeneric species, i.e., species belonging to the same genus (Bailey et al. 2009, p. 2987). Modeling conducted by Jones and

Kroll (2016, p. 10) suggest that declines in spotted owl paired territories could be due to the presence of barred owls, though they found no clear evidence of an effect on spotted owl occupancy with a small sample size of 47 northern spotted owl sites. Mangan et al. (2019, p. 10) found evidence that barred owl presence was associated with reduced northern spotted owl breeding propensity. While the adverse effects of the barred owl on the behavior and demography of the northern spotted owl are well documented, little is known about the immediate and long-term effects that barred owl presence may have on native species composition and ecosystem processes (Holm et al. 2016, pp. 1-8). Based on differences between northern spotted owls and barred owls regarding selection for diet and habitat resources, the presence of barred owls in the Pacific Northwest may cause wider trophic effects within predator and prey communities (Holm et al. 2016, pp. 1-8).

Results from Franklin et al. 2021 (pp. 11-18) supported the hypothesis that competition with barred owls is the stressor that affects northern spotted owl populations most consistently across the range; however, habitat factors and climatic patterns also were related to occupancy and recruitment, although relationships with these factors varied across study areas. Results were consistent with other studies that have found links between habitat and demographic rates of northern spotted owls (Franklin et al. 2000; Olson et al. 2004; Dugger et al. 2005, 2011, and 2016; Forsman et al. 2011; Wiens et al. 2014; Yackulic et al. 2014), and provided support for previous recommendations to preserve as much high-quality habitat in late-successional forests as possible across the range of the subspecies (Forsman et al. 2011, p. 78; Franklin et al. 2021, p. 18). Without additional management intervention, the eventual extinction of the northern spotted owl subspecies is probable, given the pervasive, widespread negative effects of barred owls on northern spotted owl populations, in combination with other stressors such as loss of habitat to wildfire and genetic effects of small population sizes (Franklin et al. 2021, p. 19).

Conservation Measure to Address Impacts from the Barred Owl

The 2011 Revised Recovery Plan for the Northern Spotted Owl contains ten recovery actions specific to address competition from the barred owl. These include the establishment of protocols to detect barred owls and document barred owl site status and reproduction (Recovery Action 24), and the design and implementation of large-scale control experiments to assess effects of barred owl removal on spotted owl site occupancy, reproduction, and survival (Recovery Action 29). Several barred owl recovery actions have been completed, and the Barred Owl Removal Experiment implementing Recovery Action 29 has recently been completed (USFWS 2013 and 78 FR 57171). The experiment was conducted by the USGS and the Hoopa Tribe for the Service. The research program evaluated the effectiveness of barred owl removal as a potential recovery strategy for northern spotted owls in one study area in Washington, two study areas in Oregon, and one study area in northern California. Barred owl removal was implemented on the California study area in starting in the fall of 2013, and on the Washington and one of the Oregon study areas in fall of 2015. Barred owl removal on the final Oregon study area was initiated in fall of 2016. Removal on the Oregon and Washington study areas was completed August 31, 2020. Barred owl removal associated with this experiment on the Hoopa study areas was completed August 31, 2021. Separate barred owl removal experiments remain ongoing in several areas in California, including Hoopa and Yurok Tribal lands, and private lands owned by Sierra Pacific Industries and Green Diamond.

While the Service's experiment was focused on Federal lands, the study area landscapes included significant interspersed private and State lands. Four SHAs were developed with State and private landowners that were willing to work with the Service to provide access for survey and removal of barred owls on their lands within the study areas. Agreements were established with Roseburg Resources Company, Oxbow I LLC, Weyerhaeuser Company, and Oregon Department of Forestry to facilitate successful completion of this research project. Oxbow I LLC was later acquired by Roseburg Resources Company. Through these four SHAs, the landowners contributed to the conservation of the northern spotted owl by allowing the researchers to use company roads, survey for barred owls on their lands throughout the Study Area, and remove barred owls from their lands within the removal portion of the experiment. The section 10 permit issued as part of the SHA provided these landowners with short-term incidental take authorization through habitat modification for spotted owls that might return to non-baseline northern spotted owl sites after the removal of barred owls. Non-baseline sites were defined as historical spotted owl sites that were unoccupied by resident spotted owls for the at least three years prior to the initiation of removal on the area. The information and access were crucial to efficient and effective implementation of the experiment.

Results from the Barred Owl Removal Experiment are now available. Annual reports on study progress were provided each year, a publication was completed in 2021 (Wiens et al. 2021), and a final report is anticipated in 2022. Removal of barred owls had a strong, positive effect on survival of sympatric spotted owls and a weaker, though still positive effect on spotted owl dispersal and recruitment. The estimated mean annual rate of population change for spotted owls stabilized in areas with removals (0.2% decline per year), but continued to decline sharply in areas without removals (12.1% decline per year) (Wiens et al. 2021, p. 5). On the Hoopa study area, apparent survival improved by nearly 10 percent from before and after removals were initiated (Carlson et al. 2019, p 9)."

A6.2. California Spotted Owl

Excerpted from: U.S. Fish and Wildlife Service. 2022. Species Status Assessment for the California Spotted Owl (*Strix occidentalis occidentalis*), Version 2.0. November 2022. Sacramento, California. Pages 48-52.

A6.2.1. Competition and Hybridization with Barred Owls

"The barred owl (Strix varia) is a closely related species to the spotted owl, native to eastern North America (Mazur and James 2000, "Introduction" Section). Since the 1960s, the barred owl has been extending its range westward, first coming in contact with northern spotted owls and more recently moving into the CSO range (Peterson and Robins 2003, p. 1162; Livezey 2009, p. 49; Keane et al. 2018, p. 5). Long and Wolfe (2019, p. 1282) includes a figure with panels demonstrating the range of barred owls from their historical range into western North America, with progression into the ranges of northern, California, and Mexican spotted owls. The barred owl range completely overlaps the northern spotted owl range (Wiens et al. 2020, p. 1), and much of the CSO range (Keane et al. 2018, p. 38). Relevant to CSO, barred owls were first detected in northwestern California in 1982 (Evens and LeValley 1982, p. 890), the Sierra

Nevada in 1991 (Dark et al. 1998, p. 53), and along the coast as far south as Marin County in California by 2002 (Jennings et al. 2011, p. 105). Barred owls and spotted owls have similar habitat requirements, with old forests representing high-quality habitat for both, although barred owls use a broad mix of forest types (Wiens et al. 2014, pp. 14, 32). Because barred owls have more habitat flexibility than spotted owls, there is potential for barred owls to expand into spotted owl habitat through corridors of lower-quality habitat. For example, there are recent barred owl sightings from Davis, California (ebird.org, accessed 14 April 2022), suggesting barred owls could expand into CSO habitat from the west in addition to the more likely pathway through forests in the Sierra Nevada. Although the CSO range has a gap between the Sierra Nevada and southern California, barred owls may be able to colonize the southern California CSO range because of their ability to use other forest types. Detections of barred owls in coastal forests in the Santa Cruz Mountains in San Mateo County, California (ebird.org, accessed 14 April 2022), an area notably absent within the CSO range (see 2.2 Geographic Distribution), suggests a pathway towards connectivity to the coastal CSO portion of the range.

Barred owls are aggressively outcompeting and displacing spotted owls on the landscape (Wiens et al. 2014, p. 1; Gutiérrez et al. 2017, p. xvi; Long and Wolfe 2019, entire). Barred owls are larger than spotted owls (Gutiérrez et al. 2007, pp. 185–186) and behaviorally dominant (Van Lanen et al. 2011, pp. 2197–2198). Although diet overlaps between the two species, with both predominantly feeding on nocturnal mammals, barred owls are generalists that consume many more prey species in comparison to spotted owls (Wiens et al. 2014, pp. 24–25; Kryshak et al. 2022, pp. 12–13). Competition between the two species results in negative effects to the survival, productivity, and recruitment of northern spotted owls (Dugger et al. 2016, pp. 69–91) and barred owls have been described as demographically superior to northern spotted owls because they have higher survival estimates and produced on average 4.4 times more young than northern spotted owls over a 3-year study period (Wiens et al. 2014, p. 28). The presence of barred owls has caused lower detection rates and occupancy probabilities in northern spotted owls (Olson et al. 2005, p. 918; Crozier et al. 2006, p. 760; Kroll et al. 2010, p. 1264; Yackulic et al. 2012, p. 1953, 2014, p. 265). Although there is some evidence that lower detection rates may be in part due to northern spotted owls responding less frequently in the presence of barred owls (Crozier et al. 2006, p. 760), the negative effects of barred owls on spotted owls are clear. Although there is no evidence of barred owls wounding or killing northern spotted owls (Wiens et al. 2014, p. 33), competition ultimately has population-level effects because of impacts to occupancy and reproduction. Additionally, barred owls can hybridize with spotted owls (Gutiérrez et al. 2017, p. 211). There are likely broader impacts on the ecosystem of the barred owl range expansion such as an imbalance in predator/prey relationships, causing even greater impacts to spotted owl interspecific competition (Holm et al. 2016, p. 615). Because of the wide and diverse diet of barred owls in comparison to spotted owls, (Kryshak et al. 2022, pp. 15–16) argue that barred owls will not be ecological replacements to the spotted owls that they displace, and this could have widespread ecological impacts.

Barred owl detections within the spotted owl range have continued to increase. From 1989 to 2013, 51 barred owls and 27 barred owl/spotted owl hybrids had been detected in the Sierra Nevada (Gutiérrez et al. 2017, p. xxv). By 2017, the number of barred and barred owl/spotted owl hybrid detections in the Sierra Nevada increased to approximately 145 (Keane et al. 2018, p. 7), with another 2.6-fold increase between 2017 and 2018 (Wood et al. 2020, p. 4). Even these

seemingly low numbers of barred owls in the CSO range are of concern, given that in the northern spotted owl range, replacement of northern spotted owls began at a slow rate in the early years of the expansion, followed by a rapid rate of replacement once the barred owl population reached a critical mass (Forsman in litt. 2018, p. 1). Recent observed CSO population declines likely do not yet reflect barred owl impacts (Gutiérrez et al. 2017, p. 99). In the summer of 2017, bioacoustic surveys in Lassen National Forest, the northern end of the CSO range, found that barred owls were approximately five times less abundant than spotted owls (Wood et al. 2019, p. 498). From 2017–2018, a rapid increase in barred owls was observed in Lassen National Forest with site occupancy changing from 0.082 (CI 0.045-0.12) to 0.21 (CI 0.14-0.28) (Wood et al. 2020, p. 4). As shown in Figure 10, barred owl detections in the CSO range have increased over the almost thirty-year period of 1989–2017. Figure 11 represents barred owl individual locations within the CSO range over two time periods: pre-1990 through 2009 and 2010 through 2022. As shown, over the last 10 years in particular, barred owl detections throughout the CSO range have increased.

Experimental barred owl removal studies were first initiated and are currently ongoing in the northern spotted owl range (Diller et al. 2012, p. entire; Wiens et al. 2020, p. entire). Wiens et al. (2020, p. entire) summarizes efforts to remove barred owls using a before-after-control-impact design in three study areas in Washington and Oregon, which resulted in removals of over 2,000 barred owls from 2015 through 2019. Results indicate that removals successfully decreased site use by barred owls and increased northern spotted owl use within treatment areas. Further, successful barred owl removals can result in competitive release for spotted owls (Wiens et al. 2021, pp. 4–5). In another (smaller) example of barred owl removals within the northern spotted owl range, after nine barred owls were removed from historical northern spotted owl sites, all sites were re-occupied by northern spotted owls within a year of removal: four by the original residents and five by new residents (Diller et al. 2012, p. 405). However, barred owls again replaced the northern spotted owls at 3 sites within 1–4 years of the northern spotted owls reoccupying those territories (Diller et al. 2012, p. 405). Overall, evidence to date indicates some measure of success for northern spotted owls related to barred owl removal efforts in at least some cases. However, species experts caution that forest conditions, densities of barred owls, and numbers of spotted owls would all factor into whether or not similar results could be obtained in other areas (Wiens et al. 2020, p. 1).

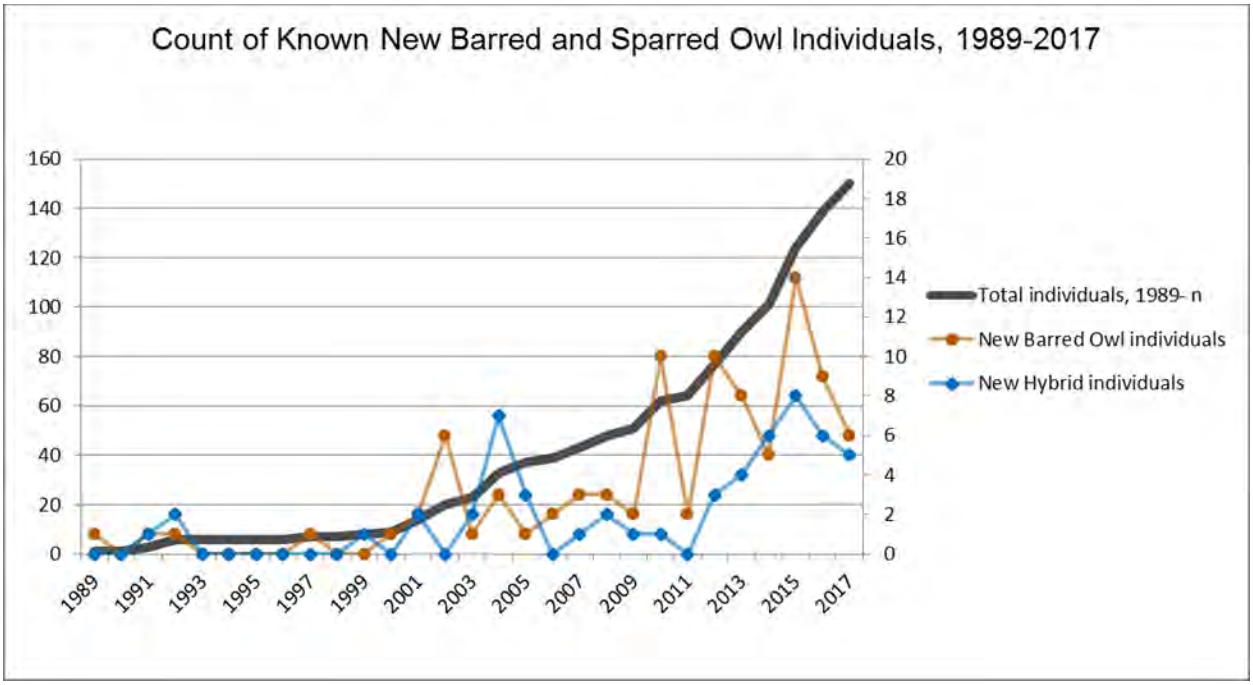

Figure 10: Figure from Keane et al. 2018 shows the barred owl expansion in the CSO range through time. The left y-axis represents the total number of individuals, and the right y-axis represents the number of new barred and hybrid individuals (i.e., sparred owls) each year.

Experimental barred owl removal studies have also recently been initiated in the CSO range, specifically in the Sierra Nevada (Hofstadter et al. 2022, p. entire). In 2017, a CSO conservation assessment concluded that control measures for barred owls in the CSO range were likely to be more successful and cost efficient while densities of barred owls are still relatively low in the CSO range, and that if control measures were not taken, barred owls would most likely replace CSO on the landscape in the future (though the timescale of this replacement was uncertain) (Gutiérrez et al. 2017, pp. xxxi, xxv); see also (Wood et al. 2020, pp. 5–7). Within the CSO range, barred owl removal experiments were initiated in 2018 and have continued through 2022 (Hofstadter et al. 2022, p. entire). Between 2018 and 2020, researchers removed 76 owls (63 barred owls and 13 hybrids) from the Sierra Nevada, decreasing barred owl occupancy by a factor of 6.3 down to 0.03 (confidence interval: 0.01–0.04). Experimental removals were guided by passive acoustic monitoring, which was also used to measure the efficacy of removals. Partnerships were crucial to the regional-scale removal, with public-private partnerships allowing access to 92% of the CSO range in the Sierra Nevada, including almost all known barred owls in the area and minimizing refugia for barred owls. California spotted owls rapidly colonized territories where barred owls were removed: 15 out of 27 territories were recolonized by CSO within one year of barred owl removals, with successful breeding documented in five of these territories (Hofstadter et al. 2022, pp. 4–5). Early and effective experimental removals of barred owls within the CSO range in the Sierra Nevada has dampened the urgency of this threat, but the potential for

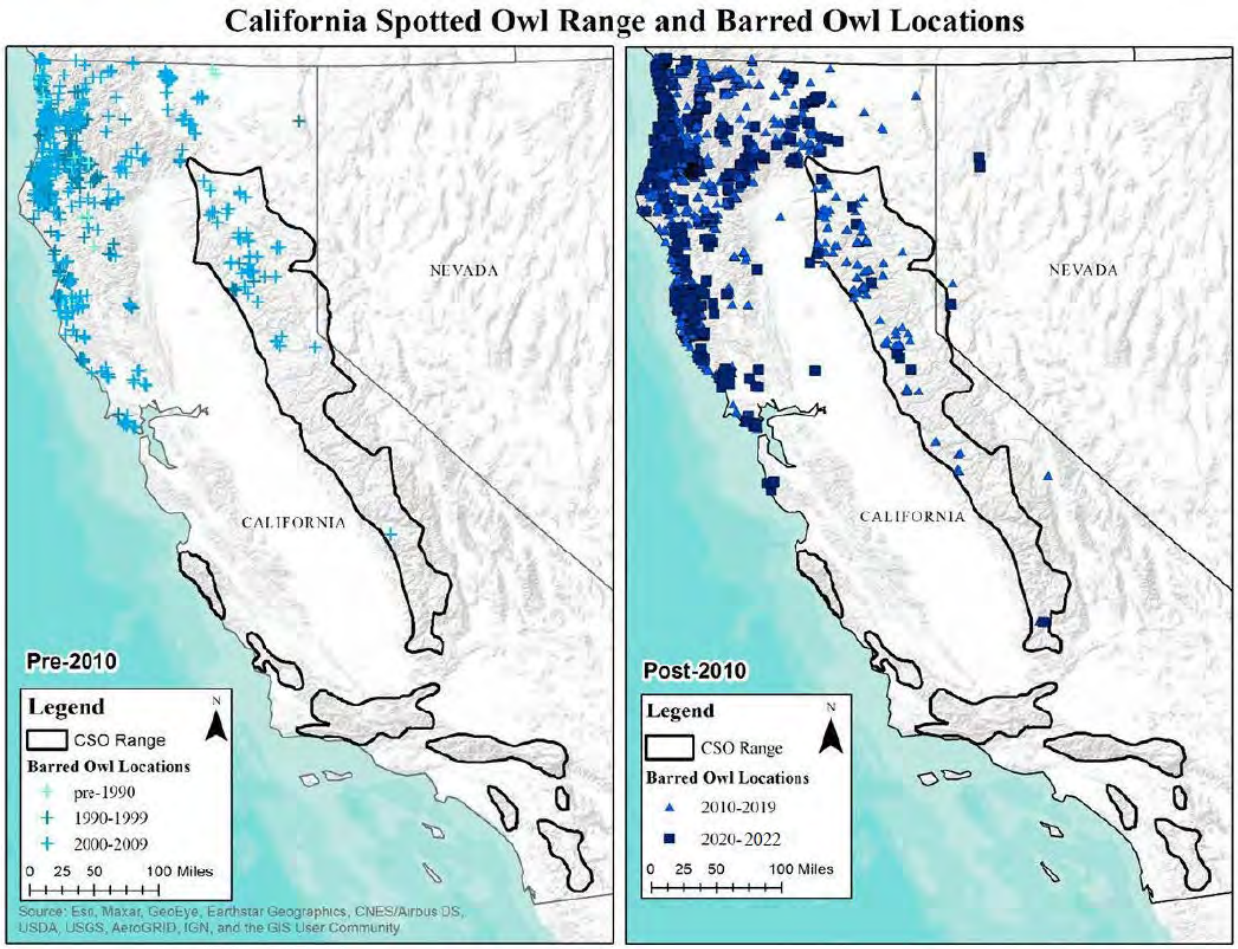

Figure 11: Barred owl detections within the California spotted owl range (eBird 2022; CNDDB 2022). Each point does not necessarily represent a unique individual, but rather a separate detection.

continued and persistent expansion into the range remains. Funding is currently available to continue barred owl removal experiments in the California extent of the Sierra Nevada through 2024 (Peery in litt. 2022). However, continued barred owl monitoring and experimental removal would likely need to continue into the future (Hofstadter et al. 2022, p. 6). Management options are currently being evaluated for potential future implementation.

Regulatory mechanisms and management actions that are providing or could potentially provide some protection from the effects of barred owl expansion include management teams, management plans, and Habitat Conservation Plans (HCPs) that coordinate, fund, and implement the experimental removals described above. For more information about the management teams, management plans, and HCPs that ensure these efforts occur, see 4.9 Regulatory Mechanisms and Management Actions. However, barred owls are a significant threat to the persistence of California spotted owls, and the magnitude of this threat is expected to increase into the foreseeable future, particularly if management efforts are not continued."