United States Department of the Interior

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June 28, 2012

Memorandum

To: Dayne Barron, District Manager, Medford District Bureau of Land Management, Medford, Oregon.

From: Jim Thrailkill, Field Supervisor, Roseburg Fish and Wildlife Office, Roseburg, Oregon.

Subject: Formal consultation on the Grants Pass Resource Area FY 2012-13 projects planned by the Medford District of the Bureau of Land Management, that are likely to affect the northern spotted owl (Reference Number 01EOFW00-2012-F-0103).

This document transmits the Fish and Wildlife Service's (Service) Biological Opinion (Opinion) on the Grants Pass Resource Area's (GPRA) FY 2012-13 integrated vegetation management projects (Poor Luck and Williams) and the West Fork Cow Creek road right-of way project located on lands administered by the Medford District Bureau of Land Management (District). This Opinion is based on our review of the Biological Assessment (Assessment) (USDI BLM 2012) dated April 30, 2012, and received in our office on May 1, 2012, regarding the potential impacts from these projects to the threatened northern spotted owl (*Strix occidentalis caurina*) (spotted owl) and designated critical habitat for the spotted owl (USDI FWS 2008). The Service prepared this document in accordance with section 7 of the Endangered Species Act of 1973 as amended (16 U. S.C. 1531 *et seq.*) (Act).

The enclosed Opinion includes a finding that implementation of the proposed action will not jeopardize the continued existence of the spotted owl, and will not adversely modify designated critical habitat for the spotted owl (USDI FWS 2008a). Portions of the Poor Luck project occur within areas recently proposed as revised critical habitat for the spotted owl (50 CFR Part 17 Vol. 77, No.46) (USDI FWS 2012). Herein, this Opinion includes a Conference Opinion that the proposed action is not likely to destroy or adversely modify proposed critical habitat.

In accordance with regulation, re-initiation of consultation is required where discretionary federal agency involvement or control over the action has been maintained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agencies' action that may affect listed species or critical habitat in a manner or to

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an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending re-initiation of formal consultation. This Opinion and the associated Incidental Take Statement remain in effect for those portions of this proposed action completed by the District prior to October 1, 2022.

If you have any questions regarding this Opinion, please contact me at the number above or Cynthia Donegan at 541-618-2374.

cc: Dayne Barron, Medford District BLM, Medford, Oregon (e)
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Biological Opinion on the Grants Pass Resource Area FY 2012-13, Medford District Bureau of Land Management timber harvest projects (Poor Luck and Williams IVM) and the West Fork Cow Creek Road Right-of-Way (ROW) that are likely to affect the northern spotted owl

(FWS Reference Number 01EOFW00-2012-F-0103)

U.S. Department of the Interior
U.S. Fish and Wildlife Service
Roseburg Field Office
June 28, 2012

Signature: _____
Jim Thrailkill
Field Supervisor

Date Signed: 6/28/2012

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CONSULTATION HISTORY

All projects included in the proposed action represent newly planned projects. The Rogue Basin Level 1 Team received a briefing on the GPRA FY 2012-13 proposed action on December 15, 2011 and conducted field tours with additional resource specialists to the Williams and Poor Luck project areas in January 2012. The Level 1 Team received a draft biological assessment on April 6, 2012; followed by submission of the final assessment on April 30, 2012 that incorporated Level 1 comments.

The Service provided a draft Biological Opinion to the Level 1 Team for their review on May 30, 2012, with comments returned soon thereafter.

In February 2012, the Service announced the designation of proposed revised critical habitat for the northern spotted owl. Because portions of the proposed action occur within proposed critical habitat, the District opted to conduct an analysis of the effects of the proposed action on proposed critical habitat, which was incorporated into the Conference Opinion (herein).

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

The District developed the proposed action to conform to the 1995 Medford District Resource Management Plan (USDI BLM 1995) and the Northwest Forest Plan (NWFP) (USDA FS/USDI BLM 1994a), and expects to implement all activities described herein upon completion of National Environmental Policy Act (NEPA) and a record of decision. Generally, the District anticipates the proposed projects to be implemented in FY 2012 and 2013. The District defines implementation of timber sales as the date a project is sold. However, harvest activities could take up to five years, or longer, to complete. Once a sale is sold, purchasers usually have three years to harvest the sale, but contracts can be extended for seasonal clearances and other reasons. Purchasers have the option to harvest the entire sale in one season or they may harvest portions of the sale in different years. The District anticipates the projects analyzed herein will be completed within a 10 year timeframe from the date of the Opinion, which is the termination date of this Opinion.

The purpose of the proposed action includes implementation of two integrated vegetation management projects (*integrated vegetation management (IVM) is a systematic landscape approach that incorporates a variety of stand and vegetation treatments (commercial, noncommercial, prescribed fire) developed by multiple disciplines (timber, fuels, silviculture, wildlife), and using a variety of tools (timber sales, stewardship, service contracts) to accomplish multiple integrated resource objectives)* and one road right-of-way realignment project. All projects occur in the Klamath Mountains physiographic province (province) and within Rogue Middle, Upper Cow and Applegate section seven (hydrologic units) watersheds and Matrix land-use allocation (USDA FS/USDI BLM 1994a). Generally, the proposed action includes a variety of harvest prescriptions (Appendix A) designed to reduce stand densities and improve existing stand conditions as well as to meet the District's obligation of producing commercial wood products (USDI BLM 2012). A summary of treatments included in the proposed action is

provided below (Table 1), in addition to the detailed project descriptions included in Appendix A.

Summary of Proposed Treatments

Variable Density Thinning: removal of smaller trees and some co-dominant trees and vegetation that compete with the dominant and other co-dominant trees for nutrients and water, with a purpose of reducing stand densities.

Commercial Thinning: removes trees that function as ladder fuels, reduce risks to older trees from wildfire and competition, favor more fire and drought tolerant tree species, control stand density, increase stand vigor and place or maintain stands on developmental paths so that desired stand characteristics of dry forests result in the future and primary elements for northern spotted owl habitat are maintained.

Density Management: treatments that proportionally thin stands by spacing the residual trees based on the crown radius of the healthiest dominant and co-dominant trees. The healthiest dominant and co-dominant trees would be retained.

Non-commercial Density Reduction: the prescription generally reduces hardwood and shrub densities by slashing, handpiling and burning. Patches of dense conifers would be pre-commercially thinned to 12'-20' spacing.

Hazardous Fuels Reduction: reduces understory vegetation density by cutting and spacing of conifers less than eight inches DBH and hardwoods less than 12 inches DBH. Untreated vegetation groups ranging in size from 0.1 to 2 acres would be retained in each treatment unit, retaining 10-15 percent untreated patches.

Hand piling and burning: sticks one to six inches in diameter and longer than two feet would be piled by hand.

Understory Burning (underburning): used where the objective is to maintain ≥80 percent of the overstory. Approximately ten percent of all treatment acres may be underburned to reduce the fuel loading and/or maintain the stands in a desired condition.

Port-Orford-Cedar (POC) Sanitation: This treatment will cut all POC trees within a 50 foot buffer on each side of the road.

West Fork Cow Creek Road: the project will obliterate and relocate a portion of the 32-8-1.1 road in order to provide a safe and reliable transportation system reducing long term maintenance costs associated with the high use public road.

Table 1. Proposed projects included in the GPRA FY 2012-13, Medford District BLM consultation (FWS Ref. #: 1EOFW00-2012-F-0103).

Project Name	Total Project Acres	Land Use Allocation[1]	Treatment Type[2]	Number of Miles Road Construction
Rogue Middle Watershed				
Poor Luck IVM	2,472	Matrix[1]	Timber Harvest and Forest Health	6.0
Upper Cow Watershed				
West Fork Cow Creek ROW	3	Matrix[1]	New Road Construction	0.1
Applegate Watershed				
Williams IVM	5,608	AMA[1]	Timber Harvest and Forest Health	0.35
Total Acres	**8,083**	**Total Miles**		**6.45**

[1] as defined in the Northwest Forest Plan (USDA FS/USDI BLM 1994a).
[2] The term Treatment Type used in this table is a general term that may include different types of prescriptions, which are provided in detail in Appendix A.

Project Design Criteria and Conservation Measures

Project Design Criteria (PDC) are conservation measures jointly developed by the Level 1 Team. PDC consist of mandatory and recommended measures designed to reduce disturbance impacts to listed species (Appendix B). Disturbance to listed wildlife species, in this case the spotted owl, occurs when noise, smoke, vibration, or visual stimuli cause impairment of normal behavior. Mandatory PDC are measures applied to project activities designed to avoid the potential adverse disturbance effects to nesting spotted owls and their young. The District will incorporate mandatory PDC into all activities as integral to the proposed action. PDC involving seasonal restrictions will be implemented unless surveys, following approved protocols, indicate either non-occupancy or non-nesting by spotted owls. PDC represent discretionary measures which District managers may incorporate during project implementation when practical.

In addition to the disturbance-based PDC described above, the District developed the following habitat conservation measures designed to minimize adverse impact to spotted owls (USDI BLM 2012).

- Proposed projects are not located within Late Successional Reserves (USDA FS/USDI BLM 1994a).
- The District plans to evaluate all proposed harvest units to identify any forest stands that meet the locally defined criteria of Recovery Action 32 (USDI FWS 2011 and USDI BLM/USDA FS 2010) and will avoid harvest activities in forest stands meeting RA 32 characteristics.
- Proposed projects will not occur within Known Spotted Owl Activity Centers (KSOAC) or nest patches of historic spotted owl sites. KSOAC are the best 100 acres of habitat at spotted owl activity centers that were documented as of January 1, 1994, and are managed as Late Successional Reserves. (USDA FS/USDI BLM 1994a).

- Pre-project surveys for spotted owls will be conducted by the District. If new spotted owl sites are located, the District plans to modify the project and/or the issue will be reviewed by the Rogue Basin Level 1 Team for further evaluation.

Monitoring

This consultation incorporates annual monitoring of projects that have adverse effects to listed species. The Level 1 Team has agreed to use the Service's Project Implementation and Monitoring Form (Appendix C) to track these adverse effects. The District shall monitor the extent of habitat affected by the implementation of activities included in the proposed action to ensure that those effects are consistent with description of the proposed action, the effects analysis, and incidental take limits presented herein. Implementation is defined as the date the project is sold, or the date the National Environmental Policy Act record of decision on contract work is signed, or task orders are confirmed. The District will annually report all projects for which the District has reached an effects determination of "may affect, likely to adversely affect" for listed species, to the Service by November 31 of the year the project is implemented.

DESCRIPTION OF THE ACTION AREA

The Action Area is defined as all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action (50 CFR 402). For the purposes of this Opinion, the Action Area is defined as 8,083 acres of proposed units, as well as those areas within the 1.3 mile radius home range of 27 known or predicted spotted owl sites.

Public lands managed by the District generally occur in a checkerboard pattern, with alternating sections of private lands. District-managed lands within the Action Area occur within different land use allocations (LUA) including matrix (NWFP) (USDA FS/USDI BLM 1994a), which is the primary LUA for the proposed treatments. Forest stands in the area have sustained frequent natural disturbances, primarily wildfires, as well as human-caused disturbances, such as timber harvest and conversion of forest lands to agricultural purposes.

ANALYTICAL FRAMEWORK FOR THE JEOPARDY DETERMINATION

The following analysis relies on four components to support the jeopardy determination for the spotted owl: (1) the *Status of the Species*, which evaluates the spotted owls range-wide condition, the factors responsible for that condition, and its survival and recovery needs; (2) the *Environmental Baseline*, which evaluates the condition of the spotted owl in the action area, the factors responsible for that condition, and the role of the action area in the spotted owl survival and recovery; (3) the *Effects of the Action*, which determines the direct and indirect impacts of the proposed federal action and the effects of any interrelated or interdependent activities on the spotted owl; and (4) *Cumulative Effects*, which evaluates the effects of future, non-federal activities in the action area on the spotted owl.

In accordance with the implementing regulations for section 7 and Service policy, the jeopardy determination is made in the following manner: the effects of the proposed federal action are evaluated with the aggregate effects of everything that has led to the spotted owls current status and, for non-federal activities in the action area, those actions likely to affect the spotted owl in the future, to determine if, given the aggregate of all of these effects, implementation of the

proposed action is likely to cause an appreciable reduction in the likelihood of both the survival and recovery of the spotted owl.

The following analysis places an emphasis on using the range-wide survival and recovery needs of the spotted owl, and the role of the action area in meeting those needs as the context for evaluating the effects of the proposed federal action combined with other relevant effects. In short, a non-jeopardy determination is warranted if the proposed action is consistent with maintaining the role of habitat and the spotted owl population in the action area for the survival and recovery of the spotted owl.

STATUS OF THE SPECIES

Spotted Owl

Legal Status

The spotted owl was listed as threatened on June 26, 1990 due to widespread loss and adverse modification of suitable habitat across the owl's entire range and the inadequacy of existing regulatory mechanisms to conserve the owl (USDI FWS 1990a). The U.S. Fish and Wildlife Service recovery priority number for the spotted owl is 12C (USDI FWS 2010), on a scale of 1C (highest) to 18 (lowest). This number reflects a moderate degree of threat, a low potential for recovery, the spotted owl's taxonomic status as a subspecies and inherent conflicts with development, construction, or other economic activity given the economic value of older forest spotted owl habitat. A moderate degree of threat equates to a continual population decline and threat to its habitat, although extinction is not imminent. While the Service is optimistic regarding the potential for recovery, there is uncertainty regarding our ability to alleviate the barred owl impacts to spotted owls and the techniques are still experimental, which matches our guidelines' "low recovery potential" definition (USDI FWS 1983). The spotted owl was originally listed with a recovery priority number of 3C, but that number was changed to 6C in 2004 during the 5-year review of the species (USDI FWS 2004).

Life History

Taxonomy
The northern spotted owl is one of three subspecies of spotted owls currently recognized by the American Ornithologists' Union. The taxonomic separation of these three subspecies is supported by genetic, (Barrowclough and Gutiérrez 1990; Barrowclough et al. 1999; Haig et al. 2004) morphological (Gutiérrez et al. 1995), and biogeographic information (Barrowclough and Gutiérrez 1990). The distribution of the Mexican subspecies (*S. o. lucida*) is separate from those of the northern and California (*S. o. occidentalis*) subspecies (Gutiérrez et al. 1995). Recent studies analyzing mitochondrial DNA sequences (Haig et al. 2004, Chi et al. 2004, Barrowclough et al. 2005) and microsatellites (Henke et al., unpubl. data) confirmed the validity of the current subspecies designations for northern and California spotted owls. The narrow hybrid zone between these two subspecies, which is located in the southern Cascades and northern Sierra Nevadas, appears to be stable (Barrowclough et al. 2005).

Physical Description

The northern spotted owl is a medium-sized owl and is the largest of the three subspecies of spotted owls (Gutiérrez 1996). It is approximately 46 to 48 centimeters (18 inches to 19 inches) long and the sexes are dimorphic, with males averaging about 13 percent smaller than females. The mean mass of 971 males taken during 1,108 captures was 580.4 grams (1.28 pounds) (out of a range 430.0 to 690.0 grams) (0.95 pound to 1.52 pounds), and the mean mass of 874 females taken during 1,016 captures was 664.5 grams (1.46 pounds) (out of a range 490.0 to 885.0 grams) (1.1 pounds to 1.95 pounds) (P. Loschl and E. Forsman, pers. comm. cited in USDI FWS 2008b). The northern spotted owl is dark brown with a barred tail and white spots on its head and breast, and it has dark brown eyes surrounded by prominent facial disks. Four age classes can be distinguished on the basis of plumage characteristics (Moen et al. 1991). The northern spotted owl superficially resembles the barred owl, a species with which it occasionally hybridizes (Kelly and Forsman 2004). Hybrids exhibit physical and vocal characteristics of both species (Hamer et al. 1994).

Current and Historical Range

The current range of the spotted owl extends from southwest British Columbia through the Cascade Mountains, coastal ranges, and intervening forested lands in Washington, Oregon, and California, as far south as Marin County (USDI FWS 1990b). The range of the spotted owl is partitioned into 12 physiographic provinces (Figure 1) based on recognized landscape subdivisions exhibiting different physical and environmental features (USDI FWS 1992a). These provinces are distributed across the species' range as follows:

- Four provinces in Washington: Eastern Washington Cascades, Olympic Peninsula, Western Washington Cascades, Western Washington Lowlands.
- Five provinces in Oregon: Oregon Coast Range, Willamette Valley, Western Oregon Cascades, Eastern Oregon Cascades, Oregon Klamath.
- Three provinces in California: California Coast, California Klamath, California Cascades.

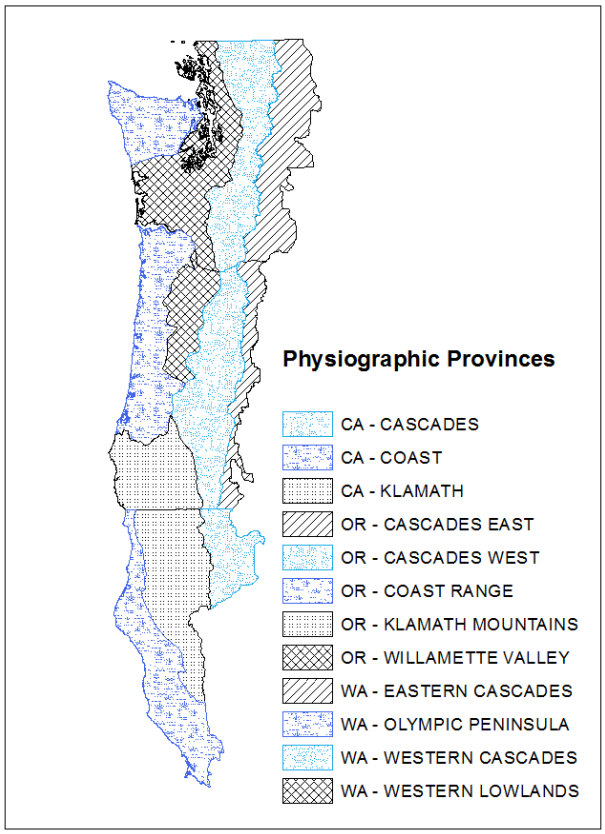
The spotted owl is extirpated or uncommon in certain areas such as southwestern Washington and British Columbia. Timber harvest activities have eliminated, reduced or fragmented spotted owl habitat sufficiently to decrease overall population densities across its range, particularly within the coastal provinces where habitat reduction has been concentrated (USDI FWS 1992a).

Behavior

Spotted owls are territorial. However, home ranges of adjacent pairs overlap (Forsman et al. 1984; Solis and Gutiérrez 1990) suggesting that the area defended is smaller than the area used for foraging. Territorial defense is primarily effected by hooting, barking and whistle type calls. Some spotted owls are not territorial but either remain as residents within the territory of a pair or move among territories (Gutiérrez 1996). These birds are referred to as "floaters." Floaters have special significance in spotted owl populations because they may buffer the territorial population from decline (Franklin 1992). Little is known about floaters other than that they exist and typically do not respond to calls as vigorously as territorial birds (Gutiérrez 1996).

Spotted owls are monogamous and usually form long-term pair bonds. "Divorces" occur but are relatively uncommon. There are no known examples of polygyny in this owl, although associations of three or more birds have been reported (Gutiérrez et al. 1995).

Figure 1. Physiographic provinces within the range of the northern spotted owl (USDI FWS 1992).



Habitat Relationships

Home Range. Home-range sizes vary geographically, generally increasing from south to north, which is likely a response to differences in habitat quality (USDI FWS 1990a). Estimates of median size of their annual home range (the area traversed by an individual or pair during their normal activities (Thomas and Raphael 1993) vary by province and range from 2,955 acres in the Oregon Cascades (Thomas et al. 1990) to 14,211 acres on the Olympic Peninsula (USDI FWS 1994). Zabel et al. (1995) showed that these provincial home ranges are larger where flying squirrels are the predominant prey and smaller where wood rats are the predominant prey. Home ranges of adjacent pairs overlap (Forsman et al. 1984; Solis and Gutiérrez 1990), suggesting that the defended area is smaller than the area used for foraging. Within the home range there is a smaller area of concentrated use during the breeding season (~20% of the home range), often referred to as the core area (Bingham and Noon 1997). Spotted owl core areas vary in size geographically and provide habitat elements that are important for the reproductive efficacy of the territory, such as the nest tree, roost sites and foraging areas (Bingham and Noon 1997). Spotted owls use smaller home ranges during the breeding season and often dramatically increase their home range size during fall and winter (Forsman et al. 1984; Sisco 1990).

Although differences exist in natural stand characteristics that influence home range size, habitat loss and forest fragmentation effectively reduce habitat quality in the home range. A reduction in the amount of suitable habitat reduces spotted owl nesting success (Bart 1995) and abundance (Bart and Forsman 1992).

Habitat Use. Forsman et al. (1984) reported that spotted owls have been observed in the following forest types: Douglas-fir (*Pseudotsuga menziesii*), western hemlock (*Tsuga heterophylla*), grand fir (*Abies grandis*), white fir (*Abies concolor*), ponderosa pine (*Pinus ponderosa*), Shasta red fir (*Abies magnifica shastensis*), mixed evergreen, mixed conifer hardwood (Klamath montane), and redwood (*Sequoia sempervirens*). The upper elevation limit at which spotted owls occur corresponds to the transition to subalpine forest, which is characterized by relatively simple structure and severe winter weather (Forsman 1975; Forsman et al. 1984).

Roost sites selected by spotted owls have more complex vegetation structure than forests generally available to them (Barrows and Barrows 1978; Forsman et al. 1984; Solis and Gutiérrez 1990). These habitats are usually multi-layered forests having high canopy closure and large diameter trees in the overstory.

Spotted owls nest almost exclusively in trees. Like roosts, nest sites are found in forests having complex structure dominated by large diameter trees (Forsman et al. 1984; Hershey et al. 1998). Even in forests that have been previously logged, spotted owls select forests having a structure (i.e., larger trees, greater canopy closure) different than forests generally available to them (Folliard 1993; Buchanan et al. 1995; Hershey et al. 1998).

Foraging habitat is the most variable of all habitats used by territorial spotted owls (USDI FWS 1992b). Descriptions of foraging habitat have ranged from complex structure (Solis and Gutiérrez 1990) to forests with lower canopy closure and smaller trees than forests containing nests or roosts (Gutiérrez 1996).

Habitat Selection. Spotted owls generally rely on older forested habitats because such forests contain the structures and characteristics required for nesting, roosting, and foraging. Features that support nesting and roosting typically include a moderate to high canopy closure (60 to 90 percent); a multi-layered, multi-species canopy with large overstory trees (with diameter at diameter at breast height [dbh] of greater than 30 inches); a high incidence of large trees with various deformities (large cavities, broken tops, mistletoe infections, and other evidence of decadence); large snags; large accumulations of fallen trees and other woody material on the ground; and sufficient open space below the canopy for spotted owls to fly (Thomas et al. 1990). Nesting spotted owls consistently occupy stands with a high degree of canopy closure that may provide thermoregulatory benefits (Weathers et al. 2001) and protection from predators.

Foraging habitat for spotted owls provides a food supply for survival and reproduction. Foraging activity is positively associated with tree height diversity (North et al. 1999), canopy closure (Irwin et al. 2000; Courtney et al. 2004), snag volume, density of snags greater than 20 in (50 cm) dbh (North et al. 1999; Irwin et al. 2000; Courtney et al. 2004), density of trees greater than or equal to 31 in (80 cm) dbh (North et al. 1999), volume of woody material (Irwin et al. 2000), and young forests with some structural characteristics of old forests (Carey et al. 1992; Irwin et al. 2000). Northern spotted owls select old forests for foraging in greater proportion than their

availability at the landscape scale (Carey et al. 1992; Carey and Peeler 1995; Forsman et al. 2005), but will forage in younger stands with high prey densities and access to prey (Carey et al. 1992; Rosenberg and Anthony 1992; Thome et al.1999).

Dispersal habitat is essential to maintaining stable populations by filling territorial vacancies when resident spotted owls die or leave their territories, and to providing adequate gene flow across the range of the species. Dispersal habitat, at a minimum, consists of stands with adequate tree size and canopy closure to provide protection from avian predators and at least minimal foraging opportunities. Dispersal habitat may include younger and less diverse forest stands than foraging habitat, such as even-aged, pole-sized stands, but such stands should contain some roosting structures and foraging habitat to allow for temporary resting and feeding for dispersing juveniles (USDI FWS 1992b). Forsman et al. (2002) found that spotted owls could disperse through highly fragmented forest landscapes. However, the stand-level and landscape-level attributes of forests needed to facilitate successful dispersal have not been thoroughly evaluated (Buchanan 2004).

Spotted owls may be found in younger forest stands that have the structural characteristics of older forests or retained structural elements from the previous forest. In redwood forests and mixed conifer-hardwood forests along the coast of northwestern California, considerable numbers of spotted owls also occur in younger forest stands, particularly in areas where hardwoods provide a multi-layered structure at an early age (Thomas et al. 1990; Diller and Thome 1999). In mixed conifer forests in the eastern Cascades in Washington, 27 percent of nest sites were in old-growth forests, 57 percent were in the understory reinitiation phase of stand development, and 17 percent were in the stem exclusion phase (Buchanan et al. 1995). In the western Cascades of Oregon, 50 percent of spotted owl nests were in late-seral/old-growth stands (greater than 80 years old), and none were found in stands of less than 40 years old (Irwin et al. 2000).

In the Western Washington Cascades, spotted owls roosted in mature forests dominated by trees greater than 50 centimeters (19.7 inches) dbh with greater than 60 percent canopy closure more often than expected for roosting during the non-breeding season. Spotted owls also used young forest (trees of 20 to 50 centimeters (7.9 inches to 19.7 inches) dbh with greater than 60 percent canopy closure) less often than expected based on this habitat's availability (Herter et al. 2002). In the Coast Ranges, Western Oregon Cascades and the Olympic Peninsula, radio-marked spotted owls selected for old-growth and mature forests for foraging and roosting and used young forests less than predicted based on availability (Forsman et al. 1984; Carey et al. 1990; Forsman et al. 2005). Glenn et al. (2004) studied spotted owls in young forests in western Oregon and found little preference among age classes of young forest.

Habitat use is influenced by prey availability. Ward (1990) found that spotted owls foraged in areas with lower variance in prey densities (that is, where the occurrence of prey was more predictable) within older forests and near ecotones of old forest and brush seral stages. Zabel et al. (1995) showed that spotted owl home ranges are larger where flying squirrels (*Glaucomys sabrinus*) are the predominant prey and smaller where wood rats (*Neotoma* spp.) are the predominant prey.

Recent landscape-level analyses in portions of Oregon Coast and California Klamath provinces suggest that a mosaic of late-successional habitat interspersed with other seral conditions may

benefit spotted owls more than large, homogeneous expanses of older forests (Zabel et al. 2003; Franklin et al. 2000; Meyer et al. 1998). In Oregon Klamath and Western Oregon Cascade provinces, Dugger et al. (2005) found that apparent survival and reproduction was positively associated with the proportion of older forest near the territory center (within 730 meters) (2,395 feet). Survival decreased dramatically when the amount of non-habitat (non-forest areas, sapling stands, etc.) exceeded approximately 50 percent of the home range (Dugger et al. 2005). The authors concluded that they found no support for either a positive or negative direct effect of intermediate-aged forest—that is, all forest stages between sapling and mature, with total canopy cover greater than 40 percent—on either the survival or reproduction of spotted owls. It is unknown how these results were affected by the low habitat fitness potential in their study area, which Dugger et al. (2005) stated was generally much lower than those in Franklin et al. (2000) and Olson et al. (2004), and the low reproductive rate and survival in their study area, which they reported were generally lower than those studied by Anthony et al. (2006). Olson et al. (2004) found that reproductive rates fluctuated biennially and were positively related to the amount of edge between late-seral and mid-seral forests and other habitat classes in the central Oregon Coast Range. Olson et al. (2004) concluded that their results indicate that while mid-seral and late-seral forests are important to spotted owls, a mixture of these forest types with younger forest and non-forest may be best for spotted owl survival and reproduction in their study area.

Reproductive Biology

The spotted owl is relatively long-lived, has a long reproductive life span, invests significantly in parental care, and exhibits high adult survivorship relative to other North American owls (Gutiérrez et al. 1995). Spotted owls are sexually mature at 1 year of age, but rarely breed until they are 2 to 5 years of age (Miller et al. 1985; Franklin 1992; Forsman et al. 2002). Breeding females lay one to four eggs per clutch, with the average clutch size being two eggs; however, most spotted owl pairs do not nest every year, nor are nesting pairs successful every year (Forsman et al. 1984, Anthony et al. 2006), and renesting after a failed nesting attempt is rare (Gutiérrez 1996). The small clutch size, temporal variability in nesting success, and delayed onset of breeding all contribute to the relatively low fecundity of this species (Gutiérrez 1996).

Courtship behavior usually begins in February or March, and females typically lay eggs in late March or April. The timing of nesting and fledging varies with latitude and elevation (Forsman et al. 1984). After they leave the nest in late May or June, juvenile spotted owls depend on their parents until they are able to fly and hunt on their own. Parental care continues after fledging into September (Forsman et al. 1984). During the first few weeks after the young leave the nest, the adults often roost with them during the day. By late summer, the adults are rarely found roosting with their young and usually only visit the juveniles to feed them at night (Forsman et al. 1984). Telemetry and genetic studies indicate that close inbreeding between siblings or parents and their offspring is rare (Haig et al. 2001, Forsman et al. 2002).

Dispersal Biology

Natal dispersal of spotted owls typically occurs in September and October with a few individuals dispersing in November and December (Forsman et al. 2002). Natal dispersal occurs in stages, with juveniles settling in temporary home ranges between bouts of dispersal (Forsman et al. 2002; Miller et al. 1997). The median natal dispersal distance is about 10 miles for males and 15.5 miles for females (Forsman et al. 2002). Dispersing juvenile spotted owls experience high mortality rates, exceeding 70 percent in some studies (Miller 1989). Known or suspected causes

of mortality during dispersal include starvation, predation, and accidents (Miller 1989; Forsman et al. 2002). Parasitic infection may contribute to these causes of mortality, but the relationship between parasite loads and survival is poorly understood (Hoberg et al. 1989; Gutiérrez 1989, Forsman et al. 2002). Successful dispersal of juvenile spotted owls may depend on their ability to locate unoccupied suitable habitat in close proximity to other occupied sites (LaHaye et al. 2001).

There is little evidence that small openings in forest habitat influence the dispersal of spotted owls, but large, non-forested valleys such as the Willamette Valley apparently are barriers to both natal and breeding dispersal (Forsman et al. 2002). The degree to which water bodies, such as the Columbia River and Puget Sound, function as barriers to dispersal is unclear, although radio telemetry data indicate that spotted owls move around large water bodies rather than cross them (Forsman et al. 2002). Analysis of the genetic structure of spotted owl populations suggests that gene flow may have been adequate between the Olympic Mountains and the Washington Cascades, and between the Olympic Mountains and the Oregon Coast Range (Haig et al. 2001).

Breeding dispersal occurs among a small proportion of adult spotted owls; these movements were more frequent among females and unmated individuals (Forsman et al. 2002, pp. 20-21). Breeding dispersal distances were shorter than natal dispersal distances and also are apparently random in direction (Forsman et al. 2002).

Food Habits

Spotted owls are mostly nocturnal, although they also forage opportunistically during the day (Forsman et al. 1984, 2004; Sovern et al. 1994). The composition of the spotted owl's diet varies geographically and by forest type. Generally, flying squirrels (*Glaucomys sabrinus*) are the most prominent prey for spotted owls in Douglas-fir and western hemlock (*Tsuga heterophylla*) forests (Forsman et al. 1984) in Washington (Hamer et al. 2001) and Oregon, while dusky-footed wood rats (*Neotoma fuscipes*) are a major part of the diet in the Oregon Klamath, California Klamath, and California Coastal provinces (Forsman et al. 1984; 2004; Ward et al. 1998). Depending on location, other important prey include deer mice (*Peromyscus maniculatus*), tree voles (*Arborimus longicaudus, A. pomo*), red-backed voles (*Clethrionomys* spp.), gophers (*Thomomys* spp.), snowshoe hare (*Lepus americanus*), bushy-tailed wood rats (*Neotoma cinerea*), birds, and insects, although these species comprise a small portion of the spotted owl diet (Forsman et al. 1984, 2004; Ward et al. 1998; Hamer et al. 2001).

Other prey species such as the red tree vole (*Arborimus longicaudus),* red-backed voles (*Clethrionomys gapperi),* mice, rabbits and hares, birds, and insects) may be seasonally or locally important (reviewed by Courtney et al. 2004). For example, Rosenberg et al. (2003) showed a strong correlation between annual reproductive success of spotted owls (number of young per territory) and abundance of deer mice (*Peromyscus maniculatus*) ($r^2 = 0.68$), despite the fact they only made up 1.6±0.5 percent of the biomass consumed. However, it is unclear if the causative factor behind this correlation was prey abundance or a synergistic response to weather (Rosenberg et al. 2003). Ward (1990) also noted that mice were more abundant in areas selected for foraging by owls. Nonetheless, spotted owls deliver larger prey to the nest and eat smaller food items to reduce foraging energy costs; therefore, the importance of smaller prey items, like *Peromyscus*, in the spotted owl diet should not be underestimated (Forsman et al. 2001; 2004).

Population Dynamics
The spotted owl is relatively long-lived, has a long reproductive life span, invests significantly in parental care, and exhibits high adult survivorship relative to other North American owls (Gutiérrez et al. 1996). The spotted owl's long reproductive life span allows for some eventual recruitment of offspring, even if recruitment does not occur each year (Franklin et al. 2000).

Annual variation in population parameters for spotted owls has been linked to environmental influences at various life history stages (Franklin et al. 2000). In coniferous forests, mean fledgling production of the California spotted owl (*Strix occidentalis occidentalis*), a closely related subspecies, was higher when minimum spring temperatures were higher (North et al. 2000), a relationship that may be a function of increased prey availability. Across their range, spotted owls have previously shown an unexplained pattern of alternating years of high and low reproduction, with highest reproduction occurring during even-numbered years (e.g., Franklin et al. 1999). Annual variation in breeding may be related to weather (i.e., temperature and precipitation) (Wagner et al. 1996 and Zabel et al. 1996 *in*: Forsman et al. 1996) and fluctuation in prey abundance (Zabel et al. 1996).

A variety of factors may regulate spotted owl population levels. These factors may be density-dependent (e.g., habitat quality, habitat abundance) or density-independent (e.g., climate). Interactions may occur among factors. For example, as habitat quality decreases, density-independent factors may have more influence on survival and reproduction, which tends to increase variation in the rate of growth (Franklin et al. 2000). Specifically, weather could have increased negative effects on spotted owl fitness for those owls occurring in relatively lower quality habitat (Franklin et al. 2000). A consequence of this pattern is that at some point, lower habitat quality may cause the population to be unregulated (have negative growth) and decline to extinction (Franklin et al. 2000).

Olson et al. (2005) used open population modeling of site occupancy that incorporated imperfect and variable detectability of spotted owls and allowed modeling of temporal variation in site occupancy, extinction, and colonization probabilities (at the site scale). The authors found that visit detection probabilities average less than 0.70 and were highly variable among study years and among their three study areas in Oregon. Pair site occupancy probabilities declined greatly on one study area and slightly on the other two areas. However, for all owls, including singles and pairs, site occupancy was mostly stable through time. Barred owl presence had a negative effect on these parameters (see barred owl discussion in the New Threats section below). However, there was enough temporal and spatial variability in detection rates to indicate that more visits would be needed in some years and in some areas, especially if establishing pair occupancy was the primary goal.

Threats

Reasons for Listing
The spotted owl was listed as threatened throughout its range "due to loss and adverse modification of suitable habitat as a result of timber harvesting and exacerbated by catastrophic events such as fire, volcanic eruption, and wind storms" (USDI FWS 1990a). More specifically, threats to the spotted owl included low populations, declining populations, limited habitat, declining habitat, inadequate distribution of habitat or populations, isolation of provinces,

predation and competition, lack of coordinated conservation measures, and vulnerability to natural disturbance (USDI FWS 1992b). These threats were characterized for each province as severe, moderate, low or unknown (USDI FWS 1992b) (The range of the spotted owl is divided into 12 provinces from Canada to northern California and from the Pacific Coast to the eastern Cascades; see Figure 3). Declining habitat was recognized as a severe or moderate threat to the spotted owl throughout its range, isolation of populations was identified as a severe or moderate threat in 11 provinces, and a decline in population was a severe or moderate threat in 10 provinces. Together, these three factors represented the greatest concerns about range-wide conservation of the spotted owl. Limited habitat was considered a severe or moderate threat in nine provinces, and low populations were a severe or moderate concern in eight provinces, suggesting that these factors were also a concern throughout the majority of the spotted owl's range. Vulnerability to natural disturbances was rated as low in five provinces.

The degree to which predation and competition might pose a threat to the spotted owl was unknown in more provinces than any of the other threats, indicating a need for additional information. Few empirical studies exist to confirm that habitat fragmentation contributes to increased levels of predation on spotted owls (Courtney et al. 2004). However, great horned owls (*Bubo virginianus*), an effective predator on spotted owls, are closely associated with fragmented forests, openings, and clearcuts (Johnson 1992; Laidig and Dobkin 1995). As mature forests are harvested, great horned owls may colonize fragmented forests, thereby increasing spotted owl vulnerability to predation.

New Threats

The Service conducted a 5-year review of the spotted owl in 1994 (USDI FWS 2004), for which the Service prepared a scientific evaluation of the status of the spotted owl (Courtney et al. 2004). An analysis was conducted assessing how the threats described in 1990 might have changed by 2004. Some of the key threats identified in 2004 are:

- "Although we are certain that current harvest effects are reduced, and that past harvest is also probably having a reduced effect now as compared to 1990, we are still unable to fully evaluate the current levels of threat posed by harvest because of the potential for lag effects…In their questionnaire responses…6 of 8 panel member identified past habitat loss due to timber harvest as a current threat, but only 4 viewed current harvest as a present threat" (Courtney and Gutiérrez 2004).

- "Currently the primary source of habitat loss is catastrophic wildfire, although the total amount of habitat affected by wildfires has been small (a total of 2.3% of the range-wide habitat base over a 10-year period)" (Courtney and Gutiérrez 2004).

- "Although the panel had strong differences of opinion on the conclusiveness of some of the evidence suggesting [barred owl] displacement of [spotted owls], and the mechanisms by which this might be occurring, there was no disagreement that [barred owls] represented an operational threat. In the questionnaire, all 8 panel members identified [barred owls] as a current threat, and also expressed concern about future trends in [barred owl] populations" (Courtney and Gutiérrez 2004).

Barred Owls (Strix varia). With its recent expansion to as far south as Marin County, California (Gutiérrez et al. 2004), the barred owl's range now completely overlaps that of the northern

spotted owl. Barred owls may be competing with spotted owls for prey (Hamer et al. 2001) or habitat (Hamer et al. 1989; Dunbar et al. 1991; Herter and Hicks 2000; Pearson and Livezey 2003). In addition, barred owls physically attack spotted owls (Pearson and Livezey 2003), and circumstantial evidence strongly indicated that a barred owl killed a spotted owl (Leskiw and Gutiérrez 1998). Evidence that barred owls are causing negative effects on spotted owls is largely indirect, based primarily on retrospective examination of long-term data collected on spotted owls (Kelly et al. 2003; Pearson and Livezey 2003; Olson et al. 2005). It is widely believed, but not conclusively confirmed, that the two species of owls are competing for resources. However, given that the presence of barred owls has been identified as a negative effect while using methods designed to detect a different species (spotted owls), it seems safe to presume that the effects are stronger than estimated. Because there has been no research to quantitatively evaluate the strength of different types of competitive interactions, such as resource partitioning and competitive interference, the particular mechanism by which the two owl species may be competing is unknown.

Barred owls were initially thought to be more closely associated with early successional forests than spotted owls, based on studies conducted on the west slope of the Cascades in Washington (Hamer et al. 1989; Iverson 1993). However, recent studies conducted in the Pacific Northwest show that barred owls frequently use mature and old-growth forests (Pearson and Livezey 2003; Schmidt 2006). In the fire prone forests of eastern Washington, a telemetry study conducted on barred owls showed that barred owl home ranges were located on lower slopes or valley bottoms, in closed canopy, mature, Douglas-fir forest, while spotted owl sites were located on mid-elevation areas with southern or western exposure, characterized by closed canopy, mature, ponderosa pine or Douglas-fir forest (Singleton et al. 2005).

The only study comparing spotted owl and barred owl food habits in the Pacific Northwest indicated that barred owl diets overlap strongly (76 percent) with spotted owl diets (Hamer et al. 2001). However, barred owl diets are more diverse than spotted owl diets and include species associated with riparian and other moist habitats, along with more terrestrial and diurnal species (Hamer et al. 2001).

The presence of barred owls has been reported to reduce spotted owl detectability, site occupancy, reproduction, and survival. Olson et al. (2005) found that the presence of barred owls had a significant negative effect on the detectability of spotted owls, and that the magnitude of this effect did not vary among years. The occupancy of historical territories by spotted owls in Washington and Oregon was significantly lower ($p < 0.001$) after barred owls were detected within 0.8 kilometer (0.5 miles) of the territory center but was "only marginally lower" ($p = 0.06$) if barred owls were located more than 0.8 kilometer (0.5 miles) from the spotted owl territory center (Kelly et al. 2003). Pearson and Livezey (2003) found that there were significantly more barred owl site-centers in unoccupied spotted owl circles than occupied spotted owl circles (centered on historical spotted owl site-centers) with radii of 0.8 kilometer (0.5 miles) ($p = 0.001$), 1.6 kilometer (1 mile) ($p = 0.049$), and 2.9 kilometer (1.8 miles) ($p = 0.005$) in Gifford Pinchot National Forest. In Olympic National Park, Gremel (2005) found a significant decline ($p = 0.01$) in spotted owl pair occupancy at sites where barred owls had been detected, while pair occupancy remained stable at spotted owl sites without barred owls. Olson et al. (2005) found that the annual probability that a spotted owl territory would be occupied by a pair of spotted owls after barred owls were detected at the site declined by 5 percent in the HJ

Andrews study area, 12 percent in the Coast Range study area, and 15 percent in the Tyee study area.

Olson et al. (2004) found that the presence of barred owls had a significant negative effect on the reproduction of spotted owls in the central Coast Range of Oregon (in the Roseburg study area). The conclusion that barred owls had no significant effect on the reproduction of spotted owls in one study (Iverson 2004) was unfounded because of small sample sizes (Livezey 2005). It is likely that all of the above analyses underestimated the effects of barred owls on the reproduction of spotted owls because spotted owls often cannot be relocated after they are displaced by barred owls (E. Forsman, pers. comm., cited in USDI FWS 2008b). Anthony et al. (2006) found significant evidence for negative effects of barred owls on apparent survival of spotted owls in two of 14 study areas (Olympic and Wenatchee). They attributed the equivocal results for most of their study areas to the coarse nature of their barred owl covariate.

In a recent analysis of more than 9,000 banded spotted owls throughout their range, only 47 hybrids were detected (Kelly and Forsman 2004). Consequently, hybridization with the barred owl is considered to be "an interesting biological phenomenon that is probably inconsequential, compared with the real threat—direct competition between the two species for food and space" (Kelly and Forsman 2004).

The preponderance of evidence suggests that barred owls are exacerbating the spotted owl population decline, particularly in Washington, portions of Oregon, and the northern coast of California (Gutiérrez et al. 2004; Olson et al. 2005). There is no evidence that the increasing trend in barred owls has stabilized in any portion of the spotted owl's range in the western United States, and "there are no grounds for optimistic views suggesting that barred owl impacts on northern spotted owls have been already fully realized" (Gutiérrez et al. 2004).

Wildfire. Studies indicate that the effects of wildfire on spotted owls and their habitat are variable, depending on fire intensity, severity and size. Within the fire-adapted forests of the spotted owl's range, spotted owls likely have adapted to withstand fires of variable sizes and severities. Bond et al. (2002) examined the demography of the three spotted owl subspecies after wildfires, in which wildfire burned through spotted owl nest and roost sites in varying degrees of severity. Post-fire demography parameters for the three subspecies were similar or better than long-term demographic parameters for each of the three subspecies in those same areas (Bond et al. 2002). In a preliminary study conducted by Anthony and Andrews (2004) in the Oregon Klamath Province, their sample of spotted owls appeared to be using a variety of habitats within the area of the Timbered Rock fire, including areas where burning had been moderate.

In 1994, the Hatchery Complex fire burned 17,603 hectares in the Wenatchee National Forest in Washington's eastern Cascades, affecting six spotted owl activity centers (Gaines et al. 1997). Spotted owl habitat within a 2.9-kilometer (1.8-mile) radius of the activity centers was reduced by 8 to 45 percent (mean = 31 percent) as a result of the direct effects of the fire and by 10 to 85 percent (mean = 55 percent) as a result of delayed mortality of fire-damaged trees and insects. Direct mortality of spotted owls was assumed to have occurred at one site, and spotted owls were present at only one of the six sites 1 year after the fire (Gaines et al. 1997). In 1994, two wildfires burned in the Yakama Indian Reservation in Washington's eastern Cascades, affecting the home ranges of two radio-tagged spotted owls (King et al. 1998). Although the amount of home ranges burned was not quantified, spotted owls were observed using areas that burned at

low and medium intensities. No direct mortality of spotted owls was observed, even though thick smoke covered several spotted owl site-centers for a week. It appears that, at least in the short term, spotted owls may be resilient to the effects of wildfire—a process with which they have evolved. More research is needed to further understand the relationship between fire and spotted owl habitat use.

At the time of listing there was recognition that large-scale wildfire posed a threat to the spotted owl and its habitat (USDI FWS 1990b). New information suggests fire may be more of a threat than previously thought. In particular, the rate of habitat loss due to fire has been expected with over 102,000 acres of late-successional forest lost on federal lands from 1993-2004 (Moeur et al. 2005). Currently, the overall total amount of habitat loss from wildfires has been relatively small, estimated at approximately 1.2 percent on federal lands (Lint 2005). It may be possible to influence through silvicultural management how fire prone forests will burn and the extent of the fire when it occurs. Silvicultural management of forest fuels are currently being implemented throughout the spotted owl's range, in an attempt to reduce the levels of fuels that have accumulated during nearly 100 years of effective fire suppression. However, our ability to protect spotted owl habitat and viable populations of spotted owls from large fires through risk-reduction endeavors is uncertain (Courtney et al. 2004). The NWFP recognized wildfire as an inherent part of managing spotted owl habitat in certain portions of the range. The distribution and size of reserve blocks as part of the NWFP design may help mitigate the risks associated with large-scale fire (Lint 2005).

West Nile Virus (WNV). WNV has killed millions of wild birds in North America since it arrived in 1999 (Caffrey and Peterson 2003; Marra et al. 2004). Mosquitoes are the primary carriers (vectors) of the virus that causes encephalitis in humans, horses, and birds. Mammalian prey may also play a role in spreading WNV among predators, like spotted owls. Owls and other predators of mice can contract the disease by eating infected prey (Garmendia et al. 2000). One captive spotted owl in Ontario, Canada, is known to have contracted WNV and died (Gancz et al. 2004), but there are no documented cases of the virus in wild spotted owls.

Health officials expect that WNV eventually will spread throughout the range of the spotted owl (Blakesley et al. 2004), but it is unknown how the virus will ultimately affect spotted owl populations. Susceptibility to infection and the mortality rates of infected individuals vary among bird species (Blakesley et al. 2004), but most owls appear to be quite susceptible. For example, eastern screech-owls breeding in Ohio that were exposed to WNV experienced 100 percent mortality (T. Grubb pers. comm. in Blakesley et al. 2004). Barred owls, in contrast, showed lower susceptibility (B. Hunter pers. comm. in Blakesley et al. 2004).

Blakesley et al. (2004) offer two possible scenarios for the likely outcome of spotted owl populations being infected by WNV. One scenario is that a range-wide reduction in spotted owl population viability is unlikely because the risk of contracting WNV varies between regions. An alternative scenario is that WNV will cause unsustainable mortality, due to the frequency and/or magnitude of infection, thereby resulting in long-term population declines and extirpation from parts of the spotted owl's current range. WNV remains a potential threat of uncertain magnitude and effect (Blakesley et al. 2004).

Sudden Oak Death. Sudden oak death was recently identified as a potential threat to the spotted owl (Courtney and Guttierez. 2004). This disease is caused by the fungus-like pathogen,

Phytopthora ramorum that was recently introduced from Europe and is rapidly spreading. At the present time, sudden oak death is found in natural stands from Monterey to Humboldt Counties, California, and has reached epidemic proportions in oak (*Quercus* spp.) and tanoak (*Lithocarpus densiflorus*) forests along approximately 300 km of the central and northern California coast (Rizzo et al. 2002). It has also been found near Brookings, Oregon, killing tanoak and causing dieback of closely associated wild rhododendron (*Rhododendron* spp.) and evergreen huckleberry (*Vaccinium ovatum*) (Goheen et al. 2002). It has been found in several different forest types and at elevations from sea level to over 800 m. Sudden oak death poses a threat of uncertain proportion because of its potential impact on forest dynamics and alteration of key prey and spotted owl habitat components (e.g., hardwood trees - canopy closure and nest tree mortality); especially in the southern portion of the spotted owl's range (Courtney and Guttierez. 2004).

Inbreeding Depression, Genetic Isolation, and Reduced Genetic Diversity. Inbreeding and other genetic problems due to small population sizes were not considered an imminent threat to the spotted owl at the time of listing. Recent studies show no indication of significantly reduced genetic variation in Washington, Oregon, or California (Barrowclough et al. 1999; Haig et al. 2001). However, in Canada, the breeding population is estimated to be less than 33 pairs and annual population decline may be as high as 35 percent (Harestad et al. 2004). Canadian populations may be more adversely affected by issues related to small population size including inbreeding depression, genetic isolation, and reduced genetic diversity (Courtney et al. 2004). Low and persistently declining populations throughout the northern portion of the species range (see "Population Trends" below) may be at increased risk of losing genetic diversity.

Climate change. Climate change, a potential additional threat to northern spotted owl populations, is not explicitly addressed in the NWFP. Climate change could have direct and indirect impacts on spotted owls and their prey. However, the emphasis on maintenance of seral stage complexity and related organismal diversity in the Matrix under the NWFP should contribute to the resiliency of the federal forest landscape to the impacts of climate change (Courtney et al. 2004). There is no indication in the literature regarding the direction (positive or negative) of the threat.

Based upon a global meta-analysis, Parmesan and Yohe (2003) discussed several potential implications of global climate change to biological systems, including terrestrial flora and fauna. Results indicated that 62 percent of species exhibited trends indicative of advancement of spring conditions. In bird species, trends were manifested in earlier nesting activities. Because the spotted owl exhibits a limited tolerance to heat relative to other bird species (Weathers et al. 2001), subtle changes in climate have the potential to affect this. However, the specific impacts to the species are unknown.

Disturbance-Related Effects. The effects of noise on spotted owls are largely unknown, and whether noise is a concern has been a controversial issue. The effect of noise on birds is extremely difficult to determine due to the inability of most studies to quantify one or more of the following variables: 1) timing of the disturbance in relation to nesting chronology; 2) type, frequency, and proximity of human disturbance; 3) clutch size; 4) health of individual birds; 5) food supply; and 6) outcome of previous interactions between birds and humans (Knight and Skagan 1988). Additional factors that confound the issue of disturbance include the individual

bird's tolerance level, ambient sound levels, physical parameters of sound and how it reacts with topographic characteristics and vegetation, and differences in how species perceive noise.

Although information specific to behavioral responses of NSOs to disturbance is limited, research indicates that close proximity to recreational hikers can cause Mexican spotted owls (*S. o. lucida*) to flush from their roosts (Swarthout and Steidl 2001) and helicopter overflights can reduce prey delivery rates to nests (Delaney et al. 1999). Additional effects from disturbance, including altered foraging behavior and decreases in nest attendance and reproductive success, have been reported for other raptors (White and Thurow 1985; Andersen et al. 1989; McGarigal et al. 1991).

Northern spotted owls may also respond physiologically to a disturbance without exhibiting a significant behavioral response. In response to environmental stressors, vertebrates secrete stress hormones called corticosteroids (Campbell 1990). Although these hormones are essential for survival, extended periods with elevated stress hormone levels may have negative effects on reproductive function, disease resistance, or physical condition (Carsia and Harvey 2000; Saplosky et al. 2000). In avian species, the secretion of corticosterone is the primary non-specific stress response (Carsia and Harvey 2000). The quantity of this hormone in feces can be used as a measure of physiological stress (Wasser et.al.1997). Recent studies of fecal corticosterone levels of spotted owls indicate that low intensity noise of short duration and minimal repetition does not elicit a physiological stress response (Tempel & Gutiérrez 2003; Tempel & Gutiérrez 2004). However, prolonged activities, such as those associated with timber harvest, may increase fecal corticosterone levels depending on their proximity to spotted owl core areas (Wasser et al. 1997; Tempel & Gutiérrez 2004).

Post-harvest fuels treatments and other types of prescribed burning may also create above-ambient smoke or heat. Although it has not been conclusively demonstrated, it is anticipated that nesting northern spotted owls may be disturbed by heat and smoke intrusion into the nest grove.

Conservation Needs of the Spotted Owl

Based on the above assessment of threats, the spotted owl has the following habitat-specific and habitat-independent conservation (i.e., survival and recovery) needs:

Habitat-specific Needs

1. Large blocks of suitable habitat to support clusters or local population centers of spotted owls (e.g., 15 to 20 breeding pairs) throughout the owl's range;
2. Suitable habitat conditions and spacing between local spotted owl populations throughout its range to facilitate survival and movement;
3. Suitable habitat distributed across a variety of ecological conditions within the spotted owl's range to reduce risk of local or widespread extirpation;
4. A coordinated, adaptive management effort to reduce the loss of habitat due to catastrophic wildfire throughout the spotted owl's range, and a monitoring program to clarify whether these risk reduction methods are effective and to determine how owls use habitat treated to reduce fuels; and
5. In areas of significant population decline, sustain the full range of survival and recovery options for this species in light of significant uncertainty.

Habitat-independent Needs

1. A coordinated research and adaptive management effort to better understand and manage competitive interactions between spotted and barred owls; and
2. Monitoring to better understand the risk that WNV and sudden oak death pose to spotted owls and, for WNV, research into methods that may reduce the likelihood or severity of outbreaks in spotted owl populations.

Conservation Strategy

Since 1990, various efforts have addressed the conservation needs of the spotted owl and attempted to formulate conservation strategies based upon these needs. These efforts began with the ISC's Conservation Strategy (Thomas et al. 1990); they continued with the designation of critical habitat (USDI FWS 1992a), the Draft Recovery Plan (USDI FWS 1992b), and the Scientific Analysis Team report (Thomas et al. 1993), report of the Forest Ecosystem Management Assessment Team (Thomas and Raphael 1993); and they culminated with the NWFP (USDA FS/USDI BLM 1994a, 1994b). Each conservation strategy was based upon the reserve design principles first articulated in the ISC's report, which are summarized as follows.

- Species that are well distributed across their range are less prone to extinction than species confined to small portions of their range.
- Large blocks of habitat, containing multiple pairs of the species, are superior to small blocks of habitat with only one to a few pairs.
- Blocks of habitat that are close together are better than blocks far apart.
- Habitat that occurs in contiguous blocks is better than habitat that is more fragmented.
- Habitat between blocks is more effective as dispersal habitat if it resembles suitable habitat.

Federal Contribution to Recovery

Since it was signed on April 13, 1994, the NWFP has guided the management of federal forest lands within the range of the spotted owl (USDA FS/USDI BLM 1994a, 1994b). The NWFP was designed to protect large blocks of old growth forest and provide habitat for species that depend on those forests including the spotted owl, as well as to produce a predictable and sustainable level of timber sales. The NWFP included land use allocations which would provide for population clusters of spotted owls (*i.e.,* demographic support) and maintain connectivity between population clusters. Certain land use allocations in the plan contribute to supporting population clusters: LSRs, Managed Late-successional Areas, and Congressionally Reserved areas. Riparian Reserves, Adaptive Management Areas and Administratively Withdrawn areas can provide both demographic support and connectivity/dispersal between the larger blocks, but were not necessarily designed for that purpose. Matrix areas were to support timber production while also retaining biological legacy components important to old-growth obligate species (in 100-acre owl cores, 15 percent late-successional provision, etc. (USDA FS/USDI BLM 1994a, USDI FWS 1994) which would persist into future managed timber stands.

The NWFP with its rangewide system of LSRs was based on work completed by three previous studies (Thomas et. al. 2006): the 1990 Interagency Scientific Committee (ISC) Report (Thomas et. al. 1990), the 1991 report for the Conservation of Late-successional Forests and Aquatic Ecosystems (Johnson et. al. 1991), and the 1993 report of the Scientific Assessment Team

(Thomas et. al. 1993). In addition, the 1992 Draft Recovery Plan for the Northern Spotted Owl (USDI FWS 1992b) was based on the ISC report.

The Forest Ecosystem Management Assessment Team predicted, based on expert opinion, the spotted owl population would decline in the Matrix land use allocation over time, while the population would stabilize and eventually increase within LSRs as habitat conditions improved over the next 50 to 100 years (Thomas and Raphael 1993, USDA FS/USDI BLM 1994b). Based on the results of the first decade of monitoring, Lint (2005) could not determine whether implementation of the NWFP would reverse the spotted owl's declining population trend because not enough time had passed to provide the necessary measure of certainty. However, the results from the first decade of monitoring do not provide any reason to depart from the objective of habitat maintenance and restoration as described in the NWFP (Lint 2005; Noon and Blakesley 2006). Bigley and Franklin (2004) suggested that more fuels treatments are needed in east-side forests to preclude large-scale losses of habitat to stand-replacing wildfires. Other stressors that occur in suitable habitat, such as the range expansion of the barred owl (already in action) and infection with WNV (which may or may not occur) may complicate the conservation of the spotted owl. Recent reports about the status of the spotted owl offer few management recommendations to deal with these emerging threats. The arrangement, distribution, and resilience of the NWFP land use allocation system may prove to be the most appropriate strategy in responding to these unexpected challenges (Bigley and Franklin 2004).

Under the NWFP, the agencies anticipated a decline of spotted owl populations during the first decade of implementation. Recent reports (Anthony et al. 2006) identified greater than expected spotted owl declines in Washington and northern portions of Oregon, and more stationary populations in southern Oregon and northern California. The reports did not find a direct correlation between habitat conditions and changes in vital rates of spotted owls at the meta-population scale. However, at the territory scale, there is evidence of negative effects to spotted owl fitness due to reduced habitat quantity and quality. Also, there is no evidence to suggest that dispersal habitat is currently limiting (Courtney et al. 2004, Lint 2005). Even with the population decline, Courtney et al. (2004) noted that there is little reason to doubt the effectiveness of the core principles underpinning the NWFP conservation strategy.

The current scientific information, including information showing northern spotted owl population declines, indicates that the spotted owl continues to meet the definition of a threatened species (USDI FWS 2004). That is, populations are still relatively numerous over most of its historic range, which suggests that the threat of extinction is not imminent, and that the subspecies is not endangered; even though, in the northern part of its range population trend estimates are showing a decline.

In May, 2008, the Service published the 2008 Recovery Plan for the Northern Spotted Owl (USDI FWS 2008b) (recovery plan). The recovery plan identified that competition with barred owls, ongoing loss of suitable habitat as a result of timber harvest and catastrophic fire, and loss of amount and distribution of suitable habitat as a result of past activities and disturbances are the most important range-wide threats to the spotted owl (USDI FWS 2008b). To address these threats, the 2008 recovery strategy had the following three essential elements: barred owl control, dry-forest landscape management strategy, and managed owl conservation areas (MOCAs) (USDI FWS 2008b). However, due to litigation, targeted revisions to the 2008 plan occurred, leading to the release of the 2011 revised recovery plan. Under the 2011 recovery

plan, northern spotted owl conservation continues to be conducted under the NWFP along with agency discretion on implementation of recommended recovery actions.

Conservation Efforts on Non-Federal Lands

In the report from the Interagency Scientific Committee (Thomas et al. 1990), the draft recovery plan (USDI FWS 1992a), and the report from the Forest Ecosystem Management Assessment Team (Thomas and Raphael 1993), it was noted that limited federal ownership in some areas constrained the ability to form a network of old-forest reserves to meet the conservation needs of the spotted owl. In these areas in particular, non-federal lands would be important to the range-wide goal of achieving conservation and recovery of the spotted owl. The Service's primary expectations for private lands are for their contributions to demographic support (pair or cluster protection) to federal lands, or their connectivity with federal lands (USDI FWS 2008b). In addition, timber harvest within each state is governed by rules that provide protection of spotted owls or their habitat to varying degrees.

There are 17 current or completed Habitat Conservation Plans (HCPs) that have incidental take permits issued for spotted owls—eight in Washington, three in Oregon, and four in California (USDI FWS 2008b). The HCPs range in size from 40 acres to more than 1.6 million acres, although not all acres are included in the mitigation for spotted owls. In total, the HCPs cover approximately 2.9 million acres (9.1 percent) of the 32 million acres of non-federal forest lands in the range of the spotted owl. The period of time that the HCPs will be in place ranges from 5 to 100 years; however, most of the HCPs are of fairly long duration. While each HCP is unique, there are several general approaches to mitigation of incidental take:

- Reserves of various sizes, some associated with adjacent federal reserves
- Forest harvest that maintains or develops suitable habitat
- Forest management that maintains or develops dispersal habitat
- Deferral of harvest near specific sites

Washington. In 1996, the State Forest Practices Board adopted rules (Washington Forest Practices Board 1996) that would contribute to conserving the spotted owl and its habitat on non-Federal lands. Adoption of the rules was based in part on recommendations from a Science Advisory Group that identified important non-federal lands and recommended roles for those lands in spotted owl conservation (Hanson et al. 1993; Buchanan et al. 1994). The 1996 rule package was developed by a stakeholder policy group and then reviewed and approved by the Forest Practices Board (Buchanan and Swedeen 2005). Spotted owl-related HCPs in Washington generally were intended to provide demographic or connectivity support (USDI FWS 1992a).

Oregon. The Oregon Forest Practices Act provides for protection of 70-acre core areas around sites occupied by an adult pair of spotted owls capable of breeding (as determined by recent protocol surveys), but it does not provide for protection of spotted owl habitat beyond these areas (Oregon Department of Forestry 2007). In general, no large-scale spotted owl habitat protection strategy or mechanism currently exists for non-federal lands in Oregon. However, a Safe Harbor program is available to individual willing landowners meeting the parameters of the program. Three spotted owl-related HCPs are currently in effect cover more than 300,000 acres of non-

federal lands. These HCPs are intended to provide some nesting habitat and connectivity over the next few decades (USDI FWS 2008b).

California. The California State Forest Practice Rules, which govern timber harvest on private lands, require surveys for spotted owls in suitable habitat and to provide protection around activity centers (California Department of Forestry and Fire Protection 2007). Under the Forest Practice Rules, no timber harvest plan can be approved if it is likely to result in incidental take of federally listed species, unless the take is authorized by a federal incidental take permit (California Department of Forestry and Fire Protection 2007). The California Department of Fish and Game initially reviewed all timber harvest plans to ensure that take was not likely to occur; the Service took over that review function in 2000. Several large industrial owners operate under spotted owl management plans that have been reviewed by the Service and that specify basic measures for spotted owl protection. Four HCPs authorizing take of spotted owls have been approved; these HCPs cover more than 669,000 acres of non-federal lands. Implementation of these plans is intended to provide for spotted owl demographic and connectivity support to NWFP lands (USDI FWS 2008b).

Current Condition of the Spotted Owl

The current condition of the species incorporates the effects of all past human activities and natural events that led to the present-day status of the species and its habitat (USDI FWS/ USDC NMFS 1998).

Range-wide Habitat and Population Trends

Habitat Baseline. The 1992 Draft Spotted Owl Recovery Plan estimated approximately 8.3 million acres of spotted owl habitat remained range-wide (USDI FWS 1992a). However, reliable habitat baseline information for non-federal lands is not available (Courtney et al. 2004). The Service has used information provided by the Forest Service, Bureau of Land Management, and National Park Service to update the habitat baseline conditions on federal lands for spotted owls on several occasions since the spotted owl was listed in 1990. The estimate of 7.4 million acres used for the NWFP in 1994 (USDA FS/USDI BLM 1994a) was believed to be representative of the general amount of spotted owl habitat on these lands. This baseline has been used to track relative changes over time in subsequent analyses, including those presented here.

In 2005, a new map depicting suitable spotted owl habitat throughout the range of the spotted owl was produced as a result of the NWFP's effectiveness monitoring program (Lint 2005). However, the spatial resolution of this new habitat map currently makes it unsuitable for tracking habitat effects at the scale of individual projects. The Service is evaluating the map for future use in tracking habitat trends. Additionally, there continues to be no reliable estimates of spotted owl habitat on non-federal lands; consequently, consulted-on acres can be tracked, but not evaluated in the context of change with respect to a reference condition on non-federal lands. The production of the monitoring program habitat map does, however, provide an opportunity for future evaluations of trends in non-federal habitat.

NWFP Lands Analysis 1994 – 2001. In 2001, the Service conducted an assessment of habitat baseline conditions, the first since implementation of the NWFP (USDI FWS 2001). This range-wide evaluation of habitat, compared to the Final Supplemental Environmental Impact Statement (FSEIS), was necessary to determine if the rate of potential change to spotted owl habitat was consistent with the change anticipated in the NWFP. In particular, the Service considered habitat effects that were documented through the section 7 consultation process since 1994. In general, the analytical framework of these consultations focused on the reserve and connectivity goals established by the NWFP land-use allocations (USDA FS/USDI BLM 1994a), with effects expressed in terms of changes in suitable spotted owl habitat within those land-use allocations. The Service determined that actions and effects were consistent with the expectations for implementation of the NWFP from 1994 to June, 2001 (USDI FWS 2001).

Range-wide Analysis 1994 – May 23, 2012. This section updates the information considered in USDI FWS (2001), relying particularly on information in documents the Service produced pursuant to section 7 of the Act, and information provided by NWFP agencies on habitat loss resulting from natural events (e.g., fires, windthrow, insect and disease). To track impacts to northern spotted owl habitat, the Service designed the Consulted on Effects Database which records impacts to northern spotted owls and their habitat at a variety of spatial and temporal scales. Data are entered into the Consulted on Effects Database under various categories including, land management agency, land-use allocation, physiographic province, and type of habitat affected.

In 1994, about 7.4 million acres of suitable northern spotted owl habitat were estimated to exist on Federal lands managed under the NWFP. As of May 23, 2012, the Service had consulted on the proposed removal/downgrading of approximately 665,012 acres (Table 2) or 8.99 percent of 7.4 million acres (Table 3) of spotted owl suitable habitat on Federal lands. Of the total Federal acres consulted on for removal/downgrading, approximately 192,240 acres or 2.6 percent of 7.4 million acres of northern spotted owl habitat were removed/ downgraded as a result of timber harvest. These changes in suitable northern spotted owl habitat are consistent with the expectations for implementation of the NWFP (USDA FS/USDI BLM 1994a).

Habitat loss from Federal lands due to management activities has varied among the individual provinces with most of the impacts concentrated within the Non-Reserve relative to the Reserve land-use allocations (Table 3). When habitat loss is evaluated as a proportion of the affected acres range-wide, the most pronounced losses have occurred within Oregon (72%), especially within its Klamath Mountains (37%) and Cascades (East and West) (35%) Provinces (Table 3), followed by much smaller habitat losses in Washington (9.28%) and California (18.4%) (Table 3). When habitat loss is evaluated as a proportion of provincial baselines, the Oregon Klamath Mountains (20.4%), and Cascades East (13.0%) provinces, have proportional losses greater than the loss of habitat across all provinces (5.93) (Table 3).

From 1994 through May23, 2012, habitat lost due to natural events was estimated at approximately 246,111 acres range-wide (Table 3). About two-thirds of this loss was attributed to the Biscuit Fire that burned over 500,000 acres in southwest Oregon (Rogue River basin) and northern California in 2002. This fire resulted in a loss of approximately 113,451 acres of northern spotted owl habitat (Table 3), including habitat within five LSRs. Approximately 18,630 acres of northern spotted owl habitat were lost due to the B&B Complex and Davis Fires in the East Cascades Province of Oregon (Table 3).

Because there is no comprehensive spotted owl habitat baseline for non-federal lands, there is little available information regarding spotted owl habitat trends on non-federal lands. Yet, we do know that internal Service consultations conducted since 1992, have documented the eventual loss of 472,772 (calculated using data in Table 2) acres of habitat on non-federal lands. Most of these losses have yet to be realized because they are part of large-scale, long-term HCPs.

Table 2. Changes to NRF[1] habitat acres from activities addressed in section 7 consultations (both formal and informal) and other causes range-wide from 1994 to May 23, 2012.

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Land Ownership	Consulted On Habitat Changes[2]		Other Habitat Changes[3]	
	Removed/ Downgraded	Maintained/ Improved	Removed/ Downgraded	Maintained/ Improved
NWFP (FS,BLM,NPS)	192,240	516,906	246,111	39,720
Bureau of Indian Affairs / Tribes	108,210	28,372	2,398	0
Habitat Conservation Plans/Safe Harbor Agreements	295,889	14,430	N/A	N/A
Other Federal, State, County, Private Lands	68,673	21,894	279	0
Total Changes	**665,012**	**581,602**	**248,788**	**39,720**

Notes:

1. Nesting, roosting, foraging (NRF) habitat. In California, suitable habitat is divided into two components; nesting - roosting (NR) habitat, and foraging (F) habitat. The NR component most closely resembles NRF habitat in Oregon and Washington. Due to differences in reporting methods, effects to suitable habitat compiled in this, and all subsequent tables include effects for nesting, roosting, and foraging (NRF) for 1994-6/26/2001. After 6/26/2001 suitable habitat includes NRF for Washington and Oregon but only nesting and roosting (NR) for California.
2. Includes both effects reported in USDI FWS 2001 and subsequent effects reported in the Northern Spotted Owl Consultation Effects Tracking System (web application and database.)
3. Includes effects to suitable NRF habitat (as generally documented through technical assistance, etc.) resulting from wildfires (not from suppression efforts), insect and disease outbreaks, and other natural causes, private timber harvest, and land exchanges not associated with consultation.

Table 3. Aggregate Results of All Adjusted, Habitat (NRF[1]) Acres Affected by Section 7 Consultation on NWFP Lands for the Northern Spotted Owl; Baseline and Summary of Effects by State, Physiographic Province and Land Use Function.

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Physiographic Province[2]		Evaluation Baseline[3]	Habitat Removed/Downgraded[4]					% Provincial Baseline Affected	% Range-wide Effects
			Land Use Allocations			Habitat Loss to Natural Events[7]	Total		
		Total	Reserves[5]	Non-Reserves[6]	Total				
WA	Eastern Cascades	706,849	4,522	6,392	10,914	14,307	25,221	3.57	5.75
	Olympic Peninsula	560,217	869	1,711	2,580	299	2,879	0.51	0.66
	Western Cascades	1,112,480	1,691	10,870	12,561	3	12,564	1.13	2.87
OR	Cascades East	443,659	2,589	14,309	16,898	40,884	57,782	13.02	13.18
	Cascades West	2,046,472	3,872	66,121	69,993	24,583	94,576	4.62	21.58
	Coast Range	516,577	447	3,994	4,441	66	4,507	0.87	1.03
	Klamath Mountains	785,589	2,631	55,875	58,506	101,676	160,182	20.39	36.54
	Willamette Valley	5,658	0	0	0	0	0	0	0
CA	Cascades	88,237	10	4,820	4,830	329	5,159	5.85	1.18
	Coast	51,494	464	79	543	275	818	1.59	0.19
	Klamath	1,079,866	1,546	9,428	10,974	63,689	74,663	6.91	17.03
	Total	**7,397,098**	**18,641**	**173,599**	**192,240**	**246,111**	**438,351**	**5.93**	**100**

Notes:

1. Nesting, roosting, foraging (NRF) habitat. In California, suitable habitat is divided into two components; nesting - roosting (NR) habitat, and foraging (F) habitat. The NR component most closely resembles NRF habitat in Oregon and Washington. Due to differences in reporting methods, effects to suitable habitat compiled in this, and all subsequent tables include effects for nesting, roosting, and foraging (NRF) for 1994-6/26/2001. After 6/26/2001 suitable habitat includes NRF for Washington and Oregon but only nesting and roosting (NR) for California.
2. Defined by the Northwest Forest Plan as the twelve physiographic provinces, as presented in Figure 3&4-1 on page 3&4-16 of the FSEIS. The WA Western Lowlands and OR Willamette Valley provinces are not listed as they are not expected to contribute to recovery.
3. 1994 FSEIS baseline (USDA FS and USDI BLM 1994b).
4. Includes both effects reported in USDI FWS 2001 and subsequent effects reported in the Northern Spotted Owl Consultation Effects Tracking System (web application and database).
5. Land-use allocations intended to provide large blocks of habitat to support clusters of breeding pairs. (LSR, MLSA, CRA)
6. Land-use allocations intended to provide habitat to support movement of spotted owls among reserves. (AWA, AMA, MX).
7. Acres for all physiographic provinces, except the Oregon Klamath Mountains, are from the Scientific Evaluation of the Status of the Northern Spotted Owl (Courtney et al. 2004) and subsequent effects entered into the Northern Spotted Owl Consultation Effects Tracking System. Acres for the Oregon Klamath Mountains province are from the biological assessment entitled: Fiscal year 2006-2008 programmatic consultation: re-initiation on activities that may affect listed species in the Rogue-River/South Coast Basin, Medford BLM, and Rogue-Siskiyou National Forest and from subsequent effects entered into the Northern Spotted Owl Consultation Effects Tracking System.

Other Habitat Trend Assessments. In 2005, the Washington Department of Wildlife released the report, "An Assessment of Spotted Owl Habitat on Non-federal Lands in Washington between 1996 and 2004" (Pierce et al. 2005). This study estimates the amount of spotted owl habitat in 2004 on lands affected by state and private forest practices. The study area is a subset of the total Washington forest practice lands, and statistically-based estimates of existing habitat and habitat loss due to fire and timber harvest are provided. In the 3.2-million acre study area, Pierce et al. (2005) estimated there was 816,000 acres of suitable spotted owl habitat in 2004, or about 25 percent of their study area. Based on their results, Pierce and others (2005) estimated there were less than 2.8 million acres of spotted owl habitat in Washington on all ownerships in 2004. Most of the suitable owl habitat in 2004 (56%) occurred on federal lands, and lesser amounts were present on state-local lands (21%), private lands (22%) and tribal lands (1%). Most of the harvested spotted owl habitat was on private (77%) and state-local (15%) lands. A total of 172,000 acres of timber harvest occurred in the 3.2 million-acre study area, including harvest of 56,400 acres of suitable spotted owl habitat. This represented a loss of about 6 percent of the owl habitat in the study area distributed across all ownerships (Pierce et al. 2005). Approximately 77 percent of the harvested habitat occurred on private lands and about 15 percent occurred on state lands. Pierce and others (2005) also evaluated suitable habitat levels in 450 spotted owl management circles (based on the provincial annual median spotted owl home range). Across their study area, they found that owl circles averaged about 26 percent suitable habitat in the circle across all landscapes. Values in the study ranged from an average of 7 percent in southwest Washington to an average of 31 percent in the east Cascades, suggesting that many owl territories in Washington are significantly below the 40 percent suitable habitat threshold used by the state as a viability indicator for spotted owl territories (Pierce et al. 2005).

Moeur et al. 2005 estimated an increase of approximately 1.25 to 1.5 million acres of medium and large older forest (greater than 20 inches dbh, single and multi-storied canopies) on federal lands in the NWFP area between 1994 and 2003. The increase occurred primarily in the lower end of the diameter range for older forest. The net area in the greater than 30 inch dbh size class increased by only an estimated 102,000 to 127,000 acres (Moeur et al. 2005). The estimates were based on change-detection layers for losses due to harvest and fire and remeasured inventory plot data for increases due to ingrowth. Transition into and out of medium and large older forest over the 10-year period was extrapolated from inventory plot data on a subpopulation of Forest Service land types and applied to all federal lands. Because size class and general canopy layer descriptions do not necessarily account for the complex forest structure often associated with northern spotted owl habitat, the significance of these acres to northern spotted owl conservation remains unknown.

Spotted Owl Numbers, Distribution, and Reproduction Trends. There are no estimates of the size of the spotted owl population prior to settlement by Europeans. Spotted owls are believed to have inhabited most old-growth forests or stands throughout the Pacific Northwest, including northwestern California, prior to beginning of modern settlement in the mid-1800s (USDI FWS 1989). According to the final rule listing the spotted owl as threatened (USDI FWS 1990a), approximately 90 percent of the roughly 2,000 known spotted owl breeding pairs were located on federally managed lands, 1.4 percent on state lands, and 6.2 percent on private lands; the

percent of spotted owls on private lands in northern California was slightly higher (USDI FWS 1989; Thomas et al. 1990).

The current range of the spotted owl extends from southwest British Columbia through the Cascade Mountains, coastal ranges, and intervening forested lands in Washington, Oregon, and California, as far south as Marin County (USDI FWS 1990b). The range of the spotted owl is partitioned into 12 physiographic provinces (Figure 1) based on recognized landscape subdivisions exhibiting different physical and environmental features (USDI FWS 1992b). The spotted owl has become rare in certain areas, such as British Columbia, southwestern Washington, and the northern coastal ranges of Oregon.

As of July 1, 1994, there were 5,431 known site-centers of spotted owl pairs or resident singles: 851 sites (16 percent) in Washington, 2,893 sites (53 percent) in Oregon, and 1,687 sites (31 percent) in California (USDI FWS 1995). By June 2004, the number of territorial spotted owl sites in Washington recognized by the Washington Department of Fish and Wildlife was 1,044 (Buchanan and Swedeen 2005). The actual number of currently occupied spotted owl locations across the range is unknown because many areas remain unsurveyed (USDI FWS 2008b). In addition, many historical sites are no longer occupied because spotted owls have been displaced by barred owls, timber harvest, or severe fires, and it is possible that some new sites have been established due to reduced timber harvest on federal lands since 1994. The totals in USDI FWS (1995) represent the cumulative number of locations recorded in the three states, not population estimates.

Because the existing survey coverage and effort are insufficient to produce reliable range-wide estimates of population size, demographic data are used to evaluate trends in spotted owl populations. Analysis of demographic data can provide an estimate of the finite rate of population change (λ) (lambda), which provides information on the direction and magnitude of population change. A λ of 1.0 indicates a stationary population, meaning the population is neither increasing nor decreasing. A λ of less than 1.0 indicates a decreasing population, and a λ of greater than 1.0 indicates a growing population. Demographic data, derived from studies initiated as early as 1985, have been analyzed periodically (Anderson and Burnham 1992; Burnham et al. 1994: Forsman et al. 1996; Anthony et al. 2006 and Forsman et al. 2011) to estimate trends in the populations of the spotted owl.

In January 2009, two meta-analyses modeled rates of population change for up to 24 years using the re-parameterized Jolly-Seber method (λ_{RJS}). One meta-analysis modeled the 11 long-term study areas (Table 4), while the other modeled the eight study areas that are part of the effectiveness monitoring program of the NWFP (Forsman et al. 2011).

Point estimates of λ_{RJS} were all below 1.0 and ranged from 0.929 to 0.996 for the 11 long-term study areas. There was strong evidence that populations declined on 7 of the 11 areas (Forsman et al. 2011), these areas included Rainier, Olympic, Cle Elum, Coast Range, HJ Andrews, Northwest California and Green Diamond. On other four areas (Tyee, Klamath, Southern Cascades, and Hoopa), populations were either stable, or the precision of the estimates was not sufficient to detect declines.

Table 4. Demographic results from population study areas across the range of the northern spotted owl (adapted from Forsman et al. 2011).

Study Area	Fecundity	Apparent Survival[1]	λ_{RJS}	Population change[2]
Cle Elum	Declining	Declining	0.937	Declining
Rainier	Increasing	Declining	0.929	Declining
Olympic	Stable	Declining	0.957	Declining
Coast Ranges	Increasing	Declining since 1998	0.966	Declining
HJ Andrews	Increasing	Declining since 1997	0.977	Declining
Tyee	Stable	Declining since 2000	0.996	Stationary
Klamath	Declining	Stable	0.990	Stationary
Southern Cascades	Declining	Declining since 2000	0.982	Stationary
NW California	Declining	Declining	0.983	Declining
Hoopa	Stable	Declining since 2004	0.989	Stationary
Green Diamond	Declining	Declining	0.972	Declining

[1]Apparent survival calculations are based on model average.
[2]Population trends are based on estimates of realized population change.

The weighted mean λ_{RJS} for all of the 11 study areas was 0.971 (standard error [SE] = 0.007, 95 percent confidence interval [CI] = 0.960 to 0.983), which indicated an average population decline of 2.9 percent per year from 1985 to 2006. This is a lower rate of decline than the 3.7 percent reported by Anthony et al. (2006), but the rates are not directly comparable because Anthony et al. (2006) examined a different series of years and because two of the study areas in their analysis were discontinued and not included in Forsman et al. (2011). Forsman et al. (2011) explains that the indication populations were declining was based on the fact that the 95 percent confidence intervals around the estimate of mean lambda did not overlap 1.0 (stable) or barely included 1.0.

The number of populations that declined and the rate at which they have declined are noteworthy, particularly the precipitous declines in the Olympic, Cle Elum, and Rainier study areas in Washington and the Coast Range study area in Oregon. Estimates of population declines in these areas ranged from 40 to 60 percent during the study period through 2006 (Forsman et al. 2011). Spotted owl populations on the HJ Andrews, Northwest California, and Green Diamond study areas declined by 20-30 percent whereas the Tyee, Klamath, Southern Cascades, and Hoopa study areas showed declines of 5 to 15 percent.

Decreases in adult apparent survival rates were an important factor contributing to decreasing population trends. Forsman et al. (2011) found apparent survival rates were declining on 10 of

the study area with the Klamath study area in Oregon being the exception. Estimated declines in adult survival were most precipitous in Washington where apparent survival rates were less than 80 percent in recent years, a rate that may not allow for sustainable populations (Forsman et al. 2011). In addition, declines in adult survival for study areas in Oregon have occurred predominately within the last five years and were not observed in the previous analysis by Anthony et al. 2006. Forsman et al. (2011) express concerns by the collective declines in adult survival across the subspecies range because spotted owl populations are most sensitive to changes in adult survival.

There are few spotted owls remaining in British Columbia. Chutter et al. (2004) suggested immediate action was required to improve the likelihood of recovering the spotted owl population in British Columbia. So, in 2007, personnel in British Columbia captured and brought into captivity the remaining 16 known wild spotted owls (USDI FWS 2008b). Prior to initiating the captive-breeding program, the population of spotted owls in Canada was declining by as much as 10.4 percent per year (Chutter et al. 2004). The amount of previous interaction between spotted owls in Canada and the United States is unknown.

STATUS OF SPOTTED OWL CRITICAL HABITAT

Legal Status

On August 13, 2008 the Service re-designated critical habitat for the spotted owl on approximately 5.3 million acres across Washington (2.2 million acres), Oregon (3.3 million acres), and California (1.4 million acres) (USDI FWS 1992a). Only federal lands were designated as critical habitat in the final rule (USDI FWS 2008a). The spotted owl critical habitat final rule states: "Section 7 analysis of activities affecting spotted owl critical habitat should consider provinces, subprovinces, and individual CHUs, as well as the entire range of the subspecies (page 1823)." The rule goes on to assert the basis for an adverse modification opinion should be evaluated at the provincial scale (page 1823).

Primary Constituent Elements

Primary constituent elements (PCEs) are the physical and biological features of critical habitat essential to a species' conservation. PCEs identified in the spotted owl critical habitat final rule include those physical and biological features that support nesting, roosting, foraging, and dispersal (USDI FWS 1992a). Features that support nesting and roosting habitat typically include a moderate to high canopy (60 to 90 percent); a multi-layered, multi-species canopy with large [> 30 inches diameter at breast height] overstory trees; a high incidence of large trees with various deformities (e.g., large cavities, broken tops, mistletoe infections, and other evidence of decadence); large snags; large accumulations of fallen trees and other woody debris on the ground; and sufficient open space below the canopy for spotted owls to fly (Thomas et al. 1990). Foraging habitat generally consists of attributes similar to those in nesting and roosting habitat, but may not always support successfully nesting pairs (USDI FWS 1992a). Dispersal habitat, at minimum, consists of stands with adequate tree size and canopy closure to provide protection from avian predators and at least minimal foraging opportunities: there may be variations over

the spotted owl's range (e.g., drier sites in the east Cascades or northern California) (USDI FWS 1992a).

Conservation Role of Critical Habitat

Spotted owl critical habitat was designated based on the identification of large blocks of suitable habitat that are well distributed across the range of the spotted owl. Critical habitat units (CHU) were intended to identify a network of habitats that provided the functions considered important to maintaining stable, self-sustaining, and interconnected populations over the range of the spotted owl, with each CHU having a local, provincial, and a range-wide role in spotted owl conservation. Most CHUs were expected to provide suitable habitat for population support, some were designated primarily for connectivity, and others were designated to provide for both population support and connectivity. Approximately 70 percent of suitable habitat in CHUs overlaps with Plan LSRs on a range-wide basis and will therefore be managed to protect and enhance habitat characteristics.

Current Condition of Critical Habitat

Table 5 displays the current condition of spotted owl habitat at the range-wide scale as well as changes to critical habitat resulting from management activities and natural disturbances.

Table 5. Change in spotted owl critical habitat from 1994 to May 23, 2012, resulting from federal management actions and natural events by physiographic province (Wed May 23 09:04:55 MDT 2012).

Physiographic Province[2]		Evaluation Baseline[3]	Habitat Removed/Downgraded[4]					% Provincial Baseline Affected	% Range-wide Effects
			Land Use Allocations			Habitat Loss to Natural Events[7]	Total		
		Total	Reserves[5]	Non-Reserves[6]	Total				
WA	Eastern Cascades	188,720	38	0	38	45	83	0.00	0.41
	Olympic Peninsula	149,090	6	0	6	0	6	0.00	0.03
	Western Cascades	415,620	10	0	10	3	13	0.00	0.06
OR	Cascades East	109,140	823	50	873	0	873	0.01	4.34
	Cascades West	498,020	14	0	14	0	14	0.00	0.07
	Coast Range	303,680	0	0	0	0	0	0.00	0.00
	Klamath	210,430	1,292	1	1,293	0	1,293	0.01	6.43

Physiographic Province[2]		Evaluation Baseline[3]	Habitat Removed/Downgraded[4]					% Provincial Baseline Affected	% Range-wide Effects
			Land Use Allocations			Habitat Loss to Natural Events[7]	Total		
		Total	Reserves[5]	Non-Reserves[6]	Total				
	Mountains								
CA	**Cascades**	137,010	189	0	189	1,162	1,351	0.01	6.72
	Coast	53,480	0	0	0	0	0	0.00	0.00
	Klamath	583,690	68	20	88	16,385	16,473	0.03	81.93
	Total	**2,648,880**	**2,440**	**71**	**2,511**	**17,595**	**20,106**	**0.76%**	**100%**

ENVIRONMENTAL BASELINE

Regulations implementing the Act (50 CFR 402.02) define the environmental baseline as the past and present impacts of all federal, state, or private actions and other human activities in the action area. Also included in the environmental baseline are the anticipated impacts of all proposed federal projects in the action area which have undergone section 7 consultations, and the impacts of state and private actions which are contemporaneous with the consultation in progress. Table 6 displays the Environmental Baseline, aggregated by watershed, of spotted owl habitat in the analysis area. The approximate size of the analysis area is 1,309,672 acres, of this 456,772 acres is considered NRF habitat (BLM = 205,044, Non-Federal NRF = 251,728).

Table 6. Environmental baseline of spotted owl habitat for the GPRA FY 2012-13, Medford District BLM consultation analysis area (FWS Ref. #: 01EOFW00-2012-F-0103).

Applegate Watershed	Acres
Total acres all ownership	492,884
Total acres Non-Medford BLM lands	344,477
BLM Non-habitat	13,513
BLM Capable	48,323
BLM Dispersal	27,979
BLM NRF	**58,592**
Total acres Medford BLM	148,407
Other Federal NRF	84,308
Non-Federal NRF	28,163
Total NRF on Non-Medford BLM lands	**112,471**

Cow-Upper Watershed	**Acres**
Total acres all ownership	216,386
Total acres Non-Medford BLM lands	133,765
BLM Non-habitat	2,917
BLM Capable	23,603
BLM Dispersal	9,445
BLM NRF	**46,656**
Total acres Medford BLM	82,621
Other Federal NRF	19,178
Non-Federal NRF	36,459
Total NRF on Non-Medford BLM lands	**55,637**
Rogue Middle Watershed	**Acres**
Total acres all ownership	600,357
Total acres Non-Medford BLM lands	386,096
BLM Non-habitat	10,041
BLM Capable	60,367
BLM Dispersal	44,057
BLM NRF	**99,796**
Total acres Medford BLM	214,261
Other Federal NRF	15,191
Non-Federal NRF	68,429
Total NRF on Non-Medford BLM lands	**83,620**

The proposed action is planned to occur within the Klamath Mountains province, within this province, there are approximately 625,407 acres of spotted owl nesting, roosting, and/or foraging (NRF) habitat (calculated using the data found in Table 3). Management activities have resulted in the loss of approximately 2,631 acres in reserve and 55,875 acres in non-reserved areas of NRF habitat. An additional 101,676 acres of spotted owl NRF habitat were lost due to natural events in the Klamath Province (Table 3).

In these drier forest systems, fire and fire suppression has played an important role in influencing successional processes and creating diverse forest conditions, such as in the Action Area. For example, Agee (1993), Agee (2003), and Hessburg and Agee (2003) characterized the historical wildfire regime as low- to mixed-severity with fire return intervals of less than 10 to 50 or more years, depending on local conditions. As a result of effective fire exclusion, many forest stands in the action area occur currently as a mid or late-seral, closed condition. Spotted owl habitat patterns in these drier portions of the species range historically were not continuous, but occurred naturally in a mosaic pattern (USDI FWS 2008b).

Most spotted owls that currently inhabit the action area nest in drainages and on northerly aspects where it is likely that prior to fire suppression, these areas acted as refugia from frequent fire and may have been in a condition similar to today. While elevation and watershed position are somewhat general variables, finer scale variables like slope position, curvature, and distance to streams seem to correspond well with known spotted owl nest sites (USDI FWS 2011). For example, spotted owls in Klamath Mountains Province selected the lower third of slopes, used the middle third of slopes in proportion to their availability, and used the upper third of slopes less than expected for roosting and nesting. The spotted owl nest locations within the Action Area exhibit a similar trend, and tend to occur lower on the slopes and in areas with a convex curvature. These are likely areas with more stable microclimates (Weathers et al. 2001) along with larger trees with more complex forest structure that spotted owls are selecting as nest sites (Hershey et al. 1998). It may also be that these same areas historically acted as refugia from stand replacement fire, due to being near the bottom of the canyons and on north tending slopes that maintained suitable spotted owl habitat over time.

The primary prey of spotted owls in the Klamath province in southwestern Oregon is the dusky-footed woodrat (*Neotoma fuscipes*) and the northern flying squirrel (*Glaucomy sabrinus*) (Forsman et al. 2004). Forsman et al. (2004) found spotted owls in the Klamath Province consumed woodrats at a rate of two to three times higher than elsewhere in the spotted owl's range. Woodrats comprised nearly one-third of the prey items in the diet and account for nearly half of the biomass. As a result, key features of woodrat habitat (typically brushy areas or closed canopy younger forest stands) strongly influence how spotted owls use the available mosaic of habitat in the Klamath Province. Where woodrats are the primary food source, spotted owl home ranges are significantly smaller and contain significantly more edge habitat and less older forest (Zabel et al. 1995, Carey et al. 1992) than other areas in the range of the spotted owl. Solis and Gutiérrez (1990) reported spotted owls hunting along ecological edges in this province.

Spotted Owl Sites within the Action Area

The District has identified a total of 319 spotted owl sites (260 historic and 59 generated sites [USDI /USDA 2008]) within the analysis area (Table 7). Of this total, 24 spotted owl home ranges are anticipated to be affected by the proposed action.

Table 7. Spotted owl sites within the analysis area for the GPRA FY 2012-2013, Medford District BLM consultation (FWS Ref. #: 01EOFW00-2012-F-0103).

Spotted Owl Sites	Applegate	Cow Upper	Rogue Middle	Total
Number of Historic Spotted Owl Sites	69	76	115	260
Number of Predicted Spotted Owl Sites	15	15	29	59
Number of Home Ranges Affected by the Proposed Action (sale name)	12 known 2 Predicted (Williams IVM)	2 known (West Fork Cow Creek ROW)	13 known 3 predicted (Poor Luck)	27

Occupancy

Spotted owl sites affected by the proposed action are located within the Klamath Mountains province. The spotted owl population in the Klamath Demography Study Area (DSA), just to the north of the GPRA Action Area, is likely representative of spotted owl populations from the larger surrounding Klamath Mountains Province (Anthony et al. 2006). Therefore, information from the Klamath DSA provides an inference to the status of status of spotted owls within the Action Area. According to Forsman et al. (2011), spotted owl populations in this province had population trend estimates of less than 1.0 (Table 4); however, the confidence intervals overlapped 1.0, suggesting the population could be stationary. Range-wide however, the spotted owl population was declining at an average annual rate of almost three percent (Forsman et al. 2011). Forsman et al. (2011) attempted to illustrate how annual population changes influenced trends in population numbers by estimating realized population changes for each study area. Based on these estimates, populations of territorial owls on the Klamath DSA declined from five to 15 percent from study initiation, but again, confidence intervals for these estimates substantially overlapped 1.0, and precision of the estimates was not sufficient to detect such small declines.

As documented in Davis et al. (2012) for the Klamath DSA, 158 spotted owl sites were surveyed in 2011. Spotted owls were detected at 50 percent of the sites visited, indicating a decrease in occupancy from the 60 percent detected in 2010 (Davis et al. 2011a). Overall, the spotted owl site occupancy rate has been in a steady decline since 2002 (Davis et al. 2012). It should be noted that the population trend information from Forsman et al. (2011) is based on capture-recapture studies of individuals. Whereas Davis et al. 2012, is based on using annual occupancy information from known sites. For most of the demographic areas, it seems that there is a lag in the population trend information as compared to annual occupancy estimates.

Reproduction

Forsman et al. (2011) found evidence that range-wide, nine of the 11 study areas had an even-odd year effect on fecundity, with higher fecundity in the even years. For the 11 study areas, fecundity was declining on four areas, stable on four areas, and increasing on three areas. Fecundity was shown to be declining through time on the Klamath DSA (Table 4).

Specifically during 2011, nesting status was determined at 50 sites in the Klamath DSA, with nesting confirmed at only 20 percent of the sites. Of these nest attempts, five pairs fledged young and the other five pairs failed to produce offspring, resulting in a nesting success rate of 50 percent (Davis et al 2012). The mean brood size (1.40) was lower in 2011 than the overall average (1.56) for 1990-2011.

Barred Owls

As discussed in the *Status of the Species* section, the 2011 Revised Recovery Plan for the Northern Spotted Owl (USDI FWS 2011) identifies competition from the barred owl (*Strix varia*) as an important threat to the spotted owl. Barred owls are native to eastern North America, but during the past century, have moved westward, arriving in the Pacific Northwest a

couple of decades ago and settling into spotted owl habitat. Since barred owls are less selective about the habitat they use and the prey they feed on, they are believed to be out competing northern spotted owls for habitat and food (USDI FWS 2011). For each of the individual demographic study areas, there has been an almost steady increase in the number of barred owls as measured by the proportion of spotted owl sites with barred owls detected, with as many as 60 percent of the spotted owl sites having barred owls detected (Forsman et al. 2011). Specifically for the Klamath study area; approximately 30 percent of the spotted owl sites had barred owls in recent years. Forsman et al. (2011) found evidence barred owl detections were important sources of variation and had negative effects on spotted owl apparent survival and recruitment. Barred owls are attributed to a decline in spotted owls (Forsman et al. 2011).

In the Action Area, barred owls have been observed in 23 percent of the 13 historic (known) spotted owl sites associated with the Poor Luck project. Barred owls have been observed in 25 percent of the 12 historic spotted owl sites associated with the Williams Project area. In 2010, a nesting pair of barred owls was observed in the Williams Project Area. The number of barred owls in the area may actually be higher because these detections are ancillary to spotted owl specific surveys (see Wiens et al. 2011).

Recent information (Dugger et al. 2011) indicates that site extinction rates for spotted owls increased with decreased amounts of old forest at the site core use area scale, an effect that was two to three times greater when barred owls were detected. In addition, the detection of barred owls decreased the probability that spotted owls would colonize vacated nesting territories as the nearest neighbor distance between old-forest patches increased. Wiens (2012) also found that the relative probability of a location being selected by spotted owls was reduced if the location was in close proximity to the core-use are of a barred owl.

Barred owls are known to use a wide variety of forest types, including early successional habitats. While a suggestion has been made that timber harvest activities may favor barred owls, an alternative hypothesis is that barred owls have a wider range of habitat use in the northern part of the spotted owl's range, and the spotted owl has a narrower one. But in the more southernly part of the spotted owl's range, the spotted owl seems to have a broader range of habitat use than does the barred owl (Courtney et al 2004). Therefore, timber harvest (e.g., regeneration type harvest) may have the effect of reducing spotted owl habitat in some areas (see Dugger et al. 2011), leading to a competitive advantage for barred owls, but perhaps not in others (Courtney et al 2004). Additionally, Wiens (2012) found that old forests represented high quality habitat for both species in terms of its influence on adult survival and emphasized the protection of old forest habitat to alleviate competitive pressures between the species.

In some portions of the spotted owl's range however, barred owl populations are increasing while spotted owls are declining, to some degree independently of forest management history in the area (Courtney et al 2004). For example, barred owls are increasing while spotted owls are declining throughout the Olympic peninsula in both industrial and national forest, but also in the National Park (in areas never harvested) (Anthony et al. 2004). On the Gifford Pinchot National Forest (Washington), the density and impact of barred owls appears higher in areas without timber harvest (Pearson and Livezey 2003).

Because the above studies suggest that the two species compete for resources, maintaining older, high quality habitat may help spotted owls persist, at least in the short-term. Our evaluation of the GPRA FY12-13 project therefore focused on whether the proposed action could potentially exacerbate competitive interactions between the two species by reducing the availability of high-quality habitat (see Recovery Plan section below). As described below, treatments are not proposed for high-quality habitat and therefore it seems less likely that the project will exacerbate the competitive interactions between the two species. However, available evidence suggests that the spatially structured social aspects such as the presence and distribution of barred owls may affect habitat quality for spotted owls (Wiens 2012).

Critical Habitat

2008 Designated Critical Habitat

Portions of the Poor Luck project are planned to occur in designated critical habitat (USDI FWS 2008) for the spotted owl, within the Rogue/Umpqua critical habitat unit (CHU 14). The Rogue/Umpqua unit (CHU-14) consists of approximately 183,800 ac (74,400 ha) in Douglas and Josephine Counties, Oregon, and is comprised of lands managed by the Umpqua National Forest (23,400 ac [9,500 ha]) and Roseburg and Medford BLM Districts (160,500 ac (65,000 ha)). This unit includes one area that, with approximately 4,100 ac (1,700 ha) of habitat or habitat-capable areas in the adjacent Wilderness, meets the size requirement of a large habitat block, and three areas wholly within critical habitat that meet the size requirement of small habitat blocks**.** These areas provide for habitat connectivity and northern spotted owl movement via the inter-provincial connection from the western Cascades to the Oregon Coast Ranges across the Rogue–Umpqua divide. Approximately 38,052 acres of the 183,840 acre Rogue/Umpqua CHU occur within the Rogue Middle watershed, in which the Poor Luck project is planned to occur.

2012 Proposed Critical Habitat

Portions of the projects included in the proposed action are planned to occur within proposed critical habitat (USDI FWS 2012), in the Klamath West (KLW) critical habitat unit (CHU 9). Portions of the Poor Luck and West Fork ROW projects occur within CHU subunits KLW 1, while portions of the Williams IVM project occur within CHU subunit KLW 4. Table 8 displays the environmental baseline for all proposed critical habitat in the affected watersheds.

Table 8. Environmental Baseline for proposed spotted owl critical habitat for the GPRA FY 2012-13, Medford District BLM Consultation (FWS Ref. # 01EOFW00-2012-F-0103).

Critical Habitat Unit Number	Applegate Watershed (acres)	Cow Upper Watershed (acres)	Rogue Middle Watershed (acres)
Unit 9: Klamath West (KLW)			
Subunit KLW 1	0	51,300	35,141
Acres NRF Habitat	0	29,203	20,681
Acres Dispersal Habitat	0	34,008	26,654
Subunit KLW 2	9,671	0	41,984
Acres NRF Habitat	2,681	0	23,002
Acres Dispersal Habitat	2,684	0	25,177
Subunit KLW 4	105,748	0	0
Acres NRF Habitat	52,561	0	0
Acres Dispersal Habitat	61,781	0	0
Unit 10: Klamath East (KLE)			
Subunit KLE 1	0	23,434	5,104
Acres NRF Habitat	0	16,303	2,788
Acres Dispersal Habitat	0	16,510	3,660
Subunit KLE 2	0	26,957	16,709
Acres NRF Habitat	0	15,849	9,340
Acres Dispersal Habitat	0	18,971	11,479
Subunit KLE 3	12,606	6	72,346
Acres NRF Habitat	3,724	0	32,612
Acres Dispersal Habitat	7,004	0	50,353
Subunit KLE 6	91,163	0	0
Acres NRF Habitat	48,094	0	0
Acres Dispersal Habitat	50,783	0	0

Detailed Description of the Affected Proposed Critical Habitat Unit and Sub-units.

Unit 9: Klamath East (KLW)

Unit 9 contains 1,290,687 ac (522,322 ha) and nine subunits. This unit consists of the western portion of the Klamath Mountains Ecological Section M261A, based on section descriptions of forest types from Ecological Subregions of the United States (McNab and Avers 1994, Section M261A). A long north-south trending system of mountains (particularly South Fork Mountain) creates a rainshadow effect that separates this region from more mesic conditions to the west. This region is characterized by very high climatic and vegetative diversity resulting from steep gradients of elevation, dissected topography, and the influence of marine air (relatively high potential precipitation). These conditions support a highly diverse mix of mesic forest communities such as Pacific Douglas-fir, Douglas-fir tanoak, and mixed evergreen forest interspersed with more xeric forest types. Overall, the distribution of tanoak is a dominant factor distinguishing the Western Klamath Region. Douglas-fir dwarf mistletoe is uncommon and seldom used for nesting platforms by spotted owls. The prey base of spotted owls within the Western Klamath is diverse, but dominated by woodrats and flying squirrels.

KLW- 1

The KLW-1 subunit consists of approximately 156,075 ac (63,161 ha) in Douglas, Josephine, Curry, and Coos Counties, Oregon, and comprises lands managed by the State of Oregon and the BLM. Of this subunit 7,236 ac (2,928 ha) are managed by the State of Oregon for multiple uses including timber revenue production, recreation, and wildlife habitat according to the Southwest Oregon State Forests Management Plan (ODF 2010, entire) and may be considered for exclusion in the final critical habitat designation. Federal lands comprise 148,837 ac (60,233 ha) and are managed as directed by the NWFP (USDA FS / USDI BLM 1994, entire). Special management considerations or protection are required in this subunit to address threats from current and past timber harvest, losses due to wildfire and the effects on vegetation from fire exclusion, and competition with barred owls. This subunit is expected to function for demographic support to the overall population and for north-south and east-west connectivity between subunits and CHUs. This subunit sits at the western edge of an important connectivity corridor between coastal Oregon and the western Cascades.

The Service's evaluation of sites known to be occupied at the time of listing indicate that approximately 96 percent of the area of KLW-1was covered by verified spotted owl home ranges at the time of listing. When combined with likely occupancy of suitable habitat and occupancy by non-territorial owls and dispersing subadults, we consider this subunit to have been largely occupied at the time of listing. In addition, there may be some smaller areas of younger forest within the habitat mosaic of this subunit that were unoccupied at the time of listing. We have determined that all of the unoccupied and likely occupied areas in this subunit are essential for the conservation of the species to meet the recovery criterion that calls for the continued maintenance and recruitment of spotted owl habitat (USDI FWS 2011, p. ix). The increase and enhancement of spotted owl habitat is necessary to provide for viable populations of spotted owls

over the long term by providing for population expansion, successful dispersal, and buffering from competition with the barred owl.

KLW- 4

The KLW-4 subunit consists of approximately 155,811 ac (63,055 ha) in Josephine and Jackson Counties, Oregon, and Del Norte and Siskiyou Counties, California, and comprises lands managed by the Forest Service, the BLM, and the NPS that are managed as directed by the NWFP (USDA FS / USDI BLM 1994, entire). Congressionally reserved natural areas in Federal ownership are proposed for exclusion in the final critical habitat designation. Special management considerations or protection are required in this subunit to address threats from current and past timber harvest, losses due to wildfire and the effects on vegetation from fire exclusion, and competition with barred owls. This subunit is expected to function for demographic support to the overall population and for north-south and east-west connectivity between subunits and CHUs.

The Service's evaluation of sites known to be occupied at the time of listing indicate that approximately 95 percent of the area of KLW-4 was covered by verified spotted owl home ranges at the time of listing. When combined with likely occupancy of suitable habitat and occupancy by non-territorial owls and dispersing sub-adults, we consider this subunit to have been largely occupied at the time of listing. In addition, there may be some smaller areas of younger forest within the habitat mosaic of this subunit that were unoccupied at the time of listing. We have determined that all of the unoccupied and likely occupied areas in this subunit are essential for the conservation of the species to meet the recovery criterion that calls for the continued maintenance and recruitment of spotted owl habitat (USDI FWS 2011, p. ix). The increase and enhancement of spotted owl habitat is necessary to provide for viable populations of spotted owls over the long term by providing for population expansion, successful dispersal, and buffering from competition with the barred owl.

Role of the Action Area in Spotted Owl Survival and Recovery

Under the conservation strategy set forth in the NWFP and the 2011 Revised Recovery Plan for the Spotted Owl (USDI FWS 2011), the federal forest lands are intended to provide: 1) habitat blocks reserved for breeding owls, and; 2) sufficient habitat amounts and distributions to facilitate spotted owl dispersal between the reserves. According to the Assessment, the Action Area occurs within the matrix land use allocation and the NWFP conservation strategy for the spotted owl does not rely on nesting pairs and nesting habitat outside of reserved habitat blocks to maintain and recover the spotted owl population. As discussed above under the *Status of the Species* section, it was assumed under the NWFP that about 2.5 percent of Matrix lands would be subject to timber harvest per decade. At that rate, a large area of Matrix is expected to continue to support nesting spotted owls and the overall species' population while additional spotted owl habitat is developing within the late successional reserve system. In the first decade of the NWFP, timber harvest in the Matrix land use allocation was consistent with that assumption. As discussed in the *Status of the Species* section, the NWFP along with the strategy outlined in the revised spotted owl recovery plan (USDI FWS 2011), is the basis for the federal contribution to spotted owl recovery, even in light of spotted owl population declines and threats from barred owls and West Nile virus.

According to the Assessment, there are over 286,525 acres of dispersal habitat (including NRF habitat) within the Action Area area at this time and 64 percent of the federal lands are currently functional dispersal habitat. On that basis, it appears the habitat needs for the owl as prescribed under the NWFP are currently being met (Lint 2005 and Davis et al. 2011a). However, the NWFP doesn't address whether the habitat needs of the spotted owl could change in the face of an increasing population of barred owls (Davis et al. 2011a) (see Barred Owl section above).

The revised spotted owl recovery plan (USDI FWS 2011) ascribes a similar role for the Action Area, emphasizing the importance of retaining the older, and more structurally complex stands between the reserves (Recovery Action 32). The proposed action will not adversely affect those roles (see below).

EFFECTS OF THE ACTION

Effects of the action refer to the permanent or temporary direct and indirect effects of an action on the species, together with the effects of other activities that are interrelated and interdependent with that action that will be added to the environmental baseline. Indirect effects are those that are caused by the proposed action, occur later in time, but are still reasonably certain to occur.

Effects to Habitat

The decline of the spotted owl throughout its range is in part linked to the removal and degradation of spotted owl habitat (USDI FWS 2001, Courtney et al. 2004). Specific vegetational and structural components are associated with spotted owl habitat (USDI FWS 2001, Courtney et al. 2004). The removal of any of those components can cause adverse effects to spotted owls by:

- Displacing spotted owls from nesting, roosting, or foraging areas;
- Concentrating displaced spotted owls into smaller, fragmented patches of habitat that may already be occupied;
- Increasing intra-specific competition for nest sites;
- Decreasing survival of displaced spotted owls and their offspring by increasing their exposure to predators and/or limiting the availability of food resources;
- Diminishing the future reproductive productivity of displaced nesting pairs that may forgo nesting temporarily following their displacement; and
- Diminishing spotted owl population size due to declines in productivity and recruitment.

Generally, the effects of habitat modification activities and the duration of those effects on spotted owls depend upon the type of silvicultural prescriptions used and the location of the harvest relative to habitat. The impacts of timber harvest may include the removal or downgrading of habitat and/or altering of habitat by the creation of exposed habitat edges. Harvest prescriptions that remove spotted owl habitat and other harvest prescriptions that result in even-aged, monotypic forest stands that would not be suitable for nesting, roosting, or foraging, are likely to adversely affect spotted owls by reducing the available amount and quality of habitat. Silvicultural prescriptions that promote multi-aged and multi-storied stands may

retain the suitability of habitat within affected stands for spotted owls and may increase the quality of that habitat over time (USDI FWS 2007).

As detailed above in the Environmental Baseline section, spotted owl habitat use represents selection based on more than simply forest structure. Important variables include slope aspect, elevation and distance from streams also play important roles in providing for the biological needs of spotted owls. The District identified spotted owl habitats in the action area based solely on forest structure (USDI BLM 2012).

Overall, the proposed action includes up to 8,080 acres of timber harvest (Table 9) and less than one mile of new road construction associated with the West Fork Cow Creek road right-of-way (Table 10). Of the 8,080 proposed harvest acres, 4,324 acres occur within NRF habitat, with 91 percent or 3,930 acres having a treat and maintain prescription (treat and maintain prescription provides for similar habitat function post-treatment as it did pretreatment). Approximately 2,778 acres of harvest is planned for dispersal-only habitat. The majority of the remaining 978 acres of proposed harvest are planned to occur within areas of capable habitat. Specific to NRF habitat, up to 394 acres will be downgraded in the Rogue Middle watershed (Table 9).

Nesting, Roosting, Foraging Habitat

NRF Habitat Downgrade

Implementation of the Poor Luck project is expected to result in the downgrade of up to 394 acres (0.09 percent) of NRF habitat in the analysis area (Table 9). This loss of habitat will be due to the removal of the majority of trees, including large diameter trees that may provide nesting structure, removal of mid-story trees that provide hunting perches, and canopy closure being reduced to below 60 percent thus negatively effecting microclimate and lack of concealment from predators. As a result, the downgrading of this habitat ***may affect and is likely to adversely affect*** spotted owls. However, as described in the Assessment, all 394 acres of NRF downgrade occur beyond the boundary of any known or predicted spotted owl sites (see Effects to Spotted Owl Section below).

NRF Habitat Treat and Maintain

The majority of proposed harvest activities within NRF habitat include prescriptions that will treat and maintain up to 3,930 acres of spotted owl NRF habitat and this represents less than one percent of the analysis area. A treat and maintain prescription generally consists of light-to moderate thinning that takes into account the site-specific silvicultural needs of the stand and the retention of spotted owl habitat features. The treatments, if implemented as intended, should be neutral and may reduce habitat elements but not to the degree where the habitat function is changed. Canopy cover (at least 60 percent), basal area retention, and other attributes of spotted owl habitat such as multiple canopy layers, down wood, snags, and hardwoods are maintained resulting in having the stand continue to function as NRF habitat post-treatment as well as providing for prey-habitat needs (see Effects to Spotted Owls and Prey section below).

Table 9. Spotted owl NRF habitat downgrade and treat and maintain activities included in the GPRA FY 2012-13, Medford District BLM consultation (FWS Ref. #: 01EOFW00-2012-F-0103).

Project Name	Total Project Acres	NRF Habitat Baseline[1] Pre-Project Implementation	Number of Acres of NRF Habitat Downgraded	Number of Acres of NRF Habitat Treated and Maintained	Percent NRF Habitat Downgraded
	Applegate Watershed				
Williams IVM	5,608	171,063	0	2,342	0
Rogue Middle Watershed					
Poor Luck	2,472	183,416	394	1,588	0.22
Total	**8,080**	**354,479**	**394**	**3,930**	**0.11**

[1] Dispersal habitat baseline reflects District-managed lands only.

Dispersal Habitat

Removal

Implementation of the West Fork Cow Creek ROW projects will result in the removal of up to three acres of dispersal-only habitat, 2.7 acres of which occur on private lands, and 0.3 acres on District-managed lands, which represents less than one percent of dispersal habitat in the analysis area (Table 10).

Treat and Maintain

The proposed action will treat and maintain up to 2,778 acres or less than one percent of the dispersal-only (and/or including NRF) habitat in the analysis area (Table 10). As discussed above it is anticipated that the post-treatment function of dispersal habitat will remain similar to its pre-treatment condition.

Table 10. Effects to spotted owl dispersal habitat for the GPRA FY 2012-2013, Medford District BLM consultation (FWS Ref. #: 01EOFW00-2012-F-0103).

Project Name	Dispersal Habitat Baseline Pre-Project Implementation[1]	Number of Acres of Dispersal Habitat Removed	Number of Acres of Dispersal Habitat Treated and Maintained	Dispersal Habitat Baseline Post-Project Implementation	Percent Dispersal Habitat Removed
Applegate Watershed					
Williams IVM	27,979	0	2,288	27,979	0
Cow Upper Watershed					
West Fork Cow ROW	9,445	3	0	9,442	0.03
Rogue Middle Watershed					
Poor Luck	44,057	0	490	44,057	0
Total	**81,481**	**3**	**2,778**	**81,478**	**0.004**

[1] Dispersal habitat baseline reflects District-managed lands only.

Facilitation of spotted owl movements, in particular natal movements, have long been assessed at the landscape scale, and as being a function of the percent land cover in a minimum structural condition (for example the "50-11-40" rule, Thomas et al. 1990). Across the Action Area, approximately 64 percent of dispersal or better quality spotted owl habitat currently occurs on federal lands along with a large percentage of non-federal lands having similar habitat conditions (Table 6). Under the proposed action, three acres of dispersal-quality habitat will be lost. At the respective watershed and Action Area scale, the Service anticipates this amount of removal will be insignificant, and not likely to adversely affect spotted owls. This is because the Service believes the remaining amount and distribution of spotted owl habitats within the area should be sufficient for spotted owls to disperse and find the necessary resources (Forsman et al. 2002, Lint et al. 2005, Davis et al 2011b).

Effects to Spotted Owls

Collectively, the proposed action includes up to 8,083 acres of vegetation management, 6.45 miles of road construction and the re-alignment of one road segment (Table 1). Of the 8,083 proposed project acres, 4,324 acres occur within NRF habitat, with 91 percent or 3,930 acres, consisting of treat and maintain prescriptions and 394 acres of NRF downgrade. Approximately 2,781 acres of harvest and road construction is planned within dispersal-only habitat, of which all but three acres are planned treat and maintain prescriptions. The remaining 1,468 acres of proposed harvest (calculated using the data in Table 1) will not occur within any spotted owl habitat.

In planning the GPRA FY2012-13 project, the District has attempted to situate projects and develop prescriptions to avoid and minimize impacts to spotted owl sites but also to address forest health issues, which is essential to long-term sustainability of spotted owl habitat. Twenty seven known and five predicted spotted owl home ranges overlap proposed harvest units associated with the Poor Luck and Williams IVM projects (Table 11). Project implementation is anticipated to result in varied impacts to the affected sites. Overall, project activities (treat and maintain prescriptions) are largely planned for the outer portions of spotted owl home ranges, to a lesser extent in core-use areas, and nest patches of two predicted sites (Table 11). This spatial approach of treatments is meant to minimize impacts to spotted owls.

As mentioned above, the proposed action will downgrade 394 acres of NRF habitat. This harvest however will occur beyond the home ranges of currently known or predicted sites but in un-surveyed spotted owl habitat. To avoid and/or minimize potential adverse impacts to spotted owls, pre-project surveys will be conducted by the District in habitat associated with the Poor Luck project in the next two to five years, depending on the harvest schedule. If spotted owls are found during surveys, affected project units would be dropped or modified to reduce the amount of potential harm as a result of the proposed action. Although the proposed action may be modified depending on survey results, removal of NRF habitat ***may likely adversely affect*** spotted owls for reasons discussed below.

For the nearly all of the affected sites, proposed activities are not likely to adversely affect spotted owls (for reasons discussed in the Habitat section and below) (Table 11). However, a disproportionate amount of impacts is anticipated to the core area of site 3286O (Table 11). This is due to 253 acres of both NRF and dispersal type habitat being treated for a central place animal like the spotted owl (Roseburg and McKelvey 1999). This relatively large proportion of treatment in a spotted owl high use area (Bingham and Noon 1997) would likely negatively impact spotted owl prey species (see Prey Section below) and may cause avoidance of the area by spotted owls in the short-term. As a result, activities at this site ***may likely adversely affect*** spotted owls through reduced survival and reproduction.

The best available information indicates spotted owls need a certain amount of habitat within the various spatial scales comprising individual home ranges so as to provide the resources necessary to meet essential life functions (Thomas et al. 1990, Courtney et al. 2004). In general, as the amount of habitat in a spotted owl's home range decreases, so does site occupancy, reproduction and survival (Courtney et al. 2004). To assess the potential effects of habitat modification on spotted owls, the Service uses the home range, core-use area, and nest patch scales because of the spatial patterns exhibited by spotted owls (Thomas et al. 1990, USDI/USDA 2008, Bart and Forsman 1992, Bart 1995, Forsman et al. 2005, Rosenberg and McKelvey 1999, Meyer et al. 1998, Zabel et al. 2003, Franklin et al. 2000, Dugger et al. 2005, Swindle et al. 1997, and Perkins 2000).

Table 11. Habitat impacts associated with spotted owl sites for the GPRA FY 2012-13 Medford District BLM consultation (FWS Ref. #: 01EOFW00-2012-F-0103).

Site Number	Analysis Scale	Number of Acres NRF Habitat Treated and Maintained	Number of Acres Dispersal Habitat Removed	Number of Acres Dispersal Habitat Treated and Maintained	Effects Determination
Poor Luck					
0911O	Home Range	41	0	1	NLAA
	0.5 mile Core	0	0	0	
	Nest Patch	0	0	0	
0916B	Home Range	364	0	47	NLAA
	0.5 mile Core	112	0	0	
	Nest Patch	0	0	0	
0923A	Home Range	416	0	30	NLAA
	0.5 mile Core	27	0	12	
	Nest Patch	0	0	0	
0951A	Home Range	206	0	2	NLAA
	0.5 mile Core	36	0	0	
	Nest Patch	0	0	0	
0970O	Home Range	102	0	59	NLAA
	0.5 mile Core	77	0	0	
	Nest Patch	0	0	0	
1308A	Home Range	184	0	65	NLAA
	0.5 mile Core	47	0	0	
	Nest Patch	4	0	0	
1309O	Home Range	224	0	123	NLAA
	0.5 mile Core	2	0	5	
	Nest Patch	0	0	0	
2624O	Home Range	21	0	0	NLAA
	0.5 mile Core	0	0	0	
	Nest Patch	0	0	0	
3387O	Home Range	27	0	0	NLAA
	0.5 mile Core	0	0	0	
	Nest Patch	0	0	0	
3945O	Home Range	100	0	0	NLAA
	0.5 mile Core	26	0	0	
	Nest Patch	0	0	0	
40G	Home Range	35	0	123	NLAA
	0.5 mile Core	7	0	38	
	Nest Patch	0	0	10	
41G	Home Range	7	0	4	NLAA
	0.5 mile Core	0	0	0	
	Nest Patch	0	0	0	

Site Number	Analysis Scale	Number of Acres NRF Habitat Treated and Maintained	Number of Acres Dispersal Habitat Removed	Number of Acres Dispersal Habitat Treated and Maintained	Effects Determination
4407O	**Home Range**	161	0	43	NLAA
	0.5 mile Core	5	0	0	
	Nest Patch	0	0	0	
4515O	**Home Range**	22	0	0	NLAA
	0.5 mile Core	0	0	0	
	Nest Patch	0	0	0	
4624O	**Home Range**	96	0	106	NLAA
	0.5 mile Core	88	0	34	
	Nest Patch	0	0	0	
49G	**Home Range**	135	0	7	NLAA
	0.5 mile Core	0	0	0	
	Nest Patch	0	0	0	
West Fork Cow Creek ROW					
2236O	**Home Range**	0	3	0	NLAA
	0.5 mile Core	0	0	0	
	Nest Patch	0	0	0	
2663O	**Home Range**	0	3	0	NLAA
	0.5 mile Core	0	2	0	
	Nest Patch	0	0	0	
Williams					
0127O	**Home Range**	388	0	541	NLAA
	0.5 mile Core	2	0	40	
	Nest Patch	0	0	0	
0890A	**Home Range**	264	0	261	NLAA
	0.5 mile Core	70	0	50	
	Nest Patch	0	0	0	
0959O	**Home Range**	44	0	330	NLAA
	0.5 mile Core	37	0	0	
	Nest Patch	0	0	0	
111G	**Home Range**	167	0	659	NLAA
	0.5 mile Core	10	0	219	
	Nest Patch	0	0	36	
127G	**Home Range**	379	0	154	NLAA
	0.5 mile Core	48	0	28	
	Nest Patch	15	0	0	
2018O	**Home Range**	512	0	7	NLAA
	0.5 mile Core	25	0	0	
	Nest Patch	0	0	0	
2019O	**Home Range**	578	0	380	NLAA

Site Number	Analysis Scale	Number of Acres NRF Habitat Treated and Maintained	Number of Acres Dispersal Habitat Removed	Number of Acres Dispersal Habitat Treated and Maintained	Effects Determination
	0.5 mile Core	47	0	7	
	Nest Patch	0	0	0	
2066A	**Home Range**	182	0	40	NLAA
	0.5 mile Core	12	0	0	
	Nest Patch	0	0	0	
2066O	**Home Range**	201	0	60	NLAA
	0.5 mile Core	30	0	0	
	Nest Patch	0	0	0	
2402O	**Home Range**	239	0	55	NLAA
	0.5 mile Core	24	0	0	
	Nest Patch	0	0	0	
2633O	**Home Range**	72	0	66	NLAA
	0.5 mile Core	0	0	0	
	Nest Patch	0	0	0	
3286O	**Home Range**	897	0	473	LAA
	0.5 mile Core	147	0	106	
	Nest Patch	0	0	0	
3558O	**Home Range**	34	0	50	NLAA
	0.5 mile Core	0	0	0	
	Nest Patch	0	0	0	
4481O	**Home Range**	65	0	63	NLAA
	0.5 mile Core	0	0	0	
	Nest Patch	0	0	0	

Approximately 90 percent of the GPRA FY2012-13 proposed action includes prescriptions that will treat and maintain NRF (Table 9) and dispersal habitat (Table 10) and will affect less than one percent of the Action Area. In general, this prescription consists of light-to moderate thinning (as described above and in Appendix A) that takes into account the site-specific silvicultural needs of the stand and the retention of spotted owl habitat features.

While there are no experimental studies currently available relating spotted owl response to thinning, there are many observational accounts that provide support to a relationship of spotted owl use of thinned habitat. For example, Solis 1983, Forsman et al. 1984, King 1993, Anthony and Wagner 1998, Hicks et al. 1999, Lee and Irwin 2005, Irwin et al. 2008 and 2010 and Irwin et al. 2011 observed that spotted owls used younger and older forest that were lightly thinned. Some of these same studies indicated that spotted owls did not vacate their home ranges and generally foraged within thinned forest stands on Bureau of Land Management Lands in southwest Oregon (Irwin et al. 2008 and 2010). In contrast, a case study conducted by Meiman

et al. (2003) did show potential negative effects due to heavy thinning of dispersal and/or foraging quality habitat to one owl that was radio-tracked in the Oregon Coast Range.

Based on the available spotted owl literature along with implementation of site specific prescriptions, the Service anticipates that the light thinning of 3,930 acres of NRF habitat and 2,778 acres of dispersal-only habitat will continue to function post as it did pre-treatment. Accentuating factors include that that no potential spotted owl nest trees will be removed and thinning activities are not planned in higher quality spotted owl habitat (i.e., Recovery Action 32 type habitat; USDI FWS 2011) (see Recovery Plan section below). Because of these factors the Service has determined implementation of the aforementioned activities *may affect, but are not likely to adversely affect* spotted owls.

Road Construction – West Fork Cow Creek ROW

Up to three acres of dispersal-only habitat removal is planned (2.7 acres on private land and 0.3 acres on District-managed lands) within the home range of known spotted owl sites (2236O and 2663O) (Table 11). Dispersal habitat removal within the home range and core area of these two sites may affect, but is *not likely to adversely affect* spotted owls because the removal is relatively small in scale and no NRF habitat will be affected. For example, 324 acres of NRF habitat is within the core area, which well above the guidance of 50 percent of habitat (USDI/USDA 2008). In addition, the road location is surrounded by dispersal habitat. Therefore, since the site does not appear to be in a NRF habitat deficit at the essential core-use area scale, it is less likely that removal of dispersal habitat from this situation would be an adverse effect to spotted owls.

Project Specific Effects to Individual Spotted Owl Sites

Poor Luck

The Poor Luck project occurs within the home ranges of 13 historic and three predicted spotted owl sites (Table 11). Proposed treatments will maintain NRF habitat at the home range and core scales of all affected spotted owl sites.

Site 1308A

Treatments which will maintain NRF habitat are planned on the upper 1/3 of a slope within the nest patch of this site, affecting approximately 5.7 percent of foraging habitat (sub-set of the NRF habitat described above) in the nest patch. Potential harm is not expected because:

- The proposed action would retain sufficient amounts of thermal and hiding cover as well as retain foraging habitat post treatment. Nesting habitat and habitat within riparian areas and main drainages within the nest patch were omitted from proposed treatment. The resource area field biologist has determined the proposed treatments are designed to maintain the current condition of the stand within the nest patch.
- Fifty-three acres of the total 57 NRF within the nest patch would not be treated.
- Infrequent past surveys have detected both spotted owls and most recently barred owls. Protocol surveys will be conducted in the next two to five years, depending on the harvest

schedule, to determine occupancy. If spotted owls are found during surveys, the District plans to drop the unit affecting this nest patch.

Site 40G - Approximately 10 acres of light-thinning treatments will maintain dispersal habitat within the nest patch of this predicted spotted owl site. Adverse affects are not expected because removal or downgrading of NRF or dispersal habitat will not occur within the nest patch and the District plans to complete pre-project protocol surveys to determine occupancy in the next two to five years, depending on the harvest schedule. If spotted owls are detected during surveys, the District plans to drop the unit affecting this predicted site so as to avoid and/or minimize harm to spotted owls.

Surveys in Un-surveyed NRF Habitat Associated with the Poor Luck Project

The District plans to implement activities which will result in the downgrade of up to 394 acres of NRF habitat, which occurs beyond any known or predicted spotted owl home ranges. In the opinion of District biologist, given what is known of nearest-neighbor distances between spotted owl sites, along with a habitat assessment, it is unlikely that spotted owls occupy this un-surveyed area. This view is also supported by opportunistic surveys of the area by the Klamath Demography study area which have yielded no responses. However, to more conclusively determine spotted owl occupancy of the area, pre-project surveys will be conducted by the District in the next two to five years, depending on the harvest schedule. If spotted owls are found during surveys, affected project units would be dropped or modified to reduce the amount of potential harm as a result of the proposed action.

Williams IVM:

The Williams project is within the home ranges of 12 historic owl sites and 2 predicted sites. NRF habitat will not be removed or downgraded and dispersal habitat will not be removed within the home ranges or core areas of these 14 sites.

Site 127G - Approximately 15 acres of NRF maintain treatments are planned to occur within the nest patch of this site, affecting 21 percent of the nest patch. Potential harm is not expected because:

- The proposed 15 acres of NRF maintenance treatments are planned in an area that falls within lower habitat quality on the USFWS Relative Habitat Suitability model (USDI FWS 2011), which is generally considered an indicator that spotted owls are unlikely to nest in a particular location due to abiotic factors such as slope, aspect, and elevation.

- 2012 will be the third year of protocol surveys to determine spotted owl site occupancy pre-project. Surveys will be continued during the next two to five years, depending on the harvest schedule, to determine occupancy. If spotted owls are found during surveys, the District plans to drop the project unit affecting this nest patch.

Site 111G – According to the Assessment, this predicted spotted owl site is located on private land immediately adjacent to BLM lands. Currently, no NFR habitat occurs in the 300 meter nest patch (USDI/USDA 2008). The District plans to implement a light-thinning prescription which would maintain dispersal habitat on up to 36 acres within the nest patch. In addition, 10

acres of NRF and 219 acres of dispersal habitat would be treated within the core area, affecting 62 percent of the available NRF and Dispersal habitat. Potential harm to spotted owls is not anticipated because:

- Field evaluations indicate insufficient amounts of NRF habitat exist at this location to support nesting spotted owls. In addition, District biologists believe it is unlikely that there is enough exiting NRF habitat at the home range scale to support nesting spotted owls, as only 13 percent of the home range currently consists of NRF habitat.
- Conservation measures specific to the Williams project indicate that generated site areas will be surveyed and if spotted owls are located, the units would be modified to reduce effects (Appendix B).
- The home range of this predicted site does show potential long term viability, since over half of the home range occurs in modeled high suitability habitat (USDI FWS 2011). However, any future improved habitat contribution would likely only occur on federal lands within the home range of this predicted site. Planned treatments which maintain NRF and dispersal habitats in existing young forest stands have the potential to provide long term benefits by opening the stands, and providing for the development of horizontal and vertical structural diversity.

Site 3286O **-** Light-thinning prescriptions which would treat and maintain up to 147 acres of NRF and 106 acres of dispersal habitat within the core area of this site. Even though these would not remove NRF or dispersal habitat, the proposed treatments are likely to adversely affect (LAA) spotted owls and potentially cause harm because:

- Treatments would simplify 253 acres (84 percent) of existing NRF and dispersal stands within the 0.5 mile core scale and would reduce the quality and amount of prey habitat within the core area. The large percentage of NRF and dispersal treatment within the core area would negatively affect prey availability, which in turn has the potential to negatively impact spotted owl survival and reproduction.
- Surveys have been limited at this site in the past several years, but a spotted owl pair is known to have successfully reproduced at this site. The amount of habitat within the home range has not significantly changed since the last surveys and without recent survey data, this site is assumed to be occupied.

West Fork Cow Creek ROW – see discussion above

Summary of Effects to Spotted Owls

Table 11 summarizes that most of the proposed action provides for treatments that will not likely adversely affect spotted owls. However, a smaller portion of proposed activities could have adverse effects to spotted owls due to habitat removal and a disproportionate amount of thinning to the core area of one spotted owl site.

Spotted Owl Recovery Plan

The Revised Recovery Plan for the Northern Spotted Owl (USDI FWS 2011) includes two recovery actions particularly relevant to this consultation, specifically Recovery Actions 10 and 32. In applying the recommendations, the District has taken a reasonable approach to locate and configure the proposed action so as to minimize impacts to spotted owls.

Recovery Action 10

Conserve spotted owls sites and high value spotted owl habitat to provide additional demographic support to the spotted owl population.

The Service's interim guidance recommends conserving occupied spotted owl sites to help maintain spotted owl demographic support. While the District proposes to downgrade up to 394 acres of NRF habitat associated with the Poor Luck project, these project acres occur beyond the boundary of any known spotted owl sites, as well as in an area of limited spotted owl habitat capable of supporting a new spotted owl territory, thereby reducing potential negative impacts to spotted owls. Other portions of the proposed action intend to restore and increase forest resiliency at the stand level, as encouraged by this action. However, these activities lack a comprehensive landscape context whereby long-term benefits to the ecosystem and spotted owls can be meaningfully evaluated, as recommended.

Recovery Action 32

Because spotted owl recovery requires well distributed, older and more structurally complex multi-layered conifer forests on Federal and non-federal lands across its range, land managers should work with the Service as described below to maintain and restore such habitat while allowing for other threats, such as fire and insects, to be addressed by restoration management actions. These high- quality spotted owl habitat stands are characterized as having large diameter trees, high amounts of canopy cover, and decadence components such as broken-topped live trees, mistletoe, cavities, large snags, and fallen trees.

District biologists conducted on-the-ground investigations to identify forest stands that meet the characteristics of older and more structurally complex, multi-layered conifer forests as defined in RA 32(USDI FWS 2008b and 2011), utilizing an interagency, interdisciplinary inventory methodology (USDI BLM/USDA FS 2010). According to the Assessment, no stands that meet RA 32 criteria occur within proposed harvest units.

Effects to Spotted Owl Prey

Effects to spotted owl prey species, such as woodrats, northern flying squirrels and a host of small mammals, which are the primary prey of spotted owls in the action area (Forsman et al. 2004), are reasonably certain to occur due to the implementation of the proposed action. However, quantifying those impacts is somewhat problematic due to limited information on prey species abundance for the action area. Studies have shown variations of prey availability across different stands within the range of the spotted owl, which is likely reflected in the action area as well.

Specific to the Poor Luck project, up to 394 acres of NRF habitat will be downgraded due to timber harvest activities. These treatments are expected to have both short-term and long-term negative effects on northern flying squirrels because of significant changes to the habitat structure (i.e., reduction in tree densities) and the reduction of the existing canopy cover within the treatment areas. Other mammalian (e.g. mice, woodrats) and avian secondary prey species may respond positively to the new forest openings, or to the newly-created ecological edges. It remains to be seen if these units will be harvested due minimization measures that would be implemented if spotted owls are located during pre-project surveys. The removal of this habitat and associated prey could adversely affect spotted owls due to removal of foraging opportunities along with the potential loss of reproductive output because of the loss of large prey (see Ward 1990). Some studies though, have shown spotted owls will forage along these forest ecotones (e.g., Solis 1989) which may have high abundances of some prey species.

Most of the GPRA FY 2012-13 proposed action is comprised of prescriptions that treat and maintain habitat. The available literature on thinning impacts to spotted owl prey species provides varied results. For example, some reports suggest negative (and sometimes persistent long-term) impacts of thinning on flying squirrels (Manning et al. 2011, Wilson 2010, Holloway and Smith 2011), there is also some counter information as to these effects (e.g., Gomez et al. 2005, Ransome et al. 2004, Waters and Zabel 1995). Carey (2000) found lower abundances of flying squirrels in recently-thinned (within 10 years) stands in Washington than in stands that were clear-cut 50 years prior to the study, with retention of both live and dead trees. Carey (2000) attributed his results to the apparently negative effects of commercial thinning on canopy connectivity, downed wood and truffle communities in the area. While an emphasis on developing mid-story tree layers is critical if the goal is to accelerate late-seral conditions and promote prey for spotted owl, the length of time between thinning and recovery of flying squirrel habitat suitability in young stands is likely 30 years or more (Wilson 2010).

Wilson (2010) suggests a few considerations to reduce short-term effects to flying squirrels while trying to create more forest complexity that would benefit them in the long-term. The proposed action incorporates some of these features:

- retention of existing large decadent trees and snags;
- retention of no-treatment areas (e.g., “skips” and no treatment buffers in Riparian Reserves) to provide travel corridors from adjacent late seral habitats and across the landscape;
- retention of a range of tree size classes throughout the stand;
- improvement of foraging opportunities by promoting the development of understory and shade-tolerant tree species throughout the stand; and
- maintenance of canopy cover within the stands (e.g., lightly thinned areas) which would provide protective cover from predators, as well as provide a tree density that allows squirrels to adequately glide between trees and move through a stand in order to access foraging areas.

Woodrats, both bushy-tailed and dusky-footed (*Neotoma cinerea* and *N. fuscipes*) are important components of the spotted owls’ diet in the action area (Forsman et al. 2004). Mixed results

have also been reported in studies that examined effects of thinning on woodrats. Dusky-footed woodrats occur in a variety of conditions, including both old, structurally complex forests and younger seral stages, and are often associated with streams (Carey et al. 1992, 1999, Williams et al. 1992, Sakai and Noon 1993, Hamm and Diller 2009). Research has suggested that thinning or associated practices (*e.g.*, burning slash piles) could be detrimental to dusky-footed woodrats if it reduces hardwoods, shrubs or downed wood, yet treatments could ultimately benefit woodrats if they result in growth of shrubs or hardwoods (Williams et al. 1992, Innes et al. 2007, Sakai and Noon 1993, Suzuki and Hayes 2003). Thinning that reduces availability of snags, downed wood or mistletoe could negatively impact bushy-tailed woodrat populations (Lehmkuhl et al. 2006a). A study of dusky-footed woodrats in the redwood region of California, however, did not find an association between abundances of woodrats and different intensities of commercial thinning (Hamm and Diller 2009).

According to the Assessment harvest prescriptions of treat and maintain NRF and dispersal habitats were designed to help reduce any negative effects to spotted prey species by incorporating untreated pockets (leave "islands" or "skips") throughout the treatment areas, with a goal of one acre left untreated for every six or seven acres treated (or approximately 15 percent). This strategy is expected to provide un-altered portions of the stand throughout the action area that have the potential to serve as refugia for spotted owl prey species during project implementation. Prescriptions also require the retention of existing snags and coarse wood, which are also key habitat elements for many prey species. The retention of these features should further reduce any negative affects to spotted owl prey species.

Treatment implementation would be temporally and spatially distributed within the action area, which should provide areas for spotted owls to forage during project implementation and reduce the impact of these short-term effects at the project level. The application of mandatory PDC and normal operating procedures applied by the District are expected to reduce impacts to the extent possible, while still facilitating tree harvest and other projects. The treatment areas are small enough and dispersed enough that many resident prey species could move to adjacent patches until affected stand recover.

Effects to Spotted Owls due to Disturbance

As described in the Status of the Species section of this Opinion, the effects of noise on spotted owls is largely unknown. Although information specific to behavioral responses of spotted owls to disturbance is limited, research indicates helicopter overflights can reduce prey delivery rates to nests (Delaney et al. 1999). Additional effects from disturbance, including altered foraging behavior and decreases in nest attendance and reproductive success have been reported for other raptors (White and Thurow 1985, Andersen et al. 1989, McGarigal et al. 1991).

Spotted owls may also respond physiologically to a disturbance without exhibiting a significant behavioral response. In response to environmental stressors, vertebrates secrete stress hormones called corticosteroids (Campbell 1990). Although these hormones are essential for survival, extended periods with elevated stress hormone levels may have negative effects on reproductive function, disease resistance, or physical condition (Carsia & Harvey 2000, Saplosky et al. 2000). In avian species, the secretion of corticosterone is the primary non-specific stress response

(Carsia & Harvey 2000). The quantity of this hormone in feces can be used as a measure of physiological stress (Wasser et al. 1997). Recent studies of fecal corticosterone levels of spotted owls indicate that low intensity noise of short duration and minimal repetition does not elicit a physiological stress response (Tempel & Gutiérrez 2003, Tempel & Gutiérrez 2004). However, prolonged activities, such as those associated with timber harvest, may increase fecal corticosterone levels depending on their proximity to spotted owl core areas (see Wasser et al. 1997, Tempel & Gutiérrez 2004).

According to the Assessment, the District plans to incorporate Mandatory PDC (Appendix B) in all activities included in the proposed action. Mandatory PDC include implementing activities outside of the spotted owl breeding season, as well as beyond recommended disturbance distance thresholds. Therefore, the District has determined there will be no effect to spotted owls as a result of the implementation of the activities included in the proposed action.

Climate Change

Various types of changes in climate can have direct or indirect effects on species. These effects may be positive, neutral, or negative and they may change over time, depending on the species and other relevant considerations, such as the effects of interactions of climate with other variables (e.g., habitat fragmentation) (IPCC 2007, pp. 8–14, 18–19). For the southern portion of the spotted owl's range, such as the location of the action area, climate models have provided a series of projections. For example, annual temperatures are likely to increase up to three degrees in the next couple of decades. Total precipitation may remain roughly similar to historic levels but likely increasing in the fall and winter months. Rising temperatures will cause snow to turn to rain in the lower elevations. As a result, the area is likely to experience more severe storm events, variable weather, higher and flashier winter and spring runoff events and increased flooding. Reduced snowpack and soil moisture along with hotter temperatures and longer fire seasons likely will increase significantly (Doppelt et al. 2008).

While a change in forest composition or extent is likely as a result of climate change, the rate of that change is uncertain. In forests with long-lived dominant tree species, mature individuals can survive these stresses, so direct effects of climate on forest composition and structure would most likely occur over a longer time scale (100 to 500 years) in some areas than disturbances such as wildfire or insect outbreaks (25 to 100 years) (McKenzie et al. 2009).

The presence of high-quality habitat may buffer the negative effects of cold, wet, springs and winters on survival of spotted owls as well as ameliorate the effects of heat. This habitat might help maintain a stable prey base, thereby reducing the cost of foraging during the breeding season when energetic needs are high (Franklin et al. 2000).

Although the scientific literature has explored the link between climate change and the invasion by barred owls, changing climate alone is unlikely to have caused the invasion (Livezey 2009). In general, climate change can increase the success of introduced or invasive species in colonizing new territory. Invasive animal species are more likely to be generalists, such as the barred owl, than specialist, such as the spotted owl and adapt more successfully to a new climate than natives.

Recovery implementation for spotted owls should, whenever feasible, look for opportunities where managing for spotted owl habitat also meets other societal priorities concerning climate change. Several actions are proposed for this project that may mitigate for climate change. For example, the project includes prescribed burning which will alleviate fire risk in the short-term. Older forest is being protected along with management for a broad spectrum of seral stages. This suite of management actions may help toward providing for ecosystem function and genetic diversity over the long-term. At this point though, it is unclear, what role, if any, Federal and State forest lands will ultimately play in mitigating climate change.

Effects to Critical Habitat

Portions of projects included in the proposed action occur within 2008 designated critical habitat, as well as within 2012 proposed critical habitat for the spotted owl. An analysis of anticipated effects to both is included below. The habitat impacts included in this section represent a subset of the total habitat impacts described in the Effects to NRF and Dispersal-only habitat sections above.

2008 Designated Critical Habitat

Portions of the Poor Luck project are planned to occur within the Rogue Umpqua critical habitat unit (CHU 14). All proposed treatments within this CHU were designed to maintain the primary constituent elements of nesting, roosting, foraging and dispersal for spotted owls. Proposed treatments in this CHU include treating and maintaining up to 254 acres of NRF habitat as well as treating and maintaining up to 109 acres of dispersal habitat. Because the District has planned activities within this CHU to maintain spotted owl habitat and therefore provide for the intended function of inter-provincial connectivity, implementation of the portions of the Poor Luck project that occur within CHU 14 may affect, but are not likely to adversely affect critical habitat.

2012 Proposed Critical Habitat

The proposed rule (USDI FWS 2012) recommends that the evaluation of actions that may affect critical habitat for the northern spotted owl for purposes of completing the section 7(a)(2) analysis for the destruction or adverse modification determination should consider the effects of the action on the factors that were the basis for determining the area to meet the definition of critical habitat. Thus when conducting section 7 consultations, factors to consider may include, but are not limited to:

- The extent of the proposed action, including its temporal and spatial scale, relative to the critical habitat subunit within which it occurs.
- The specific purpose for which that subunit was identified and designated as critical habitat.
- The impact of the proposed action on the subunit's likelihood of serving its intended conservation function or purpose.
- The overall consistency of the proposed action with the intent of the recovery plan or other landscape-level conservation plans.

The proposed rule (USDI FWS 2012) indicates that the Physical and Biological Features (forested areas providing nesting, roosting, foraging and dispersal habitats [PBFs]) and the primary constituent elements (nesting, roosting, foraging and dispersal habitats habitat [PCEs]) are essential to the conservation of the species and form the foundation of critical habitat.

Based on current research on the life history, biology, and ecology of the northern spotted owl and the requirements of the habitat to sustain its essential life history functions, the Service has identified the following primary constituent elements (PCEs) for the spotted owl (USDI FWS 2012):

1) Forest types that may be in early, mid, or late-seral states and support the spotted owl across its geographical range.
2) Habitat that provides for nesting and roosting (NR).
3) Habitat that provides for foraging (F), which varies widely across the northern spotted owl's range.
4) Habitat to support the transience and colonization phases of dispersal, which in all cases would optimally be composed of nesting, roosting, or foraging habitat (PCEs (2) or (3)), but which may also be composed of other forest types that occur between larger blocks of nesting, roosting, and foraging habitat.

The question to address when evaluating impacts to proposed critical habitat as described in the proposed rule is: how does the proposed action affect the ability of the critical habitat PBFs and PCEs, at the spatio-temporal scale under consideration, to provide for life history functions it is currently supporting (nesting, roosting, foraging, and/or dispersing). More specifically, does the proposed action have a measureable impact on the ability of the landscape, in this case a 500 acre radius scale, to provide for the life history function of the spotted owl post-project as it did pre-project?

Temporal and Spatial Extent

Within the proposed critical habitat designation, a total of 316 acres of spotted owl NRF habitat will be downgraded due to the implementation of variable density thinning and density management prescriptions. The number of trees per acre will be reduced and overall canopy closure will be reduced below 60 percent. As a result, edge effects, increased risk of predation and a decrease in prey species habitat will likely limit the habitat suitability of residual forest stands.

In addition to the downgrade of up to 316 acres of NRF habitat, the proposed action includes activities that will treat and maintain 2,490 acres of NRF habitat as well as treat and maintain up to 1,537 acres of dispersal habitat. It is anticipated that these treatments will be implemented in such a manner as to retain the existing function of the affected stands post-project. Implementation of the West Fork Cow Creek ROW is expected to result in the removal of up to 0.3 acres of dispersal habitat within designated critical habitat.

Purpose of Sub-Unit KLW 1

This subunit is expected to function primarily for east-west connectivity between subunits and Critical Habitat Units, but also for demographic support. This subunit facilitates spotted owl movements between the western Cascades and coastal Oregon.

Impact of proposed action on the subunit's likelihood of serving its intended conservation function or purpose.

Facilitation of spotted owl movements at the landscape scale have long been assessed as being a function of the percent land cover in a minimum structural condition (for example the "50-11-40" rule, Thomas et al. 1990 or see Lint 2005 and Davis et al. 2011a). Approximately 41 percent dispersal or better quality spotted owl habitat currently occurs across the 1,309,627 acre analysis area. Under the proposed action, 316 acres of NRF habitat will be converted to dispersal-only habitat, resulting in a net increase in the amount of available dispersal habitat. In addition to this conversion of NRF to dispersal habitat, the proposed action includes treating and maintaining up to 1,024 acres of NRF habitat and treating and maintaining up to 340 acres of dispersal habitat. As for the demographic support function of the Unit and Sub-unit, we believe this is comprised of, and assessed by, examining spotted owl demographic parameters such as maintaining site occupancy and habitat-fitness. Previous analyses herein indicate that affected spotted owl sites will retain sufficient amounts of NRF habitat to maintain high likelihood of continued occupancy, or those sites currently below target levels of NRF habitat will not experience any further loss of this habitat due to implementation of the proposed action. Therefore, the Service believes that occupancy and habitat-fitness levels of spotted sites in the action area will not be changed to an extent that any currently occupied sites will be abandoned or that current fitness levels will be significantly decreased.

Purpose of Sub-Unit KLW 4

This subunit is expected to function primarily for north-south and east-west connectivity between subunits and Critical Habitat Units, but also for demographic support. This subunit facilitates spotted owl movements between the western Cascades and coastal Oregon.

Impact of proposed action on the subunit's likelihood of serving its intended conservation function or purpose.

The proposed action includes the removal of up to 0.3 acres of dispersal habitat within this critical habitat sub-unit, which represents 0.0016 percent of the 61,781 acres of dispersal habitat in the sub-unit within the Applegate watershed (Table 6). This insignificant impact is not expected to reduce the ability of spotted owls to move across the affected sub-unit.

Consistency with the Northern Spotted Owl Recovery Plan

According to the Assessment, the District is directed to manage their lands consistent with approved federal recovery plans for threatened and endangered species. The Revised Recovery Plan (USDI FWS 2011) included four Recovery Criterion and 33 Recovery Actions, of which three Recovery Actions are most applicable to the Secretarial Pilot Project.

Recovery Action 10

Conserve spotted owls sites and high value spotted owl habitat to provide additional demographic support to the spotted owl population.

The proposed action occurs within the home ranges of 27 known and 5 predicted spotted owl sites (Table 11); however, post-harvest all sites will retain the existing amounts of NRF habitat. As noted above, all NRF habitat downgrade will occur beyond the boundaries of any known or predicted spotted owl sites, representing a reasonable approach to locate and configure the harvest units so as to minimize impacts to spotted owls while also meeting the District's other resource management objectives.

Recovery Action 32

Because spotted owl recovery requires well distributed, older and more structurally complex multi-layered conifer forests on Federal and non-federal lands across its range, land managers should work with the Service as described below to maintain and restore such habitat while allowing for other threats, such as fire and insects, to be addressed by restoration management actions. These high- quality spotted owl habitat stands are characterized as having large diameter trees, high amounts of canopy cover, and decadence components such as broken-topped live trees, mistletoe, cavities, large snags, and fallen trees.

The District uses an interagency developed methodology (USDI BLM/USDA FS 2010) for the identification of forest stands that would meet the definition of RA 32. Forest stands that meet the definition of RA 32 are not included in the proposed action.

Beneficial Effects to Proposed Critical Habitat

The following beneficial effects may be realized as a result of implementation of the proposed action:

- Very dense stands will be opened by thinning, thereby improving the ability for spotted owls to disperse within these stands.
- Thinning stands that currently provide poor quality dispersal habitat will improve the dispersal function for spotted owls by providing more "flying space," and encouraging residual trees to develop more size and structural diversity.
- The quality of spotted owl foraging habitat in treated stands may improve in response to the relatively more open structure of the treated stands.

In summary, based upon the analysis described in the Effects section above, we believe that that the downgrade of up to 316 acres of NRF habitat and the removal of 0.3 acres of dispersal habitat within proposed spotted owl critical habitat will have a measureable reduction in spotted owl life history functions at the 500 acre scale and therefore may affect and is likely to adversely affectproposed critical habitat. This measurable reduction is due to the quantity of habitat lost, reduced prey availability, and edge effects. However, implementation of the proposed action is not anticipated to appreciably reduce the conservation value of the sub-unit or Unit scale for spotted owls unit. As a result, the Service concludes that the project will not result in destruction or adverse modification of proposed critical habitat (see additional analysis Appendix D).

A Review of Combined Effects of the Action to the Spotted Owl

Implementation of the proposed action may have adverse effects to spotted owls because it will result in the downgrade of up to 394 acres of NRF habitat, 316 acres of which occur within proposed critical habitat for the spotted owl (USDI FWS 2011). The West Fork Cow Creek road realignment project will result in an insignificant removal of 0.3 of dispersal habitat. All other treatment acres are planned to maintain the function of NRF and dispersal habitats.

CUMMULATIVE EFFECTS

Cumulative effects include the effects of future state, tribal, local or private actions that are reasonably certain to occur within the action area considered in this Opinion. Future federal actions which are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

According to the Assessment, state and private lands within the action area support marginal habitats for the spotted owl, and do not notably contribute to the viability of this species, given the management practices on those lands. Portions of these lands do not currently provide any habitat. Habitat conditions on these lands are not expected to improve significantly within the foreseeable future.

Cumulative effects to spotted owls are likely to continue in the future within the action area. To date, the Oregon Forest Practice Rules have not adopted any regulations that specifically provide protection to spotted owls, other than a 70-acre nest site protection. Implementation of timber harvest activities that may occur on non-federal lands in the action area have the potential to adversely affect individual spotted owl home ranges by further reducing the amounts of spotted owl NRF habitat at the nest patch, core or home range scales. While Table 6 displays information regarding the amounts of spotted owl habitat that exists on non-federal lands within the affected watersheds, no mechanism exists to track the timing and extent of spotted owl NRF or dispersal habitat removal on non-federal lands. Based on the above, private lands do not currently, and are not expected in the future to contribute significantly to the recovery of spotted owls.

CONCLUSION

The proposed action is expected to adversely affect spotted owls. However, after reviewing the current status of the spotted owl, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the Service's Biological Opinion that the District's proposed action, *is not likely to jeopardize* the continued existence of the spotted owl. The Service reached this conclusion because the action area is expected to continue to fulfill its role in the survival and recovery of the spotted owl for the following reasons:

- No harvest will occur in the Late Successional Reserves (USDA FS/USDI BLM 1994a) and NWFP Standards and Guidelines will be followed.
- NWFP dispersal connectivity among the reserves is anticipated to continue its function.

- The District plans to evaluate all proposed harvest units to identify any forest stands that meet RA 32 characteristics (USDI FWS 2011), and will avoid harvest activities in forest stands that meet the intent of RA 32.
- Proposed projects will not occur within Known Spotted Owl Activity Centers (KSOAC). KSOAC are the best 100 acres of habitat at spotted owl activity centers that were documented as of January 1, 1994, and are managed as Late Successional Reserves. (USDA FS/USDI BLM 1994a).
- No harvest units will occur within the nest patch of any historic spotted owl sites.
- If the District locates newly detected spotted owl sites during project related surveys, the District plans to modify the project to avoid adverse effects.

In addition, the Service has concluded implementation of the proposed action is not likely to destroy or adversely modify areas currently designated (USDI FWS 2008) or proposed for designation as revised critical habitat for spotted owls based on the rationale provided above.

We anticipate these measures will provide for sufficient habitat conditions aiding spotted owl survival and recovery.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act, provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

Amount or Extent of Take

The Service does not anticipate nor authorize the incidental take of spotted owls due to the implementation of the proposed action. While 394 acres of NRF habitat will be downgraded due to the implementation of timber harvest activities included in the Poor Luck project, these specific treatment acres occur beyond the home ranges of any known or predicted spotted owl sites but in unsurveyed habitat. To determine occupancy of the Poor Luck project area, pre-projects protocol surveys for spotted owls will be conducted by the District. If spotted owls are located during the surveys, project units will be reevaluated so as to avoid and/or minimize impacts to spotted owls and to not cause harm as a result of the proposed action.

Effect of Take

None

Reasonable and Prudent Measures

No reasonable and prudent measures, other than a monitoring requirement, are set forth below, because the PDC were developed as part of the proposed action and include adequate measures to minimize the impacts of anticipated take on the spotted owl.

Terms and Conditions

The District shall monitor the extent of habitat affected by the proposed actions to ensure that those effects are consistent with description of the proposed action, the effects analysis, and incidental take limits presented herein. The District shall conduct that monitoring and report the results to the Service as described below:

This consultation incorporates annual monitoring of projects that have adverse effects to listed species. The Level 1 Team has agreed to use a Project Implementation and Monitoring Form developed by the Service, most recently updated in March 2004 (Appendix C). The District will report all projects for which the District has reached an effects determination of "likely to adversely affect" listed species for the preceding fiscal year to the Service by November 31 of that year, unless otherwise scheduled by Level 1 Team agreement.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

The Service believes the following conservation action would reduce the impact of the proposed action on the spotted owl within the action area:

1. As needed, the District is encouraged to discuss updated survey information with the Service for interpretation of site status.

2. In order for the Service to be kept informed of actions that minimize or avoid adverse effects or benefit listed species or their habitats, the Service requests notification regarding the implementation of any conservation recommendation. More specifically, the Service requests annual meetings with the District to discuss progress on implementation of the conservation measures as described in Appendix A of this Opinion.

MONITORING

According to the District, Timber sales are administered by an Authorized Officer and Contract Administrator. All other contracts are administered at the local level by Contracting Officer Representatives (CORs) and Project Inspectors (PI) throughout implementation until the project work is completed, or implemented by District staff. Timber sales also have a contract clause (E-4) that authorizes stop work when threatened or endangered species are found within the timber sale or to comply with court orders. When (and if) a spotted owl or other listed species is found in the project area, the District is authorized to stop the work until the issue is evaluated further. If a spotted owl is found, biologists will review PDCs and the appropriate consultation document to confirm the Endangered Species Act analysis remains valid.

If the spotted owl (or other listed species) was not analyzed in the Biological Assessment, if the project area changes from what was originally analyzed in the Biological Assessment, if a site has moved, or other information is inconsistent with what is authorized, the District coordinates with project proponents, contractors, managers, local biologists and the Level 1 Team to ensure the project impacts remain consistent with the Biological Assessment and the responding consultation document (biological opinion or letter of concurrence). If not, the project will remain stopped until the district implements one or more of the following:

- Modify the proposed action to ensure that impacts remain as described in the consultation documents;
- Impose seasonal protection (if necessary);
- Re-initiate consultation.

REINITIATION NOTICE

This concludes formal consultation on the proposed action outlined in your Assessment. As provided in (50 CFR § 402.16), re-initiation of consultation is required where discretionary federal agency involvement or control over the action has been maintained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded, and in this case, the take limit and project limit of effects are coextensive and expressed in terms of habitat; (2) new information reveals effects of the agencies' action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending re-initiation of formal consultation. This Opinion and the associated Incidental Take Statement are valid for activities included in the proposed actions that are completed prior to October 1, 2022.

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APPENDIX A: DETAILED TREATMENT TYPES AND PROJECT DESCRIPTIONS (COPIED FROM THE ASSESSMENT).

Detailed Project Descriptions

Poor Luck

Current conditions:
The Poor Luck Vegetation project will treat 1,982 acres of NRF habitat, 490 acres of dispersal habitat, and 119 acres of capable habitat. The stands are approximately 30 - 150 years old, with some inclusions up to 190 years old. Forest stands in the Poor Luck project area are Mixed Evergreen and Mixed Conifer. Douglas-fir is the primary conifer in the Mixed Evergreen stands, and ponderosa pine is the primary overstory conifer species in the Mixed Conifer stands with Douglas-fir comprising the majority of the conifer stems. Sugar pine and incense cedar, and madrone, chinquapin, tanoak, canyon live oak, rhododendron, and salal are common tree and shrub species. Most stands in the project area natural stands and have had frequent fire disturbance.

Project description:
The Poor Luck project combines dry and moist forest restoration treatments as described in the *Restoration of Federal Forests in the Pacific Northwest: Strategies and Management Implications* (Johnson and Franklin 2009) with Relative Habitat Suitability (MaxEnt) modeling described in the *2011 Revised Recovery Plan for the Northern Spotted Owl* (USDI FWS 2011), and maintaining habitat function with known spotted owl territories. Treatments proposed would maintain NRF and dispersal habitat, within the 0.5 mile core areas and home range of documented spotted owl sites. NRF habitat would not be downgraded or removed within known owl home ranges. RA 32 surveys will be done prior to implementation of the Poor Luck project. No harvest activities will occur in RA 32 stands, although yarding corridors or skid roads may occur if they would ensure the RA 32 characteristics would be maintained following treatment. Approximately 363 acres of this project are within the 2008 designated Critical Habitat Unit #14 (Rogue Umpqua).

Poor Luck Treatment Descriptions

Timber

Variable Density Thinning *(Douglas-fir Series)*
The objective is to increase landscape resiliency to environmental disturbances (i.e. fire, insects, disease, and climate change). Removing smaller trees and some co-dominant trees and vegetation that compete with the dominant and other co-dominant trees for nutrients and water would reduce stand densities. Sugar pine, ponderosa pine, incense cedar, and Douglas-fir would be favored, respectively, for retention to encourage the maintenance and establishment of fire resilient species. All trees 150 years or older and all of the largest hardwoods would be retained. Leaving small un-thinned patches and creating small openings would achieve structural diversity within stands. Un-thinned patches and modified small openings would range in size from 0.25 to 1 acre while maintaining spotted owl habitat functions within treatment units that occur within spotted owl core and home range areas. In areas with dominant fire resilient trees such as pine, oak, incense cedar, selected trees would be cleared around, removing smaller trees (principally

fir) around them to a distance of approximately 40 feet achieving treatment areas from 0.25 acres to approximately 1 acre, with similar untreated areas within the same treatment units, and retain ≥60 percent canopy at the unit treatment area. Approximately 15 percent of the project area contains dry-site vegetation characteristics and treatment areas up to 1 acre would not exceed 15 percent of a treatment unit within owl home ranges. Treatments of units outside of spotted owl home ranges may downgrade NRF habitat and maintain dispersal function at the unit and stand level.

Treatment units would average 60 percent canopy cover or greater in NRF habitat and an average 40 percent canopy closure in dispersal habitat, in active home ranges of northern spotted owls. Complex forest structure that forms NRF habitat consists of dead down wood, snags, dense canopy, and multi-storied stands would be retained in the owl home ranges. Outside of known owl home ranges, forest stands that are currently providing for northern spotted owl nesting, roosting, and foraging habitat may be thinned to 40 percent canopy and downgrade NRF habitat function. Ridge top treatment areas within the upper 1/3 of slopes, approximately 200 feet or less (one site-potential tree height) on both sides of ridge top (400 feet total or less) with roosting and foraging structure, may be thinned 50-60 percent canopy cover, depending on the density of fire resilient conifers and large hardwoods and the number of smaller adjacent competing trees removed, and retain ≥60 percent canopy in treated NRF habitat below the ridge tops. Existing snags and coarse woody material (CWD) would be retained. Snags that have to be felled for safety reasons would be left on site for CWD.

Density Management

The primary purpose is to widen the spacing of residual trees to promote growth and structural development of the remaining stand and is prescribed for even or uneven-aged stand. These treatments proportionally thin stands by spacing the residual trees based on the crown radius of the healthiest dominant and co-dominant trees. The healthiest dominant and co-dominant trees would be retained to meet an average 60 percent canopy cover in NRF stands (40 percent retention outside of known owl home ranges) and 40 percent canopy cover in dispersal stands. Density management in young stands (20-40 years old) offers the best opportunity for developing the conditions most suitable for future development of old growth characteristics. Density management in older stands is primarily driven by the need to reduce stress, increase species diversity, and increase growth in the remaining trees, where stands structures are simple and lack complex vertical and horizontal structure.

Forest Health/ Fuels Reduction

Noncommercial Density Reduction

Stands are primarily a result of natural regeneration. Stands to be treated are generally a mix of conifers, hardwoods and shrubs. Conifer distribution is patchy and variable. The general prescription would reduce hardwood and shrub densities by slashing, handpile and burning. Patches of dense conifers would be precommercially thinned to 12’-20’ spacing. Existing snags and down wood are retained. Thinning will release larger trees and increase vigor and growth potential of remaining young trees. It may include removing other competing vegetation, pruning lower branches to improve wood quality, and selectively retaining tree desired species such as oaks or maples that may be limited within treatment areas.

Hazardous Fuels Reduction reduces understory vegetation density by cutting and spacing of conifers <8 inches dbh and hardwoods <12 inches dbh. Retained vegetation would be spaced 14-45 feet apart. Untreated vegetation groups ranging in size from 0.1 to 2 acres would be retained in each treatment unit, retaining 10-15 percent untreated patches.

Hand piling and burning is typically used when underburning is not possible due to heavy fuel loads. Sticks 1 inches to 6 inches diameter and longer than two feet would be piled by hand. Hand piling and burning would decrease fuel loading of material 1 to 6 inches in diameter by 85 to 95 percent. Fuels greater than 6 inches in diameter would be left on the surface and would contribute to the coarse woody debris load. This treatment would move stands from a slash fuel type into a timber fuel type, which would result in a reduced rate of fire spread and average flame length.

Treated vegetation may be removed as Biomass**.** Biomass is any dead or living vegetation in a fuels unit that is ≤ 8 inches dbh for conifers and ≤ 12 inches dbh for hardwoods. For slopes < 35 percent, mechanized low ground pressure machinery would cut, skid, haul or chip biomass. On slopes > 35 percent, biomass would be cable yarded.

Understory Burning (underburning) is used where the objective is to maintain ≥80 percent of the overstory. Typically, burning occurs between fall and spring outside of Project Design Criteria (PDC). Approximately ten percent of all treatment acres may be underburned to reduce the fuel loading and/or maintain the stands in a desired condition.

Conservation measures specific to Poor Luck

- Dry forest restoration treatments (for example, Johnson and Franklin, 2009) would reduce stand density, retain old trees (> 150 years), favor drought tolerant species, provide structural complexity (un-thinned patches and small openings), and increase average stand diameter. These characteristics would increase stand resiliency to environmental disturbances (i.e. fire, insects, disease, and climate change).

- Project development and stand treatments revolved around trying to reduce adverse effects to spotted owls. Careful attention was focused toward avoiding the downgrade and removal of habitat within the home ranges of occupied owl sites.

- Approximately 65 acres of NRF habitat was deferred from treatment. NRF habitat treatment was deferred in habitat within the home range of 3 known owl sites that occurred in high RHS (Relative Habitat Suitability) or was located adjacent to nest patches. Treatment was also deferred in known utilized foraging habitat identified from survey data within or adjacent to mapped core areas and nest patches.

- Owl surveys are being conducted to learn the occupancy status of historic sites that have little survey history. If owls are found during surveys, the associated maintenance treatment units would be dropped or modified if they occur in a new nest patch area.

- Owl surveys are being conducted in unsurveyed suitable habitat outside of the home ranges of known owl sites. If owls are located during surveys, the associated NRF downgrade units would be modified or dropped to eliminate potential harm.

Williams

Current conditions:

The Williams Vegetation Management project will treat 2,342 acres of NRF, 2,288 acres of dispersal habitat, and 978 acres of capable habitat.

Current stand conditions were assessed in the field for all units proposed in the planning area. The exclusion of fire and previous forest management has shaped the landscape structure and condition. The project area exhibits a broad spectrum of stand conditions: early seral plantations, neglected stands of advanced reproduction, natural stands of complex structure, and near-pure hardwood sites. Conditions and ages vary throughout the project area ranging from 10 to 190 years. Some stands include 250 and 300 year old inclusions. The recent lack of frequent natural disturbance and fire suppression have enabled the conifer stands to reach high stocking levels that causes suppression, mortality or loss of tree vigor (reduced radial growth and live crown ratios). Mature Douglas-fir, Sugar Pine and Ponderosa pine have been dying because of competition for water with dense understory vegetation. Many of the forest stands have a dense overstory. Ladder fuels are prevalent creating conditions for crown fires to occur that could result in large stand replacement fires.

On the North and East aspects of conifer dominated stands, Douglas-fir is the predominant tree species in both the overstory and understory. However, on the Panther Ridge area most of the Douglas-fir dominated stands tend to be on North & Northwest aspects, while the ponderosa pine stands tend to be on South & Southwest aspects. Generally, Douglas-fir sites are in the advanced reproduction (poles) to mid seral stages. Overstory diameters range from 8-30" dbh, while averages remain mostly in the lower half of this range. There are few mature Douglas-fir stands, most of which are overstocked. In mature Douglas-fir sites, overstory trees can range from 18 to 60" dbh. Ponderosa pine, sugar pine, and incense cedar are the main secondary species. Vigor of the overstory is variable ranging from many full crowned to a few thinning crowns or dead tops. Understory stocking is variable. The predominate hardwood species are madrone and canyon live oak, tanoak, scattered big leaf maple, dogwood, willow, Prunus species, California black oak and Oregon white oak. Generally, hardwoods, particularly madrone, are overstocked. Madrone have occupied conifer sites where they are limiting growth of important species such as ponderosa pine, California black oak, Douglas-fir, sugar pine, white oak, and incense cedar. Shrub species, in addition to sprouting hardwoods, include deerbrush, buckbrush, Rubus species, hazel, manzanita, poison oak, ocean spray, whipple vine, hairy honeysuckle, sword fern and bracken fern. Within the south and west portions of the planning area, Port Orford cedar is a common tree species along drainages and more moist northerly slopes. Oregon White Oak stands usually occur on lower slope positions, predominately on South, Southwest and west aspects.

Project description:

A landscape assessment was done early in the project planning process to determine current stand conditions, stand trajectories, and to identify threats, such as fires and insects. The Williams project uses ecological forestry principles of Forest Restoration tailored to southwestern Oregon forests and local conditions, without compromising occupancy, reproduction, and survival of known northern spotted owl sites within the project area. The

Relative Habitat Suitability (MaxEnt) model described in the *2011 Revised Recovery Plan for the Northern Spotted Owl* (USDI FWS 2011), a Fire Probability model layer, and the Medford District known site layer were used to strategically place units to reduce effects to spotted owl sites.

Basic Objectives:

- Utilize ecological forestry principles and plant communities to restore characteristic structure and composition, ecological conditions, and ecosystem functions
- Shift composition toward more fire and drought tolerant species (ponderosa pine, sugar pine, incense cedar) and away from less fire and drought tolerant species such as white fir
- Reduce stand density and ladder fuels to increase long term tree growth, quality, and vigor of the remaining trees and increase resistance and resilience of forest stands and landscape to wildfire, insects, and drought
- Create diversified stand structure (height, age, and diameter classes) to enhance and accelerate development of structural complexity and composition (which is the result of variability)
- Restore characteristic levels of ground fuels and understory vegetation, using prescribed fire where possible

Silvicultural actions utilize variable density thinning to reduce stand basal area to desirable target levels of retention. Retention criteria are determined by plant series, stand condition, structure, and species composition. Desirable conifers and hardwoods would be promoted as leave trees (ponderosa pine, incense cedar, sugar pine, Douglas-fir of variable genotypes, old trees, oak trees 10 inches dbh and larger, and madrone trees 16 inches dbh and larger with full live crown ratios of 30 percent or greater). Old trees are defined as trees greater than 150 years of age. Individual trees greater than 150 years old would be retained in all prescriptions. Their survivability would be improved by eliminating ground and ladder fuels and competing trees from 2x the dripline of the tree crown. Where many old trees are present, treated areas may overlap.

The treatments are designed to remove mostly small and medium sized trees, but can include removal of some larger young trees. An additional aim of treatment is to maintain or improve the proportion of fire resilient early seral tree species and stimulate their proliferation. Prescriptions would be modified where needed to retain additional canopy cover in treat and maintain units within the home range of known owl sites.

Port-Orford-Cedar (POC) sanitation treatments are incorporated into timber harvest or fuels projects on sites at high-risk for spreading Port-Orford-Cedar (POC) root disease. POC sanitation treatments are implemented to help reduce the risk of spreading the disease, benefiting the overall forest health of infested watersheds.

Williams Treatment Descriptions

Timber

Variable Density Thinning (Douglas-fir Series)

The overall objective is to retain overall stand basal area to within a range based on plant association and site productivity of Douglas-fir sites. Generally 80-120 ft^2 basal area per acre

would be retained at the stand level (some sites may require slightly lower or higher retention based on productivity e.g., 60 or 140 sq. ft.). On dry ridges and southwesterly aspects in the Douglas-fir plant association, especially where manzanita is found, trees would be thinned to retain no more than 80 ft^2 basal area per acre while promoting ponderosa pine, incense cedar, sugar pine, and Douglas-fir, respectively.

Approximately 10-15 percent of the management unit would be retained to provide habitat diversity, hiding cover, structural diversity, and reduce visual sighting distances. Gaps ranging in size from 0.25 to 2 acres would be created and comprising ± 15 percent of the stand (e.g. limiting 1 acre openings to every 6 or 7 acres and 2 acres openings to every 13 acres). The majority of the gap sizes would be from 0.25 to 0.5 acre in size. Johnson and Franklin (2009) recommend 2 acre gap size as the maximum gap size. However, the application of this size would be implemented on a limited basis in the Williams project area. The use of 2 acre gaps would be appropriate (to dry forests) where, because of the variability of stands in the project area, the site transitions into (< 5 acre) white oak woodland where Douglas-fir trees have encroached to occupy the growing space. Douglas-fir on such sites do not belong there and as indicated by their physical condition. The treatment would salvage of dead and dying Douglas-fir trees rather than a removal of healthy full-crown trees. Larger gaps sizes would be utilized in section 3 where gaps would regenerate a significant understory to develop a future multi-storied structure. Because it is a northerly aspect this unit will likely be shaded by the ridgeline, a larger gap would bring in enough sunlight to get the early seral species that we want to initiating the understory.

The proposed gaps, will follow Johnson and Franklin's (2009) Dry Forest Restoration principles, and will not remove all vegetation, but retain 1-2 large trees. Generally, gaps would be designed to protect and promote large legacy fire resilient tree species including prominent large hardwoods and to stimulate regeneration of fire and drought tolerant tree species in the understory. If no pines or cedars are available for legacy retention, gaps may be utilized to protect and promote legacy Douglas-fir and prominent large hardwoods. Gap size and shape would be positioned to benefit establishment of early seral species. Gap edges would be separated by at least 150 ft. Low density planting of fire resilient, early seral, or drought tolerant species may occur within gaps to increase species and structural diversity. Generally, the canopy cover would be 30-40 percent; however, the prescription will be modified to retain additional canopy cover in dispersal and NRF habitat. The amount, size, and distribution of gaps would be limited in NRF and dispersal habitat to ensure habitat function is retained.

Variable Density Thinning (Pine Series)

The overall objective is to retain stand basal area commensurate with the lower site productivity of pine sites. Generally 60-80 ft^2 basal area per acre at the stand level would be retained. Where site productivity shifts to a Douglas-fir Series, 80-120 ft^2 basal area/acre would be retained and 40 sq. ft. basal area/ acre would be retained where the goal is to restore an open stand with pine and oak dominance). Trees greater than 150 years old would be retained and fuels and competing vegetation would be removed for 2x the dripline of the crown radius of such trees.

Approximately 10-15 percent of the management unit would be retained to provide habitat diversity, hiding cover, structural diversity, and reduce visual sighting distances. Gaps ranging

in size from ¼ to 2 acre would be created (± 15 percent of stand). Generally, gaps would be designed to protect and promote legacy fire resilient tree species including prominent large hardwoods and to stimulate regeneration of fire and drought tolerant tree species in the understory. If no pines or cedars are available for legacy retention, gaps may be utilized to protect and promote legacy Douglas-fir and prominent large hardwoods. Low density planting of fire resilient or drought tolerant species may occur within gaps to increase species and structural diversity. Generally, the canopy cover would be 30-40 percent; however, the prescription will be modified to retain additional canopy cover in dispersal and NRF habitat.

Commercial Thin (CT)

Treatment goals are to utilize ecological forestry principles of dry forests to restore more characteristic and sustainable ecological conditions and functions while retaining key habitat features for northern spotted owl habitat so that its function would be maintained. Commercial thinning would remove trees that function as ladder fuels, reduce risks to older trees from wildfire and competition, favor more fire and drought tolerant tree species, control stand density, increase stand vigor and place or maintain stands on developmental paths so that desired stand characteristics of dry forests result in the future and primary elements for northern spotted owl habitat are maintained. Over time, crowns of remaining trees would become fuller. Dry forest restoration principles as well as growth and yield considerations would be applied to commercial thinning treatments. Thinning to improve growth of residual trees, restoring spatial heterogeneity in a non-uniform distribution of forest structural elements of dry forests would be incorporated such that homogenous conditions are avoided and key habitat features that support spotted owl habitat are maintained. Treatment would not change the conditions that would classify the stand as NRF or dispersal post-treatment. The NRF stand would retain at least 60 percent canopy cover, large trees, multistoried canopy, standing and down dead wood, diverse understory adequate to support prey, and may have some mistletoe or other decay. Dispersal habitat would retain at least 40 percent canopy, flying space, and trees 11 inches diameter at breast height (dbh) or greater, on average. The habitat classification of the stand following treatment would be the same as the pretreatment habitat classification.

Forest Health/ Fuels Reduction

Density Management

These are units with a generally predominant pole size component mostly in the stem exclusion stage of forest development. Many also exhibit a dense understory and/or hardwood composition. The Silvicultural Design and Variable Density Thinning prescriptions, as outlined above, would be utilized. However, fewer older trees exist in these units which implies the potential for fewer gaps and a retention guideline using basal area as specified for Douglas-fir or ponderosa pine plant series. Generally, the canopy cover would be 35-50 percent; however, the prescription will be modified to retain additional canopy cover in dispersal and NRF habitat.

Density Management / Hazardous Fuels Reduction

These treatments involve the above Density Management commercial activities as well as understory reduction to vegetation described in Hazardous Fuels Reduction below. This prescription treats the entire stand (excluding skips) to reduce densities throughout. The Silvicultural Design and Variable Density Thinning prescriptions, as outlined above, would be

utilized. Generally, the canopy cover would be 35-50 percent; however, the prescription will be modified to retain additional canopy cover in dispersal and NRF habitat.

Port-Orford-Cedar Sanitation
The POC Sanitation treatment is a buffer of up to 50 feet on each side of the road. This distance will vary based on terrain and likelihood of disease spread. This treatment will cut all POC trees within this buffer. The amount of POC along the roads is highly variable and is usually more concentrated in the drainages. The majority of the POC trees along the road are composed of seedlings/saplings to pole size trees with some trees greater than 8 inches DBH. No POC greater than 150 years old would be cut. Live POC trees beyond 50 feet from roadways would be reserved from cutting. Canopy reduction would be minimal and unlikely to reduce canopy covers below 40 percent.

Hazardous Fuels - Biomass Removal
Biomass is any dead or living vegetation in a fuels unit that is ≤ 8 inches dbh for conifers and ≤ 12 inches dbh for hardwoods. For slopes < 35 percent, mechanized low ground pressure machinery would cut, skid, haul or chip biomass. On slopes > 35 percent, biomass would be cable yarded.

Hazardous Fuels - Selective Slashing
Understory vegetation density would be reduced by cutting and spacing of conifers <8 inches dbh and hardwoods <12 inches dbh. Retained vegetation would be spaced 14-45 feet apart. Approximately 10-15 percent of the project area will be left untreated.

Hazardous Fuels - Hand Piling and Burning is typically used when underburning is not possible due to heavy fuel loads. All slash less than 7 inches diameter and longer than 2 feet would be piled by hand.

Hazardous Fuels - Understory Burning (underburning) is used where the objective is to maintain ≥80 percent of the overstory. Typically, burning occurs between fall and spring outside of project design criteria.

Conservation measures specific to Williams

- Dry forest restoration treatments (for example, Johnson and Franklin, 2009) would reduce stand density, retain old trees (> 150 years), favor drought tolerant species, provide structural complexity (un-thinned patches and small openings), and increase average stand diameter. These characteristics would increase stand resiliency to environmental disturbances (i.e. fire, insects, disease, and climate change).
- No downgrading or removal of habitat would occur. Only Treat and Maintain prescriptions are proposed in NRF and dispersal habitat.
- No treatment will occur in known site nest patches
- Approximately 12,167 acres of NRF within the planning area (all ownerships) will be left untreated.
- Generated owl site “areas” are being surveyed according to the 2011 protocol and if nesting owls are located, units would be modified to reduce effects to owls. 2012 will be the third year of protocol surveys.

West Fork Cow Creek Road Right-of-Way Construction

Current conditions:
The West Fork Cow Creek road has failed continuously for the past 20 years at approximately mile post 8.00 (T31S-R9W-Section 36, SE SE). The road is not passable during several months out of the year and requires extensive repair once or twice per year.

Project description:
The project will obliterate and relocate a portion of the West Fork Cow creek road 32-8-1.1 in order to provide a safe and reliable transportation system reducing long term maintenance costs associated with the high use public road. The proposed action will include obliterating (re-contouring) approximately 800' of existing road (located on BLM lands), placing topsoil and planting vegetation for soil/slope stabilization, constructing approximately 600' of new road (relocation) located on private timber lands in spotted owl dispersal habitat. The total clearing width on will be approximately 100' on private land and a total of 3 acres of dispersal habitat removed (2.7 acres on private and 0.3 acres on BLM) for construction and to provide a safe visual field to see merging traffic at the intersections of the 31-8-31 road and the intersection of the existing 32-8-1.1 road. The new road running surface will be approximately 20 feet wide with a 3 foot wide one foot deep ditch. The surfacing will be paved (BST). The new road will cross one intermittent draw and tie back into the existing 32-8-1.1 road off of the 32-8-31 road. Conifers removed in the clearing width range from 6" diameter at breast height (dbh) to 24" dbh. Project implementation will occur between May 1, 2013 and November 1, 2013.

APPENDIX B: PROJECT DESIGN CRITERIA

Project design criteria (PDC) are measures applied to project activities designed to minimize potential detrimental effects to proposed or listed species. PDC usually include seasonal restrictions and may also include clumping of retention trees around nest trees, establishment of buffers, dropping the unit(s)/portions, or dropping the entire project. Use of project design criteria may result in a determination of no effect for a project which would have otherwise been not likely to adversely affect. In other cases, project design criteria have resulted in a determination of not likely to adversely affect for a project which might have otherwise been determined to be likely to adversely affect. The goal of project design criteria is to reduce adverse effects to listed or proposed threatened or endangered species.

Physical impacts to habitat and disturbances to spotted owls will be reduced or avoided with PDC. Listed are project design criteria designed for the programmatic impacts discussed in the Effects of the Action section.

Medford BLM retains discretion to halt and modify all projects, anywhere in the process, should new information regarding proposed and listed threatened or endangered species arise. Minimization of impacts will then, at the least, include an appropriate seasonal restriction; and could include clumping of retention trees around the nest trees, establishment of buffers, dropping the unit(s)/portions, or dropping the entire project.

The seasonal or daily restrictions listed below may be waived at the discretion of the decision maker if necessary to protect public safety (as in the case of emergency road repairs or hazard tree removal). Emergency consultation with the Service will then be initiated in such cases, where appropriate.

PDC for disturbance are intended to reduce disturbance to nesting spotted owls or marbled murrelets. For this consultation, potential disturbance could occur near either documented owl sites or projected owl sites. To estimate likely occupied habitat outside of known home ranges, nearest-neighbor distances and known spotted owl density estimates were utilized to “place” potential spotted owl occupied sites in suitable habitat. Marbled murrelets are difficult to locate. No murrelets have been documented on the District, but Medford remains within zone B. To ensure that activities that have the potential of disturbing marbled murrelets are reduced to not likely to adversely affect (NLAA) (or no effect (NE)), we (Medford BLM) will impose the PDC in or adjacent to marbled murrelet habitat.

Any of the following Mandatory PDC may be waived in a particular year if nesting or reproductive success surveys conducted according to the Service endorsed survey guidelines reveal that spotted owls are non-nesting or that no young are present that year. Waivers are only valid until March 1 of the following year. Previously known sites/ activity centers are assumed occupied until protocol surveys indicate otherwise.

Mandatory Project Design Criteria (spotted owls)

A. Activities (such as tree felling, yarding, road construction, hauling on roads not generally used by the public, prescribed fire, muffled blasting) that produce loud noises above ambient levels will not occur within specified distances (Table B-1) of any documented or projected owl site between March 1 and June 30 (or until two weeks after the fledging period) – unless protocol surveys have determined the activity center to be not occupied, non-nesting, or failed in their nesting attempt. The distances may be shortened if significant topographical breaks or blast blankets (or other devices) muffle sound traveling between the work location and nest sites.

B. The action agency has the option to extend the restricted season until September 30 during the year of harvest, based on site-specific knowledge (such as a late or recycle nesting attempt) if project would cause a nesting spotted owl to flush. (See disturbance distance).

C. Burning will not take place within 0.25 miles of spotted owl sites (documented or projected) between 1 March and 30 June (or until two weeks after the fledging period) unless substantial smoke will not drift into the nest stand.

D. To minimize the number of potential spotted owl nest trees used for used for in-stream structures, only the following sources will be used:

(I) Trees already on the ground in areas where large woody material is adequate;

(II) Trees lacking suitable nesting structure for spotted owls.

Table B-1. Mandatory Restriction Distance to Avoid Disturbance to Spotted Owl Sites.

Activity	Documented Owl Site
Heavy Equipment (including non-blasting quarry operations)	105 feet
Chain saws	195 feet
Impact pile driver, jackhammer, rock drill	195 feet
Small helicopter or plane	360 feet*
Type 1 or Type 2 helicopter	0.25 mile*
Blasting; 2 pounds of explosive or less	360 feet
Blasting; more than 2 poundsof explosives	1 mile

* If below 1,500 feet above ground level

Above-ambient noises further than these Table B-1 distances from spotted owls are expected to have ether negligible effects or no effect to spotted owls. The types of reactions that spotted owls could have to noise that the Service considers to have a negligible impact, include flapping of wings, the turning of a head towards the noise, hiding, assuming a defensive stance, etc. (USDI FWS 2003).

APPENDIX C: MONITORING FORM.

Consultation Effects Data Input Form for
Northern Spotted Owls & Marbled Murrelets
(for use in preparing BA, BO, and annual tracking reports)

Section I: Consultation Identifier Information (fill out for each form) Page ____ of ____ forms

Consultation Type:	Consultation #	Consultation Name			Sale Volume (MBF)
☐ Formal					
☐ Informal	Reinitiation Cross-Ref.#	Consultation Author (full name)			Fiscal Year Signed
☐ Tech Assistance					
☐ Tech Asst Nat Event	Suppl. ☐ or Replace ☐	Termination Date	/ /	Signature Date	/ /
Comments					

Section II: Ownership and Location Identifier Information[1]

Species	NWFP Province	Group	Land Use Allocation	CHU Identifier
		☐ NWFP Lands	☐ AMA ☐ AW	
Consulting Agency	California Ecozone	☐ Tribal	☐ CRA ☐ LSR	FY of Record
		☐ Other Fed Agency/Land	☐ MLSA ☐ MX	
Administrative Unit	MAMU Conservation Zone	☐ HCP	☐ NAT ☐ PVT	Decade
		☐ Other Private/State	☐ SEA[2]	
Administrative Subunit	NWFP Timber Sale Activity		[2]Murrelets only	Consult Status
	☐ YES ☐ NO			☐ Authorize
Project Report Name	**Report Contact Name**	**Report Contact Phone**	LUA Identifier	☐ Proj. Report

[1]Requires a new data entry form for each change in any field (fill out all fields for each form).

Section III: NSO Consultation Habitat Effects (requires separate form for each change in any data entry field in Section II)

Affected Suitable Habitat				Habitat Associated Take			Dispersal Habitat (non NRF)	
Effect	NRF	NR[3]	F[3]	Acres	AC (w/acres)	AC (wo/acres)	Acres	Assoc. Harm
Removed								
Downgraded								
Degraded								
Added								

[3]California only.

	Disturbance Effects	Annual Effects (Number by Fiscal Year)					
		FY'	FY'	FY'	FY'	FY'	FY'
☐ Harm	Acres (wo/ LOPs)						
☐ Harass	Activity Centers (w/acres)						
	Activity Centers (wo/acres)						

Section III: MAMU Consultation Habitat Effects (requires separate form for each change in any data entry field in Section II)

Affected Habitat				Habitat Associated Harm		
	Suitable Habitat		Critical Habitat			
Effect	Stands	Remnants	½ Site Potential w/in .5 mile	Unsurveyed Acres	Occupied Acres	Surveyed Not Occupied Acres
Removed						
Degraded						
Added						
# trees						

	Non-Habitat Effects	Annual Effects (Number by Fiscal Year)					
		FY'	FY'	FY'	FY'	FY'	FY'
☐ Harm	Unsurveyed Suitable Habitat (Acres)						
☐ Harass	Occupied Suitable Habitat (Acres)						
	# Individuals						

Section II & III: General Note and Comments

R1 ES/OTS-3 Rev. 03/22/2004

APPENDIX D. ADDITIONAL ANALYSES OF PROPOSED SPOTTED OWL CRITICAL HABITAT EFFECTS DETERMINATION.

For the spotted owl, the physical or biological features essential to the owl are forested areas that are used or likely to be used by northern spotted owl for nesting, roosting, foraging, or dispersing. The specific characteristics or components that comprise these features include, for example, specific ranges of forest stand density and tree size distribution; coarse woody debris; and specific resources, such as food (prey and suitable prey habitat), nest sites, cover, and other physiological requirements required by northern spotted owls and considered essential for the conservation of the species. The primary constituent elements of proposed critical habitat for the spotted owl are nesting, roosting, foraging, and dispersal habitats.

The physical and biological features provide for connectivity and demographic support by serving as suitable habitat for the spotted owl throughout all life history stages. This role is best supported when the primary constituent elements of spotted owl critical habitat (above) are present in the forested areas relied upon by spotted owls for nesting, roosting, foraging and dispersing.

The proposed rule recommends evaluating impacts to proposed critical habitat by determining the effects the proposed action is likely to have on the ability of a 500-acre area to support life-history needs of the spotted owl. This differs from earlier critical habitat rules which recommended evaluating impacts too critical habitat at the scale of the PCE (1992) or the affected stand (2008). To conduct this recommended analysis, we delineated 500-acre (800 meter radius) circles around centroids of seven proposed harvest units that included NRF downgrade prescriptions that occur fully or partially within critical habitat sub-unit KLW 1, as these represent the areas most affected by the proposed action (Table D-1).

Table D-1. Habitat amounts within 500-acre buffers of a sample of proposed Critical Habitat harvest unit centroids for the GPRA FY 2012-13 proposed action (FWS reference # 01EOFW00-2012-F-0103).

Unit ID #	Acres NRF Habitat Pre-Harvest	Acres NRF Habitat Post-Harvest	Percent Change
207	389	332	-15%
210	371	356	-4%
211	438	426	-3%
212	455	393	-14%
213	379	256	-33%
246	315	287	<1%
282	442	392	-11%

The proposed rule instructs that we evaluate impacts to proposed critical habitat in terms of potential changes to the conservation value of affected landscapes. The downgrade of NRF habitat within the 500-acre landscape surrounding proposed harvest units that consist of prescriptions that would result in the downgrade of NRF habitat is likely to measurably decrease flying squirrel abundance by removing mid-story and overstory structure from those acres (Wilson 2010, Manning et al. 2012). Removing snags potentially used for denning by flying squirrels and nesting of secondary avian spotted owl prey species will reduce spotted owl foraging opportunities. Also, reducing canopy closures below 60 percent will likely introduce ecological edge effects to the affected stands as well as to adjacent stands of NRF habitat, extending the area of impact beyond the treated areas. These impacts to proposed critical habitat primary constituent elements and principle biological features important to the conservation of spotted owls are not immeasurable, nor are they unlikely to occur. Therefore, we agree with the District's determination that the proposed action is likely to adversely affect proposed spotted owl critical habitat.

The proposed rule indicates that determinations of whether a proposed action likely to adversely affect critical habitat will destroy or adversely modify proposed critical habitat need to be made at the scale of the critical habitat subunit. Because all NRF downgrade acres occur within critical habitat sub-unit KLW 1, we conducted our evaluation for this proposed action in this sub-unit.

Activities that may destroy or adversely modify critical habitat are those that alter the essential physical or biological features of the critical habitat to an extent that appreciably reduces the conservation value of the critical habitat for the listed species. The conservation role or value of spotted owl critical habitat is to adequately support the life-history needs of the species to the extent that well-distributed and inter-connected northern spotted owl nesting populations at habitat carrying capacity levels are likely to persist within properly functioning ecosystems at the critical habitat unit and range-wide scales.

One of the designated functions of proposed critical habitat subunit KLW 1 is to provide north-south and east-west connectivity and demographic support. This subunit sits at the western edge of an important connectivity corridor between coastal Oregon and the West Cascades. Presuming the subunit is currently functioning as intended when proposed for designation, the habitat contiguity in the proposed critical habitat portion of the action area will not likely be decreased enough to measurably affect spotted owl movements into and out of this portion of the proposed CHU because the affected landscape will still be over 70 percent dispersal habitat (which includes NRF habitat) post project implementation. Therefore, we expect connectivity will be maintained between the Klamath East CHU (KLE 2 subunit) to the east, to the Oregon Coast Range CHU (ORC 6 subunit) to the north, and to the remainder of Klamath West CHU (subunits KLW 2 and KLW 3 respectively) to the south and west.

A second role of this critical habitat subunit is to contribute to the demographic stability of the area. The proposed action occurs within the home ranges of 27 known and five predicted spotted owl sites (Table 11). However, as described above, because habitat quantity recommendations will continue to be met at spotted owl sites currently consisting of sufficient habitat amounts, or

will not be further decreased at habitat-limited spotted owl sites, we anticipate demographic support will still occur.

Subunit KLW 1 consists of approximately 156,075 acres, of which 86,441 acres overlap the analysis area. Within the 86,441 acres, 49,884 acres consist of NRF habitat while 60,652 acres (NRF plus dispersal-only habitat) provide dispersal habitat (Table 8). There are 159 spotted owl sites on federal land within the subunit. As described above, all affected spotted owl home ranges and core use area thought likely to be currently occupied will retain sufficient habitat to continue to adequately support nesting, roosting, foraging and dispersal activities post-project implementation. Because nesting at known spotted owl sites is considered not likely to be reduced and dispersal characteristics within the subunit and connectivity to adjacent subunits are not considered likely to be measurably reduced, we conclude that the conservation value, in terms of the stated conservation objective for the KLW 1 critical habitat subunit (connectivity and demographic support), will not be significantly altered at the subunit scale by the proposed action. Therefore we conclude the proposed action is not likely to destroy or adversely modify proposed critical habitat for the spotted owl.