United States Department of the Interior

FISH AND WILDLIFE SERVICE

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August 10, 2011

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 variable density thinning and density management thinning activities associated with the Pilot Joe project, scheduled to occur on public lands administered by the Medford District of the Bureau of Land Management (District) that are likely to affect the northern spotted owl (Reference Number 13420-2011-F-0162).

This document transmits the Fish and Wildlife Service's (Service) biological opinion (Opinion) based on our review of the proposed variable density thinning and density management thinning activities scheduled to occur on lands administered by the District, and their potential impacts to the threatened northern spotted owl (*Strix occidentalis caurina*) (spotted owl). 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 Service received your consultation request and corresponding Biological Assessment (Assessment) (USDI BLM 2011) dated June 17, 2011, in our office on June 20, 2011. According to the Assessment, the proposed action will not occur within designated critical habitat for the spotted owl (USDI FWS 2008a).

The enclosed Opinion includes a finding that implementation of the proposed action would not jeopardize the continued existence of the spotted owl. Although this Opinion provides for the incidental take of the spotted owl, the proposed action represents restoration-based forest management as described in the 2011 Revised Recovery Plan for the Northern Spotted Owl. The Service believes that strategically developed active forest management will provide more resilient forest habitats in the face of climate change and other stressors, which in turn has the potential to conserve spotted owl habitat on the landscape for longer periods of time. We believe the Pilot Joe project offers conservation benefits to the spotted owl through strategic placement of treatment units and retention of late-successional emphasis areas. It should also benefit the ecosystem by enhancing ecological function and processes, leading to a more resilient system in

the Middle Applegate watershed. One of the stated purposes of the Endangered Species Act is "to provide a means whereby the ecosystems upon which endangered and threatened species depend may be conserved." The Pilot Joe project is consistent with this direction.

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 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, 2021.

If you have any questions regarding this Opinion, please contact me at 541-957-3474; or Cynthia Donegan at 541-957-3469.

cc: Dayne Barron, Medford District BLM, Medford, Oregon (e)
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Biological Opinion on variable density thinning and density management thinning activities associated with the Pilot Joe project, scheduled to occur on public lands administered by the Medford District of the Bureau of Land Management (District) that are likely to affect the northern spotted owl (FWS Reference Number 13420-2011-F-0162)

U.S. Department of the Interior
U.S. Fish and Wildlife Service
Roseburg Field Office
August 10, 2011

Signature: _____
Jim Thrailkill
Field Supervisor

Date Signed: 8/10/2011

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CONSULTATION HISTORY

The Service has participated with District staff in public meetings and field tours during the planning phase of the Pilot Joe project. In addition, the Rogue Basin level 1 team reviewed the proposed action and the potential effects to spotted owls at a meeting on May 3, 2011. These comments have been incorporated with the District submitting a final Assessment to the Service on June 17, 2011.

The action area for this proposed action overlaps areas within which the District had previously planned timber harvest activities, as detailed in the Assessment (USDI BLM 2011). The proposed action represents new projects, consisting of newly developed prescriptions, in these same geographic areas. The District assessed the environmental impacts of this new proposed action in environmental assessment (EA) number DOI-BLM-OR-M060-2011-0016-EA.

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 (USDA FS and USDI BLM 1994a), and expects to implement all activities included in the proposed action after the Opinion is received and National Environmental Policy Act (NEPA) compliance is completed. Generally, the proposed treatments are expected to be implemented at the earliest in the fall of fiscal year (FY) 2011 and throughout FY 2012.

The District defines implementation of timber sales as the date a project is sold. However, harvest activities could take up to five years 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 harvest portions of the sale in different years. The District anticipates the Pilot Joe project will be completed within a 10 year timeframe from the date of the Opinion.

The Pilot Joe project, designed under the Dry Forest Restoration Principles as developed by Drs. K. Norman Johnson and Jerry F. Franklin (Johnson and Franklin 2009, 2010), represents a portion of the larger Middle Applegate Dry Forest Restoration Project. This project is also part of the Secretary of Interior's designated Pilot Demonstration Projects occurring on Bureau of Land Management (BLM) Districts in southwest Oregon to demonstrate the application of forest restoration principles as described by Johnson and Franklin.

Johnson and Franklin define "restoration" broadly to encompass activities that are designed to restore forests and landscapes to conditions that are both more resistant and resilient to disturbances, and that provide the diversity needed to restore and sustain native biodiversity and essential ecosystem functions. Restoration of ecosystems at the stand and landscape scale are the primary focus of the proposed action, rather than singular goals, such as fuel and wildfire abatement, timber production, or wildlife habitat (Johnson and Franklin 2009, 2010).

As detailed in the Assessment, the ecosystem restoration strategy for the Pilot Joe project calls for:

- "An active management program to restore more ecologically desirable and sustainable conditions in forests and landscapes. Existing dry forest landscapes in the Middle Applegate Watershed are characterized by dense maturing forests with relatively simple structure and low tree species diversity; landscape heterogeneity is low and spotted owl habitat is at significant risk. Functionality, diversity, and sustainability of these forests and landscapes can be improved with management that structurally and compositionally enriches these forests and reduces their vulnerability to wildfire, insects, and other disturbances. Ecosystem restoration, planned and implemented at the landscape scale, is needed, rather than actions focused primarily on fire or any other singular objective.
- Landscape-level planning to insure that desirable and sustainable mixtures of forest and non-forest conditions are maintained on the landscape. These efforts can guide restoration of landscapes to desired and heterogeneous conditions, from their current largely homogeneous and high risk state. The desired condition includes retention of denser forest patches needed to provide important habitat for many organisms, such as the spotted owl and some of its prey species. These dense, multi-layer patches are best maintained by embedding them in a forest matrix that resists, rather than facilitates, the spread of insect epidemics and stand-replacement wildfire."

As part of the landscape level planning process, the District assessed the action area in an effort to delineate a proportion of the landscape that would serve as areas of dense, closed-canopy contiguous forests, within which minimal to no treatments would be proposed. These areas, called Late-Successional Emphasis Areas (LSEAs), are designed to provide larger blocks (300-500 acres) of dense forest conditions where succession continues uninterrupted by active management, and which provide fairly contiguous blocks of mature and late-successional habitat to support those species that rely on and are associated with these forest habitats, such as the spotted owl and the fisher (*Martes pennanti*).

District biologists used historic spotted owl site locations combined with site utilization information, and a habitat suitability assessment to inform the placement of the LSEAs. While active management will occur within the home range of the affected spotted owl sites (see Effects of the Action section of this Opinion), the location of the LSEAs maintain habitat conditions of the spotted owl nest patches and likely core-use areas of affected sites.

In addition to the site maintenance efforts for the LSEAs, landscape level planning under the Dry Forest Restoration Principles led to the development of strategically located treatments adjacent to the LSEAs to meet stand level restoration goals. The restoration goal of increasing forest stand resiliency by reducing forest stand densities should result in the lessening of fuel and corresponding fire hazard. This strategy provides a measure of protection to the LSEAs by reducing the chance of high severity fire reaching the LSEAs, while concurrently providing for the habitat needs of spotted owls.

A more detailed and comprehensive description of the background and scientific rationale of the Dry Forest Restoration Principles and the need for restoration within the Middle Applegate landscape context is available in the Pilot Joe EA.

The propose action consists of up to 299 acres of commercial treatments and an additional 590 acres of non-commercial treatments (Table 1). A detailed description of the treatment types can be found in Appendix A.

Table 1. Proposed Action by Prescription Type for Commercial and Non-Commercial Treatments. FWS Reference #: 13420-2011-F-0162

Commercial Prescriptions	**Acres**
Variable Density Thin – Douglas-fir series	203
Variable Density Thin – Ponderosa Pine series	96
Total	**299**
Non-commercial Prescriptions	
Density Management – Pine, Douglas-fir, Oak series	590
Grand Total All Treatments	**889**

The District completed and submitted the Assessment prior to the Service finalizing the Revised Recovery Plan for the Northern Spotted Owl (USDI FWS 2011). The revised recovery plan became effective on June 28, 2011.

The Northern Spotted Owl Recovery Plan (UDSI FWS 2008b and 2011), through Recovery Action 32 (RA 32), encourages land managers to maintain and restore older and more structurally complex multi-layered conifer forests; this high quality habitat is important for reducing key threats faced by spotted owls. District staff utilized an interagency methodology (USDA/USDI 2010) to identify forest stands that meet RA 32 criteria during development of the proposed action. The District is not proposing actions in RA 32 type stands.

The Service also recommends conserving occupied spotted owl sites through Recovery Action 10 (RA 10) (USDI FWS 2011). The District is meeting the intent of RA 10, in part, by maintaining the habitat conditions of spotted owl home ranges, specifically nest patches and core-use areas, in the action area through the identification of the LSEAs as described above.

Additionally, the 2011 Revised Recovery Plan recognizes the need to move dry forest systems, like those within the action area, on a path that will develop and retain resiliency,

allowing for the system to adequately respond future changes. The Pilot Joe project is consistent with this premise.

Project Design Criteria

Project Design Criteria (PDC) are conservation measures developed by the Level 1 team to reduce disturbance impacts to listed species (see Appendix B). Disturbance of listed wildlife species 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 birds 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 of target species. Recommended PDC will be incorporated during project implementation when practical.

Monitoring

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 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 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 the year the project is implemented, as defined above. The District will use the monitoring report form found in Appendix B, unless otherwise scheduled by Level 1 team agreement.

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 Assessment, the action area is defined here as all District-administered lands located within the southern portion of the Humbug Creek – Applegate River 6th field sub-watershed south of the Applegate River (the Pilot Joe Project Area) (see map Appendix D), as well as all the lands that collectively comprise the potential home ranges of known spotted owls that may be affected by this project (see Effects to Spotted Owls section of this Opinion).

Federal public lands managed by the District generally occur in a checkerboard pattern, with alternating sections of private lands. All District-managed lands within the action area are designated as Adaptive Management Area (AMA) under the Northwest Forest Plan (NWFP) (USDA FS and USDI BLM 1994a). The action area is located within the Klamath Mountains Physiographic Province (Klamath Province). Forest stands in the action area have

sustained frequent natural disturbances, primarily frequent wildfires, as well as extensive human disturbances, including mining, timber harvest and conversion of forest lands to agricultural purposes.

In general, the action area contains mostly dry Douglas-fir plant associations. Distribution and landscape patterns of plant species and communities are controlled primarily by physical factors of the environment, which include moisture, temperature, light, and soil type (Waring 1969). The Middle Applegate Watershed Analysis (USDI BLM 1995b) describes the vegetative condition in detail. The District's analysis includes the following summary:

> "In general, vegetation density levels are much higher than in the past, especially in conifer forests. Conifer stands in the Middle Applegate also seem to be more homogeneous than in the past. Many trees that are over 200 years old with old-growth characteristics have been killed by the competing, second growth trees. Due to fire suppression and past logging, the ponderosa pine (*Pinus ponderosa*), knobcone pine (*Pinus attenuata*), and incense cedar (*Calocedrus decurrens*) stands are converting to Douglas-fir (*Pseudotsuga menziesii*), the climax species for the majority of the forested area. Douglas-fir is even encroaching upon the edges of the oak woodlands.
>
> Lack of fire in the shrublands has created maximum vegetation stocking levels and an extremely high fire hazard. Tree species have encroached into the shrublands as well. Without treatment vegetation will continue to die and create even more fire fuels. Forest openings (i.e., grass, forbs, herbaceous condition class) in the watershed are at risk. This is due to the invasion of trees, shrubs and exotic plant species such as yellow star thistle (*Centaurea solstitialis*), hedgehog dogtail (*Cynosurus eschinatus*), medusahead rye (*Taeniatherum caput-medusae*), cheatgrass (*Bromus tectorum*), and ripgut brome (*Bromus rigidus*). Fire is the ecological process that maintained these communities historically. However, it is unknown if fire would rejuvenate native plant communities or favor the further encroachment of exotic species.
>
> Trees in the Middle Applegate are growing at the slowest rates since the 1800s. Stand vigor is decreasing because the forest stands are significantly overstocked. Relative density index ratings indicate that stands within the Middle Applegate are at the point of imminent mortality and suppression. Decreases in tree vigor and growth have contributed to the overall decline in forest health.
>
> The Middle Applegate watershed may not be resilient to catastrophic change. Vegetation densities are very high and ladder fuels are abundant. Vegetation mortality is already occurring because of plant competition and expanding bark beetle populations, so the stage is set for stand replacement fires. The replacement of ponderosa pine by Douglas-fir increases the percentage of drought-susceptible trees in the stand. Therefore, the risk of beetle infestation and/or wildfire also increases."

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 (see Figure 3) 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.

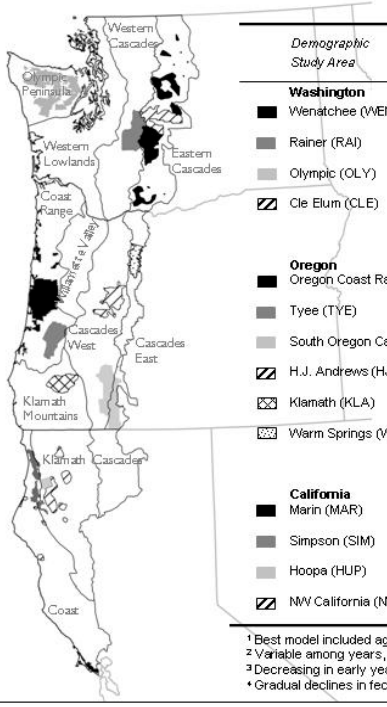
The spotted owl is extirpated or uncommon in certain areas such as southwestern Washington and British Columbia. Timber harvest activities have eliminated, reduced or fragmented spotted owl habitat sufficiently to decrease overall population densities across its range, particularly within the coastal 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, spotted owl demographic study areas, and demographic trends (adapted from Anthony et al. 2006).



Demographic Study Area	Land Ownership	# Owls Banded	Fecundity	Apparent Survival	λ_{R-S}	Population Trend Based on $\Delta\lambda$
Washington						
Wenatchee (WEN)	Mixed	1,200	Declining	Declining	0.917	Declining
Rainer (RAI)	Mixed	217	Stable	Declining	0.896	Declining
Olympic (OLY)	Federal	985	Stable	Declining	0.956	Declining
Cle Elum (CLE)	Mixed	724	Declining[1]	Declining?[2]	0.938	Declining
Oregon						
Oregon Coast Range (COA)	Mixed	1,025	Declining?[1]	Stable	0.968	Declining
Tyee (TYE)	Mixed	1,032	Increasing	Stable	1.005	Stationary
South Oregon Cascades (CAS)	Federal	881	Declining	Stable	0.974	Stationary
H.J. Andrews (HJA)	Federal	1,095	Stable?[3]	Stable	0.978	Declining
Klamath (KLA)	Mixed	1,147	Stable	Stable	0.997	Stationary
Warm Springs (WSR)	Tribal	381	Stable	Stable	0.908	Declining
California						
Marin (MAR)	Federal	96	Stable	Stable	NA	NA
Simpson (SIM)	Private	1,344	Declining[1]	Stable	0.970	Declining
Hoopa (HUP)	Tribal	279	Increasing	Stable	0.980	Stationary
NW California (NWC)	Federal	1,026	Declining	Declining	0.985	Declining?[4]

[1] Best model included age and even-odd year effects, but a competing model had a negative time effect on productivity.
[2] Variable among years, but with a declining trend.
[3] Decreasing in early years, increase in last 5 years, stable overall.
[4] Gradual declines in fecundity and apparent survival, plus estimates of realized population change suggest a decline in last 8 years.

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. (2006a) 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 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 and 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 and 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 and 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 and 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 Safeharbor 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 U.S. Fish and Wildlife 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 and 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 and USDI 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 and 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 – July 13, 2011. 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 July 13, 2011, the Service had consulted on the proposed removal/downgrading of approximately 191,126 acres (Table 2) or 2.58 percent of 7.4 million acres (Table 3) of northern spotted owl suitable habitat on Federal lands. Of the total Federal acres consulted on for removal/downgrading, approximately 162,711 acres or 2.2 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 and 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 (79%), especially within its Klamath Mountains (40%) and Cascades (East and West) (38%) Provinces (Table 5), followed by much smaller habitat losses in Washington (10%) and California (11%) (Table 3). When habitat loss is evaluated as a proportion of provincial

baselines, the Oregon Klamath Mountains (20.3%), Cascades East (12.9%), and the California Cascades (5.85%) all have proportional losses greater than the loss of habitat across all provinces (5.4) (Table 3).

From 1994 through July 13, 2011, habitat lost due to natural events was estimated at approximately 209,132 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 2[7]), 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[7]).

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 July 13, 2011. Wed Jul 13 10:34:52 MDT 2011

Land Ownership	Consulted On Habitat Changes[2]		Other Habitat Changes[3]	
	Removed/ Downgraded	Maintained/ Improved	Removed/ Downgraded	Maintained/ Improved
NWFP (FS,BLM,NPS)	191,126	513,412	209,132	32,907
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	**663,673**	**578,108**	**211,809**	**32,907**

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.

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 472,547 acres (calculated using data in Table 2) 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. Combining effects on federal and non-federal lands, the Service had consulted on the proposed removal of approximately 663,373 acres of spotted owl habitat range-wide, resulting from all management activities, as of July 13, 2011 (Table 2).

Table 3. Aggregate Results of All Adjusted, Suitable 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.

Wed Jul 14 10:41:12 MDT 2011

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	6.3
	Olympic Peninsula	560,217	869	1,711	2,580	299	2,879	0.51	0.72
	Western Cascades	1,112,480	1,681	10,870	12,551	3	12,554	1.13	3.14
OR	Cascades East	443,659	2,500	14,249	16,749	40,884	57,663	12.99	14.5
	Cascades West	2,046,472	3,862	65,946	69,808	24,583	94,391	4.61	23.58
	Coast Range	516,577	447	3,844	4,291	66	4,357	0.84	1.09
	Klamath Mtns	785,589	2,631	55,255	57,886	101,676	159,562	20.31	39.86
	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	1.29
	Coast	51,494	464	79	543	100	643	1.25	0.16
	Klamath	1,079,866	1,546	9,428	10,974	26,885	37,859	3.51	9.46
Total		**7,397,098**	**18,532**	**172,594**	**191,126**	**209,132**	**400.258**	**5.41**	**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 3) 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 6), while the other modeled the eight study areas that are part of the effectiveness monitoring program of the NWFP (Forsman et al. 2011).

Table 4. Spotted owl demographic study areas (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.

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.

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.

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 5 displays the Environmental Baseline of spotted owl habitat in the action area.

Table 5. Environmental Baseline of Spotted Owl Habitats (FWS13420-2011-F-0162).

Environmental Baseline of Spotted Owl Habitats	
Middle Applegate Watershed	**Acres**
Total acres all ownership	11,682
Total acres non-Medford BLM ownership	2,120
Total acres Medford BLM	9,562
Unsuitable	1,537
Dispersal	3,241
NRF	4,784
Total NRF on Non-Medford BLM ownership	261

As stated previously, the proposed action is planned to occur within the Klamath Province. As of July 13, 2011 approximately 626,027 acres of spotted owl NRF habitat occurs within this province (calculated using Table 5 data). Management activities have resulted in the loss of approximately 2,631 acres in reserve areas, and additional 55,255acres of spotted owl NRF habitat in non-reserves in this province. An additional 101,676 acres of spotted owl NRF habitat were lost due to natural events (Table 3) in the Klamath Province.

Fire has played an important role in influencing successional processes and creating diverse forest conditions in the action area. Spotted owl habitat patterns in these drier portions of its range are not continuous, but occurred naturally in a mosaic pattern (USDI FWS 2008a). 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 in a mid or late-seral, closed condition.

It is unknown how spotted owls have responded to effective fire suppression over the last 80 - 100 years. We do know that most spotted owls that currently inhabit the action area occur in the 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. For example, spotted owls in Northern California 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 (Blakesley et al, 1992). The spotted owl nest locations within the action area exhibit a similar pattern and tend to occur lower portion on the slopes. This is likely due to these areas having relatively more stable microclimates, and larger trees with more complex forest structure. 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, which 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*). Both prey items are relatively high in biomass. Woodrats comprised nearly one-third of the prey items in the diet and accounted for nearly half of the biomass. Forsman et al. (2004) found spotted owls in the Klamath Province consumed woodrats at a rate of two to three times higher than most other areas within the range of the spotted owl. As a result, key features of woodrat habitat (typically brushy areas or younger forest stands) strongly influence how spotted owls use the available habitat in the Klamath Province. For example, where woodrats are the primary food source, spotted owls have home ranges that 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. Additionally, Franklin et al. 2000 found that spotted owl habitat fitness, in particular reproduction, seems to benefit from some habitat heterogeneity, which includes edge habitat.

Spotted Owl Sites within the Action Area

The Assessment identifies five historic spotted owl sites, plus three alternate spotted owl site locations (Appendix E). Table 6 displays the known and alternate site locations in the action area, along with the most recent occupancy status for each location. Some of these sites have had no surveys conducted in the recent past, though surveys are currently occurring at these sites.

Table 6. Spotted Owl Site Summary (FWS 134202011-F-0162).

Spotted Owl Site Name	Date of Detection	Site Occupancy Status
Bald Ben	7/03/2003	Pair with two juveniles
Blind Chap	7/11/2002	Pair with one juvenile
Chapman Creek	7/31/1997	Single female
Chapman Creek (other detection location)	6/22/1994	Pair with one juvenile
Keeler Creek	4/23/1999	Single Male
Keeler Creek (alternate)	7/15/1997	Pair with two juveniles
Lime Gulch	5/30/2002	Single female
Lime Gulch (other detection location)	7/25/2001	Pair with two juveniles

Occupancy

Spotted owl sites affected by the proposed action are located in the Klamath Mountains Physiographic Province. According to the Forsman et al. (2011), populations in drier forest systems of southern Oregon and northern California surrounding the Pilot Joe project area had population trend estimates of 1.0 or just less (Table 4) with the confidence intervals overlapped 1.0, suggesting the populations could be stationary. Range-wide, the spotted owl population was declining at an average annual rate of almost three percent (Forsman et al. 2011).

As documented in Davis et al. (2011) for the Klamath Demographic Study Area, just to the north of the Pilot Joe project, 156 spotted owl sites were surveyed to demographic survey protocol in 2010. Spotted owls were detected at 60 percent of the sites visited, indicating a slight decrease in occupancy from the 63 percent detected in 2009 (Horn et al. 2009). Overall, spotted owl site occupancy rate has been in a steady decline since 2002 (Davis et al. (2011).

Reproduction

Forsman et al. (2011) found evidence of 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. Specifically for the Klamath study area, fecundity was shown to be declining through time (Table 4).

Barred Owls

As discussed in the *Status of the Species* section, the 2008 and 2011 Recovery Plans for the Northern Spotted Owl (USDI FWS 2008b) identified competition from the barred owl (*Strix varia*) as a pressing 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 out competing northern spotted owls for habitat and food (USDI FWS 2008b). 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 (Forsman et al. 2011). In some areas, as many of 60 percent of the spotted owl sites have barred owls detected; specifically for the Klamath study area, approximately 30 percent of the spotted owl sites have 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).

As explained in the Assessment, barred owl detections on the District have generally occurred opportunistically; however, these detections indicate there is a trend of increasing numbers of barred owls within the District boundary, following a similar pattern to the surrounding demographic study areas. According to the Assessment, barred owls have not been observed in the action area, but have been detected in adjacent watersheds.

Recent information (Dugger et al 2011 *in press*) indicates that site extinction rates for spotted owls increased with decreased amounts of old forest at the site core 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.

Role of the Action Area in Spotted Owl Survival and Recovery

Under the conservation strategy set forth in the NWFP and affirmed in the 2011 Revised Recovery Plan for the Northern Spotted Owl (USDI FWS 2011), the action area, which occurs within the AMA land use allocation, is intended to provide for spotted owl dispersal between habitat blocks reserved for breeding spotted owls.

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 is the basis for the federal contribution to spotted owl recovery.

EFFECTS OF THE ACTION

Background Information

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.

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), which consists of

specific vegetation and structural components (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 (NRF), 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 on more than simply forest structure. Important variables such as slope aspect, elevation and distance from streams interact with forest structure in attaining spotted owl habitat and use patterns. The District identified spotted owl habitats in the action area based on forest structure alone. Because of this, anticipated affects may represent an over-estimation of actual affects because some areas proposed for treatment may not have the suite of habitat variables that better support spotted owl use of an area.

Effects to Spotted Owls

The District has identified five known spotted owl sites as well as one alternate site location in the action area (Table 7) (Appendix E). Collectively, the proposed action will include commercial harvest of up 889 acres; however, 185 acres is considered unsuitable spotted owl habitat. Approximately 298 acres of NRF habitat will have both treat and maintain (123 acres) and downgrade activities (175 acres). Approximately 406 acres of dispersal-only habitat will have a prescription of treat and maintain.

NRF Treat and Maintain

A treat and maintain prescription is generally a light-to moderate thinning that takes into account the site-specific silvicultural needs of the stand and the retention of spotted owl habitat features. For those activities that treat and maintain (123 acres) spotted owl NRF habitat (Table 8), the prescriptions, if implemented as intended, should provide for the appropriate amount of canopy cover (at least 60 percent) and other attributes of spotted owl habitat such as multiple canopy

layers, down wood, snags, and hardwoods. This should result in having the stand continue to function as NRF habitat post-treatment as well as providing for prey-habitat needs (see Effects to Prey section below). While there are no experimental studies currently available relating spotted owl response to thinning in NRF habitat, there are observational accounts that provide support to the relationship of spotted owl use of thinned NRF habitat (Solis 1983, Forsman et al. 1984, King 1993, Anthony and Wagner 1998, Hicks 1999, and Irwin et al. 2010). However, a case study conducted by Meiman et al (2003) did show potential negative effects due to thinning of dispersal and/or foraging quality habitat to one owl that was radio-tracked in the Oregon Coast Range. Habitat amount and condition are dissimilar between the Pilot Joe project area and the Oregon Coast Range, with relatively more favorable habitat conditions occurring in southwest Oregon. Therefore, the Service anticipates a different outcome in response to treat and maintain thinning in the Pilot Joe project.

The Service anticipates NRF habitat post-treatment will continue to function as it did pre-treatment. This because key habitat elements will be retained along with observational accounts of continued spotted owl site fidelity and stand use at sites post-treatment. Accentuating factors also include that no treatments will occur in higher quality spotted owl habitat (RA 32 type habitat) and nest patches will not be impacted, though a few limited treatments will occur in core-use areas. Based on this information, it is the opinion of the Service that treat and maintain activities *may affect, but will not adversely affect spotted owls.*

NRF Downgrade

As mentioned above, approximately 175 acres of NRF habitat will be downgraded within the home range of five spotted owl sites as well as within the core area of one historic spotted owl site (Tables 7 and 8).

Table 7. Effects to Spotted Owl Sites at the Nest Patch, Core Area, and Home Range due to Activities that Downgrade Spotted Owl NRF Habitat (FWS Reference #: 13420-2011-F-0162).

	NEST PATCH (300M)		CORE AREA (0.5 MILES)		HOME RANGE (1.3 MILES)	
	CURRENT NRF ACRES (% NP)	POST NRF ACRES (% NP)	CURRENT NRF ACRES (% CORE)	POST NRF ACRES (% CORE)	CURRENT NRF ACRES (% HR)	POST NRF ACRES (% HR)
CHAPMAN CREEK[1]						
FEDERAL NRF ONLY	70 (100)	70 (100)	374 (75)	355 **(71)**	1369 (40)	1276 **(38)**
BALD BEN[1]						
FEDERAL NRF ONLY	46 (66)	46 (66)	234 (47)	234 (47)	1823 (54)	1697 **(50)**
BLIND CHAP[1]						

	NEST PATCH (300M)		CORE AREA (0.5 MILES)		HOME RANGE (1.3 MILES)	
	CURRENT NRF ACRES (% NP)	POST NRF ACRES (% NP)	CURRENT NRF ACRES (% CORE)	POST NRF ACRES (% CORE)	CURRENT NRF ACRES (% HR)	POST NRF ACRES (% HR)
FEDERAL NRF ONLY	67 (95)	67 (95)	372 (70)	372 (70)	1508 (44)	1459 **(43)**
LIME GULCH						
FEDERAL NRF ONLY	43 (61)	43 (61)	221 (44)	221 (44)	1590 (47)	1590 (47)
KEELER CREEK (ORIGINAL SITE)[1]						
FEDERAL NRF ONLY	56 (80)	56 (80)	244 (49)	244 (49)	1372 (40)	1283 **(38)**
KEELER CREEK (ALTERNATE SITE B)						
FEDERAL NRF ONLY	69 (99)	69 (99)	323 (64)	323 (64)	1699 (50)	1699 (50)

[1] Represents spotted owl sites with NRF habitat downgrade; bold text indicates at which scale.

In downgrading NRF habitat as proposed by the District, the Service anticipates adverse effects will occur. This is because best available information indicates spotted owls need a certain amount of habitat within the various spatial scales comprising the home ranges so as to provide the resources necessary to meet essential life functions [Thomas et al. 1990, Courtney et al. 2004, Seattle Audubon Society et al. v. Sutherland et al. Civ. No. C06-1608MJP (D.W. Wa August 1, 2007)]. In general, as the amount of habitat in an owl's home range decreases, so does site occupancy, reproduction and survival (Courtney et al. 2004). To assess the potential effects of habitat removal 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. As with any evaluation, local site specific conditions, such as elevation, topography survey information should factor into such an analysis.

At the home range scale, the available science (Bart and Forsman 1992, Bart 1995, Forsman et al. 2005) suggests that as the amount of habitat in an owl's home range decreases, so does site occupancy, reproduction, and survival. Bart and Forsman (1992) found that areas with less than 20 percent suitable habitat had few owls and less reproductive success than areas with more suitable habitat. In 1995, Bart re-analyzed his prior data, and concluded that spotted owl reproduction and survival decreased as habitat decreased from 40 to 20 percent. While the threshold amounts of habitat needed to support spotted owls is uncertain, the studies cited above and summary information provided in USDI/USDA 2008, suggest that the removal of NRF habitat to below 40 percent of the median annual home range area is likely to adversely affect spotted owls. Based on these studies, habitat coverage of at least 40 percent or higher at the

home range scale is likely necessary for maintaining spotted owl life history functions. If a proposed action will reduce the amount of NRF habitat within a home range to less than 40 percent, incidental take, through harm, of the spotted owl(s) occupying that home range is considered to be likely.

Stepping down to spotted owl core-use areas, Rosenberg and McKelvey (1999) reported that spotted owls are "central place" animals with the core area (the area closest to the nest) being the focal area. Recently developed habitat-fitness and landscape models have demonstrated the importance of habitat amount within core areas. For example, Meyer et al. (1998) examined landscape indices associated within spotted owl sites versus random plots on BLM lands throughout Oregon. Across provinces, landscape indices highly correlated with the probability of spotted owl occupancy included the percent older forest (30 percent) within the 500 acres surrounding the site. Zabel et al. (2003) found for their northwest California study that the highest probability of owl occupancy occurred when the core area was composed of 69 percent nest/roosting habitat. Bart (1995) found that core areas should contain 30-50 percent mature and old growth forest. Franklin (pers. comm.) found that the proportion of good to medium to lesser quality habitat for owl cores in northwest California was approximately 60:30:10 percent. Lastly, Dugger et al. (2005) showed that when owl core areas in their southern Oregon study area had at least 50-60 percent older forest habitat, spotted owl fitness (i.e., survival and reproduction) was relatively higher than in core areas with lesser amounts. Based on the above studies and summary information contained in USDI/USDA 2008, it is the Service's view that 50 percent or higher of NRF habitat within a 0.5 mile radius should be considered as likely necessary to maintain spotted owl life history functions. If the amount of NRF habitat within a specified core-use area is less than 50 percent, incidental take, through harm, of the spotted owl(s) occupying that core area is considered likely.

The nest patch is the smallest spatial use scale used for spotted owl effects analysis. Available information as summarized in USDA/USDI 2008 provides rationale for the importance of nest patches. Similar to the home range and core-use areas, removal of habitat in the immediate vicinity of the spotted owl nest patch is generally considered to likely cause incidental take of the spotted owl.

The following text details the anticipated impacts to each of the affected spotted owl sites in the action area.

Chapman Creek

Approximately 567 acres of treatments are proposed within the home range of the Chapman Creek spotted owl site. NRF and dispersal-only habitat treat and maintain activities comprise the majority (84 percent) of treatment. Approximately 121 acres of NRF habitat and 295 acres of dispersal-only habitat will be treated and maintained within the Chapman Creek home range. Whereas, two percent (93 acres) of NRF habitat will be downgraded to dispersal-only habitat at the home range scale and four percent (19 acres) of NRF habitat would be downgraded to dispersal-only habitat at the core scale. There are no treatments of any type proposed at the nest patch.

The non-commercial treatments that will occur within Chapman Creek home range are designed to reduce vegetative competition and fuel loading. Strategic locations within the home range

were selected during landscape planning so as to reduce fuel hazards that: 1) are in close proximity to private lands and low elevation valley areas where human caused fires typically start, and 2) in locations that will break up the continuity of fuels across the landscape and provide a short term reduction in fuel hazard between and around the high value LSEAs located within the action area.

Overall at the Chapman Creek site, approximately 17 percent of the home range and 32 percent of the core area will be treated over the course of implementation. However, implementation of each treatment type is expected to occur across multiple years, so only a portion of the final treatment is expected to occur in any given year.

Bald Ben

Approximately 578 acres of treatments are proposed within the home range of the Bald Ben spotted owl site. Treat and maintain activities in spotted owl NRF and dispersal-only habitat comprise the majority (78 percent) of treatments; whereas up to 126 acres (four percent) of NRF habitat will be downgraded to dispersal-only habitat at the home range scale. There are no treatments proposed that will result in a downgrade of NRF habitat at the core or nest patch scales (Table 7).

Up to 145 acres of non-commercial treatments (unit 31-14NC) within the core area as well as 18 acres at the nest patch is proposed. The existing habitat where these treatments are proposed consists mostly of dispersal-only (75 percent) or unsuitable (13 percent) habitat; the small amount of NRF habitat receiving treatment (12 percent) is located at the margins of the treatment unit, within the core area of this site. This area was previously treated for fuel hazard reduction under a previous project called Appleseed in 1998. Under this proposal, it is being scheduled as maintenance treatment to once again reduce fuel hazard within this strategic location.

During development of this project, a comprehensive field evaluation and discussion occurred between the Service and District staff related to the habitat quality across the treatment area, including the nest patch area, and the potential effects from the proposed treatment to existing habitat structure. From this, it was determined that the proposed treatments would likely have insignificant impact to existing habitat, and would not alter prey availability or overstory canopy cover. In addition, 10-20 percent of the hand-piles that will be generated from these treatments will not be burned. This will likely result in providing cover and food resources for land-based spotted owl prey species. Overall, these treatments would result in beneficial effects by reducing the continuity of fuels across the treatment area and provide a short term reduction in fuel hazard between and around the high value LSEAs located within the action area. Although these treatments may minimally affect habitat at the Bald Ben site, the District will implement mandatory PDC, which will restrict potential disturbance effects during the critical breeding season, thus providing an additional measure to minimize any negative effects from this treatment to the Bald Ben spotted owl site.

Blind Chap

Approximately 134 acres of treatments are proposed within the home range of the Blind Chap spotted owl site. While 63 percent of forest activities in the home range of this site would treat and maintain spotted owl dispersal-only habitat, up to 49 acres of NRF habitat would be

downgraded to dispersal-only habitat at the home range scale. There are no treatments proposed at the core or nest patch scales within the Blind Chap spotted owl site. The downgrading of 49 acres of NRF habitat at the home range scale will result in a reduction in available NRF habitat at the Blind Chap site by approximately one percent (44 to 43 percent) (Table 7). All proposed treatments will occur at the periphery of the home range and no treatments are proposed at the core or nest patch scale.

Lime Gulch

Approximately 128 acres of treatments are proposed within the home range of the Lime Gulch spotted owl site, all of which will treat and maintain the existing NRF or dispersal-only habitat. Therefore, habitat amount post-project will remain at pre-project level within the Lime Gulch (Table 7). No treatments are proposed at the core or nest patch scales.

The Lime Gulch spotted owl site is located in an adjacent sixth field watershed, which is outside of the project area, but the home range of this site extends into the project area (Appendix E). Therefore, the site was analyzed in conjunction with the proposed action. The Service concurs with the District's biologists conclusions that the treatments will have an insignificant impact on the Lime Gulch spotted owls. This reasoning is due to the results of past surveys showing fairly strong fidelity of detections to the Lime Gulch core area. From a habitat use perspective, spotted owls generally use habitat more on the lower slopes whereas the proposed action treatment areas are farther upslope, suggesting likely limited use by spotted owls. Lastly, the treatment areas are well within the core-use area of the adjacent Bald Ben spotted owl site. This would suggest that these treatments would actual little effect to the spotted owls at the Lime Gulch site due to the territorial and nearest –neighbor avoidance behavioral responses by spotted owls.

Keeler Creek

According to the Assessment, the Keeler Creek site consists of three separate nest stands where spotted owl nesting activity has been documented. Because the distance between the Keeler Creek Original nest stand and the Keeler Creek Alternate B nest stand is over one mile apart, it is possible that both sites could be used by separate pairs of spotted owls in the same year. Therefore, for the purposes of this analysis, District biologists included both the original site and alternate site B in the effects analysis. Information on the habitat and treatments within both of these sites is given below.

Keeler Creek Original

Spotted owl habitat on the private land to the east of the Keeler Creek Original nest area was extensively harvested starting the spring of 1994 through fall of 1995. Subsequently, no spotted owls have been detected by District biologists at the Keeler Creek Original nest site, despite multiple years of survey effort.

In total, 330 acres of treatments are proposed within the home range of the Keeler Creek Original spotted owl site. The majority of these treatments (73 percent) will treat and maintain spotted owl NRF and dispersal-only habitats, however 89 acres of NRF habitat will be downgraded to dispersal-only habitat at the home range scale. No treatments will result in a downgrade of

habitat at the core or nest patch scales. Table 8 displays the anticipated changes to spotted owl NRF habitat at this site.

Keeler Creek Alternate B

The most recent documented spotted owl activity for the Keeler Creek site has been concentrated at the Keeler Creek Alternate B site, with successful breeding documented in 1994 and 1997 and occupancy through 1999. Survey history suggests that this alternate location is most likely of any of the historic Keeler Creek nest locations to be used by spotted owls. This is further supported by the detection of a single male spotted owl at the Alt B nest stand during the 2011 this field season (USDI BLM 2011).

In total, 57 acres of treatments are proposed at the Keeler Creek Alternate B spotted owl site, all of which will treat and maintain spotted owl dispersal-only habitat at the periphery of the home range; NRF habitat will not be treated. No treatments are planned to occur at the core or nest patch scales; therefore, no overall change to the amount of NRF habitat is expected at this site.

Summary of Effects to Individual Spotted Owl Sites

For the Chapman Creek and Keeler Creek Original spotted owl sites, it is the Service's opinion that downgrading of spotted owl NRF habitat, which will reduce extant NRF habitat below 40 percent at the home range scale, may result in reduced site occupancy and habitat-fitness of spotted owls for the reasons provided above (however see discussion below). For these reasons, the Service believes that this action may affect, and is likely to adversely affect spotted owls at these two sites.

Specific the Keeler Creek Original site, the proposed action includes the downgrade of up to 89 acres of NRF habitat within the home range. Although this downgrade will result available habitat being reduced to below 40 percent (Table 7), adverse effects to spotted owls are not anticipated because: 1) survey results have not detected spotted owls, 2) timber harvest on non-federal lands adjacent to this site may have altered site suitability, and 3) the District biologist believes spotted owls that used this site historically have moved to a new site center, located approximately 1.2 miles from the original site center. For these reasons, the Service believes that spotted owls are not present in making the effects determination.

While NRF habitat downgrade is planned to occur within the home range of the Bald Ben and Blind Chap sites, implementation will not reduce the amounts of NRF habitat below the 40 percent (Table 7). Additionally, there will not be any activities that downgrade NRF habitat at the core area or nest patch of any of these three sites. Therefore, the Service believes the proposed action may affect, but is not likely to adversely affect spotted owls at these three sites.

For the Keeler Creek alternate site B, the proposed action does not include any treatments within NRF habitat. All planned activities will treat and maintain spotted owl dispersal-only habitat, or will occur in unsuitable habitat, and will occur at the outer edge of the home range for this site. Therefore, the Service believes implementation of the proposed action may affect and is not likely to adversely affect spotted owls at this site.

Effects to Spotted Owl NRF Habitat

The proposed action consists of commercial and non-commercial thinning projects (Table 1) that, when implemented, will treat up to 889 acres, some of which do not consist of spotted owl habitat. Of the 889 acres, the proposed action will affect up to 298 acres of spotted owl NRF habitat (Table 8) and an additional 406 acres of spotted owl dispersal-only habitat (Table 9). The remaining 185 acres (of the 889 total acres) will take place in areas that do not consist of spotted owl habitat. Table 8 displays the anticipated changes to spotted owl habitat in the action area.

Table 8. Effects to Spotted Owl Habitats in the Action Area (FWS Ref. #: 13420-2011-F-0162).

Habitat Type	Pre-project Acres	Number of Downgrade Acres	Number of Treat and maintain acres	Post-Project Acres	Percent Change
NRF	5,045	175	123	4,870	-3.5%
Dispersal-only	3,504	0	406	3,679	+4.8%
Unsuitable	3,133	0	185	3,133	0
Total	11,682	175	714	11,682	NA

NRF Treat and Maintain

The proposed action includes commercial and non-commercial harvest activities that will treat and maintain up to 123 acres (Table 8) (14 percent of the 5,045 total acres of NRF habitat in the action area) of spotted owl NRF habitat. The function of NRF habitat in these post-treatment areas is anticipated to remain similar with pre-treatment condition. The Service has determined the implementation of forest restoration treatments that result in the maintenance of up to 123 acres of spotted owl NRF habitat associated with the proposed action *may affect, but is not likely to adversely affect* spotted owls because:

- Canopy cover within spotted owl NRF habitat proposed for treatment will be retained at or above 60 percent which, according to the generally accepted definition of spotted owl NRF habitat, is the minimum canopy closure at which spotted owls would likely continue to use these stands as NRF habitat due to the maintenance of concealment cover from predators and micro-habitat conditions ameliorating weather conditions.
- Decadent woody material in the treatment area, such as large snags and down wood, which provide key habitat elements for spotted owl prey species will remain post-treatment.
- Multi-canopy, diverse tree species composition, and uneven-aged tree structure present prior to treatment will be retained, thus providing cover from predators, nesting opportunities, hunting perches, and prey species habitat.
- No spotted owl nest trees will be removed.

NRF Downgrade

The proposed action does not include the removal of any NRF habitat. The proposed action does however include treatments that would result in the downgrade of up to 175 acres of NRF habitat, which represents approximately four percent of the 5,045 acres of NRF habitat (federal and non-federal) in the action area (Table 8). Only a small portion of the NRF habitat in the action area is located on private lands (261 acres) so the contribution from private is almost immaterial, but if private lands are excluded in this calculation, then the Proposed Action would result in a 3.7 percent decrease in the total NRF habitat in the action area.

Besides the reduction of NRF habitat by almost four percent, the Service has determined the proposed downgrading of up to 175 acres of spotted owl NRF habitat, planned to occur within the action area, *may affect, and is likely to adversely affect* spotted owls for the following reasons:

- Harvest prescriptions that result in the downgrade of spotted owl NRF habitat may eliminate key habitat elements, including large diameter tree with nesting cavities or platforms, multiple canopy layers, adequate forest cover, as well as hunting perches used by spotted owls.
- Implementation of treatments that downgrade spotted owl NRF habitat have the potential to reduce nesting, roosting, foraging and dispersal opportunities in the action area.
- Loss of habitat has the potential to reduce future reproduction and survival of young spotted owls in the action area through the reduction of habitat-fitness potential.

2011 Revised Northern Spotted Owl Recovery Plan

District staff utilized the local interagency methodology (USDA/USDI 2010) to identify forest stands that meet RA 32 criteria prior to implementation of the proposed action. The proposed action does not include any proposed treatments in stands that meet the local RA 32 criteria.

The Service also recommends conserving occupied spotted owl sites through Recovery Action 10 (RA 10) (USDI FWS 2011). The District completed its Assessment prior to the Service finalizing the recovery plan; therefore, it was not aware of this recovery action in their planning. The District however is meeting, the intent of RA 10, in part, by maintaining the habitat conditions of spotted owl home ranges, in particular, at the nest patch and core area scales through the use of the LSEAs.

Additionally, the recovery plan recognizes the need to move dry forest systems, like those within the action area, on a path that will develop and retain resiliency, allowing for the system to adequately respond future changes. The key to developing resiliency is to restore inherent forest structure and composition, as well as to re-integrate the relationship between forest vegetation and the disturbance regimes (Holling 1996, USDI FWS 2011). The Pilot Joe project is consistent with this direction.

Effects to Spotted Owl Dispersal-only Habitat

Implementation of the proposed action will treat and maintain up to 406 acres of spotted owl dispersal-only habitat in the action area (Table 8). Collectively, these activities represent up to

12 percent of the 3,504 acres of dispersal-only habitat in the action area, and up to 4.75 percent of the total amount of dispersal habitat in the action area, which is the sum of 5,045 acres of NRF habitat plus 3,504 acres of dispersal-only habitat. The proposed action does not include the removal of any spotted owl dispersal-only habitat.

It is the Service's opinion that the maintenance of up to 406 acres of spotted owl dispersal habitat associated with the proposed action *may affect, but is not likely to adversely affect* spotted owls because:

- Canopy cover in treated stands will be maintained at 40 percent, a value found to be important for spotted owl dispersal across the landscape (Thomas et al 1990), helping to ameliorate microclimate conditions and providing concealment cover against predators.
- Decadent woody material, such as large snags and down wood that provide habitat for the prey species of dispersing spotted owls will retained post-harvest; therefore helping to keep prey abundant and available to dispersing spotted owls.
- The proposed treatments are planned to occur on a relatively small amount, approximately four percent, of the area; the amount and distribution of remaining habitat we believe will be sufficient to facilitate dispersal conditions. Analysis conducted by Lint et al. 2005 suggested that dispersal conditions in the Klamath Province were not limiting.
- Prescriptions are intended to include areas of "skips and gaps" helping to provide refugia for prey and dispersing spotted owls.
- The prey base, as measured in total small-mammal biomass within these treated areas, is not expected to significantly change following treatment (Converse et al. 2006) because the proposed prescriptions will retain habitat used by spotted owl prey species in the action area.
- These treatments will reduce tree density to increase individual tree vigor, leading to increased stand resistance to insects, diseases, and wildfire. This will make the residual habitat healthier and more ecologically-sustainable over time; and
- The proposed treatments will be dispersed throughout the action area, which will minimize the potential for negatively affecting spotted owl dispersal opportunities across the action area.

Effects to Spotted Owl Prey

Effects to spotted owl prey species are likely to occur due to the implementation of the proposed action. However, quantifying those impacts is somewhat problematic due to limited to no information on prey species abundance in the action area. Studies elsewhere have shown variations of prey availability across different stands within the range of the spotted owl, we presume this is likely reflected in the Middle Applegate watershed as well.

As provided above, northern flying squirrels and woodrats (*Neotoma cinerea* and *N. fuscipes*) are the co-dominate prey items in the diet of spotted owls for this action area, with woodrats comprising the bulk of the diet biomass (Forsman et al. 2004). While some reports suggest negative impacts of forest thinning on flying squirrels abundance and survival (Wilson 2010, Holloway and Smith 2011), there is also some counter information (neutral to beneficial) as to these effects (e.g., Gomez et al. 2005, Ransome et al. 2004, Waters and Zabel 1995). Compounding the lack of local information in ascertaining effects to prey is the difficulty of

trying to compare the multitude of thinning prescriptions in these studies to the proposed action. Hence, our qualification of potential impacts to northern flying squirrels in particular.

For woodrats, Lehmkuhl et al. 2006 reported that some management activities could reduce woodrat populations unless prescriptions can mitigate the loss of snag, mistletoe and down log cover. Conversely, some authors have described beneficial effects to dusky-footed woodrats due to shrub development in thinned stands (Sakai and Noon 1993, Suzuki and Hayes 2003).

Specific to the Pilot Joe Project, the downgrade of spotted owl NRF habitat will occur. These treatments may have short-term negative effects (such as reduced number of denning sites, or reduced foraging opportunities) on the prey population present within the treatment areas as a result of changes to habitat structure and the reduction of the existing canopy cover within the treatment areas. The remaining acres of non-commercial treatments are expected to minimally alter the forest structure and any potential negative effects associated with these treatments should be limited to mostly disturbance. Some minor changes in prey availability may occur as cover is disturbed and animals move around in the understory.

The proposed action also incorporates 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. Planned prescriptions also require the retention of all existing snags and coarse wood, which also provide key habitat elements for many prey species. The retention of these features should further reduce any negative affects to spotted owl prey species within planned treatment areas.

Treatment implementation would be spread out temporally and spatially within the action area, which would 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.

In summary, it is difficult to quantify the effects to spotted owl prey. While the proposed action will likely have some short-term impacts to prey on a small portion of the action area, it does include design elements to lessen impacts across the entire action area. These beneficial elements include: maintaining high canopy cover and tree species diversity, retention of snags and down logs and character trees, incorporating islands of skips and gaps and temporal and spatial spacing of the treatments. These elements, along with findings that woodrats, which are early and late seral habitat species and provide the bulk of the biomass in spotted owl diets, and observations (provided above) that spotted owls will retain some site fidelity post-treatment, collectively contribute to lessening the impacts of the proposed action on spotted owl prey.

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.

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

Implementation of the proposed action will downgrade spotted owl habitat at five spotted owl sites (Table 7); however, only two sites will have habitat reduced below 40 percent. As discussed above (Effects to Spotted Owls), a reduction in NRF habitat is anticipated to have negative effects on spotted owl occupancy (numbers), survival, and reproduction. The Service anticipates reduce habitat fitness (Dugger et al. 2005) may delay the ability of spotted owls to achieve reproduction levels that will replace themselves. Reduced fitness may also exacerbate conditions of moving and searching for a new territory potentially causing the adults to be exposed to a greater predation risk (Courtney et al 2004, page 2-8) than that which the adult spotted owls experienced within their established territories.

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 and provided above, 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 the Assessment provided information regarding the amounts of spotted owl NRF habitat that exists on non-federal lands within the affected spotted owl home ranges (Table 7), no mechanism exists to track the timing and extent of spotted owl NRF 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

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. We reached this conclusion because: 1) we anticipate the action area will continue to fulfill its role in the survival and recovery due to retention of the majority of currently occupied or un-surveyed spotted owl habitat in the action area, 2) in large part, impacts are avoided and/or minimized in spotted owl nest patches and core areas, 3) no impacts will occur in RA 32 habitat, and 3) the District is currently conducting spotted owl surveys within the action area and will use this information as it becomes available to avoid and minimize impacts at these sites. Collectively, the conservation measures included in the proposed action along with NWFP (USDA FS and USDI BLM 1994a) standards and guidelines being implemented, these conditions are expected to provide for sufficient habitat conditions enabling spotted owl survival and recovery.

Although this Opinion provides for the incidental take of the spotted owl, the proposed action represents restoration-based forest management as described in the 2011 Revised Recovery Plan for the Northern Spotted Owl. The Service believes that strategically developed active forest management will provide more resilient forest habitats in the face of climate change and other stressors, which in turn has the potential to conserve spotted owl habitat on the landscape for longer periods of time. We believe the Pilot Joe project offers conservation benefits to the spotted owl through strategic placement of treatment units and retention of late-successional emphasis areas. It should also benefit the ecosystem by enhancing ecological function and processes, leading to a more resilient system in the Middle Applegate watershed. One of the stated purposes of the Endangered Species Act is "to provide a means whereby the ecosystems upon which endangered and threatened species depend may be conserved." The Pilot Joe project is consistent with this direction.

The Service has determined implementation of the proposed action will not adversely affect designated critical habitat for the spotted owl because the proposed action will not occur within critical habitat designated in 2008.

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 anticipates the incidental take of one spotted owl site, Chapman Creek, (with the potential to take up to two adult and up to 1.5 juvenile spotted owls), due to the implementation of activities that reduce the amount of NRF habitat below 40 percent at the home range scale. This take is expected to occur in the form of harm due to the likelihood of reduced habitat fitness negatively effecting breeding, feeding and sheltering of spotted owls at this site. Although the Effects of the Proposed Action section above includes a finding that implementation of the proposed action has the potential to adversely affect spotted owls at the Keeler Creek Original site, the Service does not believe these adverse effects rise to the level of take for reasons stated in that section (page 46).

Effect of Take

In the accompanying Opinion, the Service determined that this level of anticipated take is not likely to jeopardize the continued existence of the spotted owl.

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 B). 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 spotted owl site status.

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.

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 spotted owl sites (or other listed species) were not analyzed in the Assessment, if the project area changes from what was originally analyzed in the Assessment, if a site has moved, or other information is inconsistent with what is authorized, the District will coordinate with project proponents, contractors, managers, local biologists and the Level 1 team to ensure the project impacts remain consistent with the 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, 2021.

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APPENDIX A. PROJECT TREATMENT DESCRIPTIONS (COPIED FROM THE ASSESSMENT).

The following is a summarized description of all treatment types proposed under the Pilot Joe Project. A more extensive and complete description of these treatments is available in the Pilot Joe EA (USDI BLM 2011). Appendix A provides a table of all the proposed treatment types for each unit in the project. Figure 2 in Appendix E shows the location of all the proposed commercial and non-commercial treatments within the action area, and includes unit labels that can be cross-referenced with the table in Appendix A to derive a unit by unit treatment description and the spatial location of each treatment type.

Silvicultural Objectives and Dry Forest Prescriptions

All of the prescriptions included under the Pilot Joe Project were designed to achieve the following over-arching objectives:

- Conserve and improve survivability of older trees (trees >150 years of age) by reducing nearby fuels and competing vegetation.
- Increase resistance/resilience of forest stands and landscape to wildfire, drought, insects, etc. by reducing stand densities, ladder fuels, and shifted tree species diversity.
- Restore more sustainable structure and composition by reducing stand densities and enhancing tree diversity, including hardwoods, and desirable understory species.
- Accelerate development of structural complexity such as larger tree structures and decadence.
- Develop spatial heterogeneity within stands (e.g. fine-scale structural mosaic).
- Create conditions that are favorable for the initiation, creation, and retention of snags, down wood, large vigorous hardwoods, and understory vegetation diversity in areas where these are lacking

The implementation of these objectives within the project units will be accomplished by BLM personnel, with oversight from the Ashland Resource Area's silviculturist and wildlife biologist, to ensure that stands are marked according to the silvicultural prescriptions. Silvicultural prescriptions are based on the range of desirable conditions by plant series in accordance with the Applegate Adaptive Management Area Ecosystem Health Assessment (Atzet 1995). Basal area ranges are a general guideline to reduce the risk of insect attack, improve vigor, and restore and promote large early seral species (Atzet 1995).

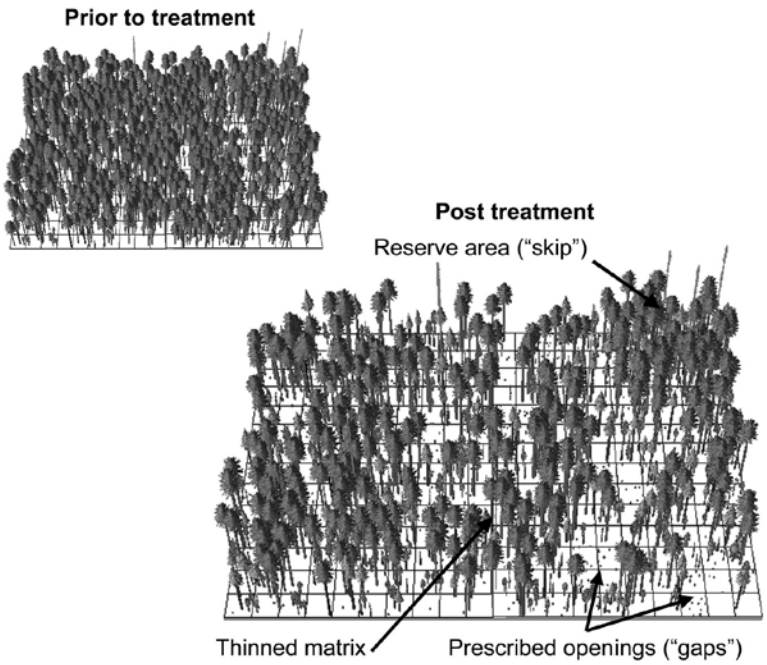
The treatments proposed under the Pilot Joe Project are categorized into two categories: commercial and non-commercial treatments.

Commercial treatments – Variable Density Thinning

The silvicultural prescriptions for this project are designed to restore dry forest stands to site conditions of spatially heterogeneous characteristics. The silvicultural strategy that will be applied to achieve the desired dry forest restoration goals include the use of variable-density management. This uneven-aged management approach encourages the creation of spatial heterogeneity and structural mosaics characteristic of dry forest stands. Stand level features that are desired include a diversity of age class and species within the forest canopy. Variable-density thinning (VDT) for

this project will combine thinning with gaps and skips (untreated patches) to replicate historical patterns commonly found in mixed species and mixed-age stands (Talyor and Skinner 2003). The thinned matrix or the area between skips and gaps will be thinned proportionally or from below (illustration 1).

Illustration 1. Visual of a stand before and after thinning with skips and gaps.



Elements of the VDT prescription call for:

Retaining the older trees (conifer and hardwood) and improving their survival potential by eliminating nearby competing vegetation and ground/ladder fuels.
Retaining other key structural/compositional elements in the stand.
Leaving areas in the stand untreated ("skips") to provide:
- diversity in structural conditions (e.g. heavily shaded areas);
- desirable snag and down wood features;
- hiding cover and break up visuals (e.g., for wildlife); and
- Protection of sensitive areas (e.g., seeps, rock outcrops)

Thinning the remainder of stand (after old tree protection and skips) to :
- Favor more drought-and fire-tolerant tree species;
- Protect hardwood species with high wildlife value (many require removal of some dominant/co-dominant [but never old] conifers);
- Increase the average diameter of the residual stand; and
- Reduce overall stocking levels to a target basal area or density.

Creating some small openings for intolerant tree regeneration (e.g. pines) and plant if seed sources are limited or absent.
Treating activity fuels, such as by broadcast burning or pile-and-burn; and
Enhancing heterogeneity and avoid creating homogeneity within a stand.

Ponderosa Pine/Oak Sites (Ponderosa Pine Series)

These are areas with southerly or easterly aspects and shallow soils where pine species are best adapted. These stands may have developed a substantial component of Douglas-fir as a result of fire exclusion and stands have become overstocked with all condition classes of vegetation. These sites are also identified by the presence of ponderosa pine, black or white oak, and white-leaf manzanita (either live or dead) in the understory. They are typically small in size and found on dry ridges and low elevations with Douglas-fir mortality occurring. The goal on these sites is the retention of large ponderosa pine and the subsequent development of young pine. Specifically, the VDT prescription on ponderosa pine / oak sites aims to achieve the following goals:

- Leave 60-80 ft² basal area per acre at the stand level.
- Reduce competing vegetation from around healthy pines, oak, and incense cedar to ensure their survival.
- Protect exceptional hardwoods (oak trees 10 inches dbh and larger, madrone trees 16 inches dbh and larger with full live crown ratios of 30% or greater).
- Leave all codominant and dominant pine, cedar, and oak; suppressed individuals can be cut.
- Leave SKIPS (15% +/-) to provide visual barriers, hiding cover, protect seeps and intermittent channels, etc.

Douglas-fir Sites (Douglas-fir Series)

Dry Douglas-fir stands are typically found on west, southwest, east, and southeast aspects in Douglas-fir plant associations. Douglas-fir is the predominant conifer species and ponderosa pine is often present in these stands. The goal on these sites is the retention and release of the larger and older conifers and hardwoods, and to increase the spatial heterogeneity of the species composition and the forest structure. Treatment of activity fuels following completion of thinning activity is an essential component of this prescription. Specifically, the VDT prescription on dry Douglas-fir sites aims to achieve the following goals:

- Leave 60-120 ft² basal area per acre at the stand level. Low basal areas (e.g., 60-80 sq ft.) are acceptable in the “driest” Douglas-fir plant associations where the goal is to restore a pine and oak component within the stand.
- Protect exceptional hardwoods.
- Leave all codominant and dominant pine, cedar, and oak; suppressed individuals can be cut.
- Leave SKIPS (+/-15% of the treatment area) to provide dense/shaded forest patches as habitat, hiding cover, and visual barriers; and ecologically significant patches, such as seeps, rock outcrops, and hardwood groves.
- Provide GAPS (+/-15% of the treatment area) to create some larger (1/2 to 2 acre) open areas to the extent of about 1 acre opening every 6 or 7 acres (or ~(+/-15% of the treatment area) for establishing pine regeneration and other understory components. Complete removal of overstory is not encouraged; i.e., generally leave some scattered trees behind.

Low density planting of fire resilient or drought tolerant species may be utilized in such gaps, where seed sources are limited or absent. The objective is to maintain a multi-aged and mutli-species mix of drought tolerant and fire resilient species in dry forest stands. Planting would increase species and structural diversity. Following initial treatment (variable-density thinning) units would be assessed for planting needs based on the available planting space and lack of species diversity in the stand. Tree planting spacing would be clumped and random, rather than evenly spaced. Seedlings would be planted no more than 100 trees per acre and planting sites would be dictated by microsite conditions.

Non-commercial Treatments – Understory Reduction

Understory vegetation in stands prescribed for variable-density thinning would be treated using manual techniques (slashing) to desired tree densities. The objective is to maintain a multi-layered mix of conifer, hardwood and shrub species that would occur in the dominant plant series. Conifer, hardwood, and shrub spacing widths and reservation will vary depending on site conditions and plant community.

Understory vegetation density would be reduced by cutting and spacing Douglas-fir <8" DBH, Pacific madrone <6" DBH, and canyon-live oak <4" DBH. Spacing widths may vary from 15 to 25 feet for Douglas-fir and 25 to 35 feet for Pacific madrone and canyon-live oak. Within this range, the wider spacing would be used for species such as pine or oak, which thrive in less dense conditions. These species will be spaced off trees ≥8" DBH and within the driplines of ponderosa pine and sugar pine ≥8" DBH. The spacing of conifers will be independently spaced from hardwoods. Vegetation diversity would be obtained by maintaining species occurring at low frequencies in the stand (i.e. incense cedar, sugar pine, white oak). All shrub species other than whiteleaf manzanita, buckbrush and deerbrush ceanothus will be reserved from cutting. All conifer and hardwood species other than Douglas-fir, Pacific madrone, and canyon-live oak are reserved from cutting, unless pine trees need drip-line treatment, than black oak <6" DBH will be cut. Canyon-live oak and black oak will generally not be cut unless appropriate for the plant community. In some stands all hardwoods will be reserved. Refer to the density management prescription below for the required reserve (no cut) vegetation for understory reduction. The slash created from the understory reduction treatment, including harvest activity slash, could be hand-piled and burned (HP/B) or underburned (UB).

Non-commercial Treatments – Density Management

Density management is used to accomplish forest health thinning and fuels reduction treatments in conifer forests, hardwood woodlands, and shrublands. Density management consists of cutting small trees (generally less than 8 inches diameter) and vegetation with chainsaws and disposing of the material by hand-piling and burning or use of a lop and scatter method in lighter fuels. The objective of the density management prescription is to increase tree growth rates and promote horizontal and vertical structural diversity in stands, and reduce fuels and fire hazard adjacent to conifer stands. Density management is also used in stands where pines and shade intolerant hardwood species are diminishing in vigor and numbers because of overcrowded stand density conditions.

Conifer, hardwood, and shrub spacing widths will vary depending on site conditions and plant community. Spacing widths may vary from 15 to 25 feet for conifers and 25 to 45 feet for hardwoods and shrubs. Within this range, the wider spacing would be used for larger leave trees or for species such as pine or oak which thrive in less dense conditions. Hardwoods ≥6" DBH and conifers ≥8" DBH are reserve vegetation and shall not be cut. These trees shall be included in spacing requirements. A minimum of ¼- to ½-acre "skips" or no-treatment areas (15%+/- at the stand level) would be untreated to further facilitate diversity. Plant buffers, hardwood areas, rock out-crops, wet areas, and areas with large woodrat nests would contribute to or serve as these leave areas. Pre-existing small openings experiencing encroachment would be targeted first to restore open patches. Thinning treatment should maintain species composition similar to the potential vegetation or dominant plant association for the site. Retained stems per acre will vary widely, ranging from 70-200 trees per acre. When considering a group of conifer trees for thinning, select leave trees by the following order of species preference, sugar pine, ponderosa pine, incense cedar, Douglas-fir, and white fir. When considering a group of hardwood trees for thinning, select leave trees by the following order of species preference, black oak, canyon live oak, and Pacific madrone. Depending on plant community one or more species may be reserved from cutting (see below). Vegetation reserved from cutting will always be maple species, dogwood, pacific yew, silk tassel, hazel, willow, and oceanspray, regardless of spacing (i.e., not included in spacing or considered leave trees). No removal of white oak, mountain mahogany and manzanita >12" single stem at one foot above ground. Any species of conifer, hardwood or shrubs considered as rare (less than 5% coverage) within the entire unit shall be left. The slash created from the density management treatment could be handpiled and burned (HP/B) or underburned (UB).

APPENDIX B. PROJECT DESIGN CRITERIA (PDC)

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 A-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 A-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.

		Annual Effects (Number by Fiscal Year)					
	Disturbance Effects	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						

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

Section II & III: General Note and Comments

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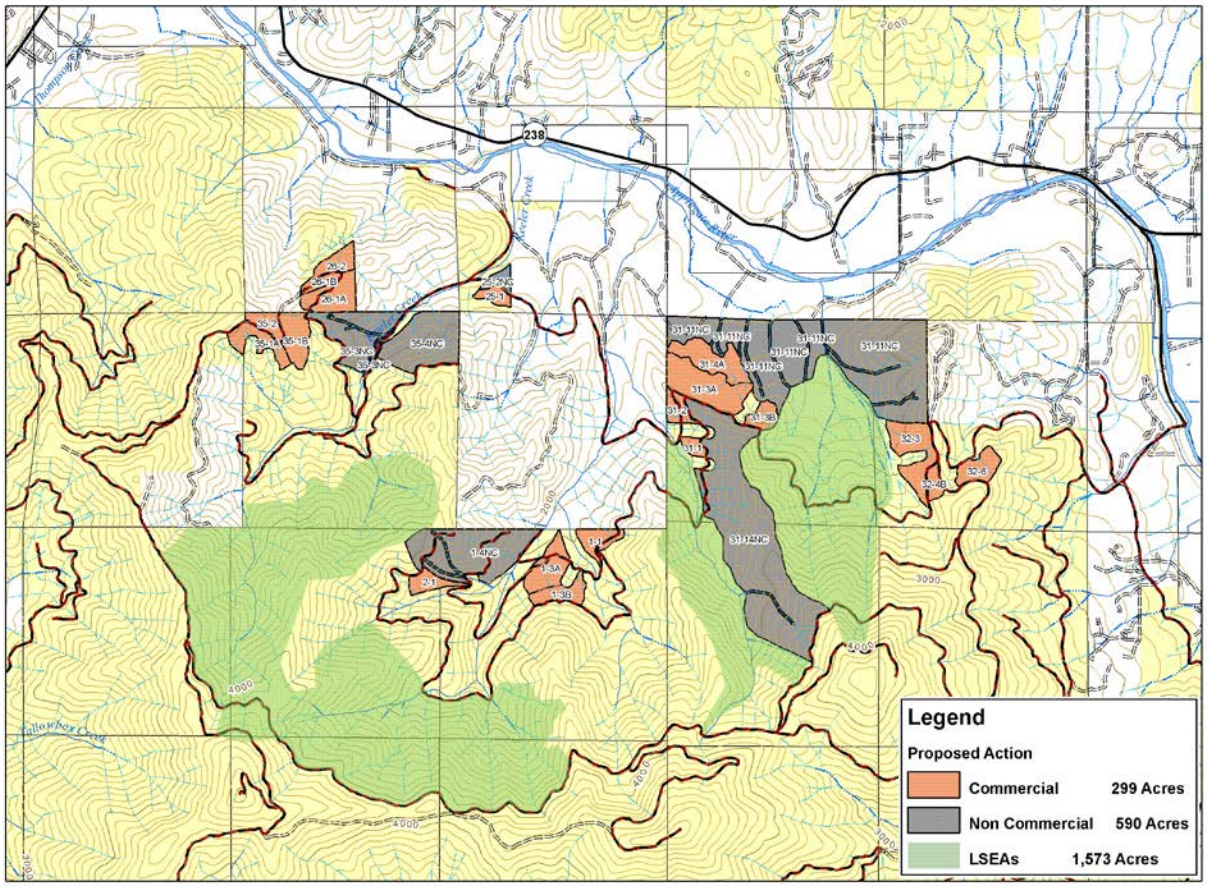
APPENDIX D. Map of the Action Area (copied from the Assessment).



APPENDIX E. Map of Spotted Owl Sites in the Action Area (copied from the Assessment).