United States Department of the Interior

FISH AND WILDLIFE SERVICE

Roseburg Field Office
2900 NW Stewart Parkway
Roseburg, Oregon 97471
Phone: (541) 957-3474 FAX: (541)957-3475

In Reply Refer To: 8330.F0124(11)
Filename: MBLM Evans Creek Formal
Tails #: 13420-2011-F-0124
TS#: 11-734

May 31, 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 timber harvest, fuels reduction, small diameter thinning and road construction/renovation activities associated with the Evans Creek Planning area, 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-0124).

This document transmits the Fish and Wildlife Service's (Service) biological opinion (Opinion) based on our review of proposed timber harvest and associated 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 March 29, 2011, in our office on April 1, 2011.

The enclosed Opinion includes a finding that implementation of the proposed action would not jeopardize the continued existence of the spotted owl. According to the Assessment, the proposed action will not occur within designated critical habitat for the spotted owl (USDI FWS 2008a).

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: Carole Jorgensen, Medford District BLM, Medford, Oregon (e)
Dave Clayton, Rogue River – Siskiyou National Forest, Medford, Oregon (e)
Brendan White, FWS-OFWO, Portland, Oregon (e)
Office Files, FWS-OFWO, Portland, Oregon (e)

Biological Opinion on timber harvest, fuels reduction, small diameter thinning and road construction/renovation activities associated with the Evans Creek Planning area, 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-0124)

U.S. Department of the Interior
U.S. Fish and Wildlife Service
Roseburg Field Office
May 31, 2011

Signature: Jim Thrailkill

Jim Thrailkill
Field Supervisor

Date Signed: May 31, 2011

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CONSULTATION HISTORY

The Rogue Basin level 1 team met on January 5, 2011 to review projects, and in March 2011 to review a draft biological assessment for the Evans Creek planning area.

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 number OR-M050-2010-0019.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

As described in the Assessment, which is herein incorporated by reference, the proposed action includes six individual timber harvest projects and up to 0.2 miles of new road construction (Table 1). All projects included in the proposed action are planned to occur within the matrix land use allocation, as defined in the Northwest Forest Plan (NWFP) (USDA FS and USDI BLM 1994a). According to the Assessment, the District has planned the projects to provide a sustainable supply of timber and forest products while managing for a healthy forest ecosystem. The District will utilize a combination of cable and tractor yarding systems to implement timber harvest operations. All proposed harvest units will receive post-harvest fuels treatments, designed to reduce potential increases in fuel loading. These activities include fuels reduction treatments, such as biomass removal, selective slashing, hand pile burning, as well as follow-up maintenance under burns, all planned to occur within 7-10 years post-harvest. All fuels reduction treatments will occur within the footprint of the individual harvest units.

For this proposed action, the District has decided to avoid older and more structurally complex, multi-layered conifer forests (USDI BLM 2011), identified as important to the recovery of spotted owls per recovery action (RA) 32 of the Recovery Plan for the Northern Spotted Owl (USDI FWS 2008b). District biologists conducted on-the-ground investigations with a purpose of identifying forest stands that meet the definition of RA 32 using the January 2010 draft methodology (USDI BLM et al. draft 2010).

Table 1. Proposed Actions. FWS Reference #: 13420-2011-F-0124

Project Name[1]	Number of Timber Harvest Acres	Physiographic Province	Number of Road Construction Miles	Treatment Type
Evans Creek Fifth Field Watershed				
Evans Sardine	198	Klamath Mountains	0	Dry Forest Restoration timber harvest/activity fuels treatments
Evans Stew	1,140	Klamath Mountains	0	Stewardship
Musty Evans	84	Cascades West	0	Dry Forest Restoration timber harvest/activity fuels treatments
Musty Evans	406	Klamath Mountains	0.2	Dry Forest Restoration timber harvest/activity fuels treatments
Pleasant Fielder	267	Klamath Mountains	0	Dry Forest Restoration timber harvest/activity fuels treatments
Skeleton Mountain	765	Klamath Mountains	0	Dry Forest Restoration timber harvest/activity fuels treatments
Slick Battle	268	Klamath Mountains	0	Dry Forest Restoration timber harvest/activity fuels treatments
Trail Creek Fifth Field Watershed				
Musty Evans	24	Cascades West	0	Dry Forest Restoration timber harvest/activity fuels treatments
Musty Evans	10	Klamath Mountains	0	Dry Forest Restoration timber harvest/activity fuels treatments
Upper Cow Creek Fifth Field Watershed				
Musty Evans	124	Klamath Mountains	0	Dry Forest Restoration timber harvest/activity fuels treatments
Skeleton Mountain	14	Klamath Mountains	0	Dry Forest Restoration timber harvest/activity fuels treatments
Total	**3,300**		**0.2**	

[1] Individual projects may have units that occur in more than one watershed/physiographic province.

Timber Harvest

Dry Forest Restoration: The Assessment defines timber harvest activities designed to meet the objectives of restoring dry forest ecosystems as follows:

> "The objective of forest restoration is to increase landscape resiliency to environmental disturbances (i.e. fire, insects, disease, and climate change). Removing smaller trees and vegetation that compete with the dominant and co-dominant trees for nutrients and water would reduce stand densities. All trees 150 years or older and all of the largest hardwoods would be retained. Leaving small un-thinned patches and creating small openings would achieve structural diversity within stands. Un-thinned patches and modified small

openings would range in size from .1 to .25 acres and occupy 10-15 percent of the stand acreage."

"Treatment acres would have a minimum of 60 percent canopy closure left in nesting, roosting, foraging (NRF) habitat in active home ranges of northern spotted owls (defined in the Assessment as locations with evidence of continued use by spotted owls, including breeding, repeated location of a pair or single birds during a single season or over several years, presence of young before dispersal, or some other strong indication of continued occupation. A spotted owl site may include one or more alternate nest sites) and existing snags and course woody material (CWM) would be retained. Snags that have to be felled for safety reasons would be left on site for CWM. Prescribed burning would be avoided in treat and maintain NRF acres. Outside of the active home ranges of the spotted owl, a minimum of 40 percent canopy closure would be reserved within treated stands."

Selective Slashing: understory vegetation density will be reduced by cutting and spacing of conifers less than eight inches diameter at breast height (dbh) and hardwoods less than 12 inches dbh. Retained vegetation would be spaced 14 to 45 feet apart. Untreated vegetation groups ranging in size from 0.1 to two acres will be retained in each treatment unit.

Hand Piling and Burning: typically used when under-burning is not possible due to heavy fuel loads. Sticks one to six inches in diameter and longer than two feet will be piled by hand.

Understory Burning (under-burning): used where the objective is to maintain greater than or equal to 80 percent of the overstory. Typically, burning occurs between fall and spring outside of the breeding season for spotted owls.

Small Diameter Thinning: Prescriptions will vary depending on stand type and age, relative density, canopy cover and location on the landscape. Tree removal treatments consist of thinning from below, generally of trees smaller than 16 inches dbh. In stands of trees 80 years or older, no trees greater than 16 inches dbh will be removed.

Project Design Criteria

Project design criteria (PDC) are conservation measures developed to reduce impacts to listed species. PDC may include implementation of seasonal restrictions that reduce impacts during critical breeding seasons of listed species, retention of known nest trees and/or restricting activities within a certain distance of known sites to reduce impacts of disturbance. According to the Assessment, the District has decided to apply mandatory PDC to all activities associated with the proposed action. Recommended PDC will be incorporated during project implementation when practical. Detailed descriptions of the PDC are provided in Appendix A.

Conservation Measures

According to the Assessment, the District considered the following information in the design of the projects included in this proposed action:

- Spotted owl habitat assessments (using maps, aerial photographs, and on-the-ground surveys).
- Red tree Vole, mollusk, great grey owl and spotted owl surveys.
- Surveys to identify the locations of sensitive plants.
- Assessment of historic spotted owl survey data.
- Tracking locations and nesting success of banded spotted owls.
- Tree stand exams.
- Identification of fragile soils.

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 B). 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 has been 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) (USDI FWS 1992a). For the purposes of this Opinion, the action area includes all treatment units within spotted owl home ranges; including areas subject to increased ambient noise levels caused by activities associated with the proposed action (see the disturbance distances described below in the *Description of the Proposed Action* section of this document). The term analysis area is also used in this document to describe the larger geographic area within which the action area occurs, and at which scale the District conducted the effects analysis for the proposed action.

Activities included in the proposed action are planned to occur within the Klamath Mountains and Cascades West Physiographic Provinces in southwest Oregon, and are dispersed among three fifth field (hydrologic unit) watersheds (watersheds). Federal public lands managed by the District generally occur in a checkerboard pattern, with alternating sections of private lands.

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 1983a, b). 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 2008a). 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 1990a). The range of the spotted owl is partitioned into 12 physiographic provinces (see Figure 1) based on recognized landscape subdivisions exhibiting different physical and environmental features (USDI FWS 1992b). 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).

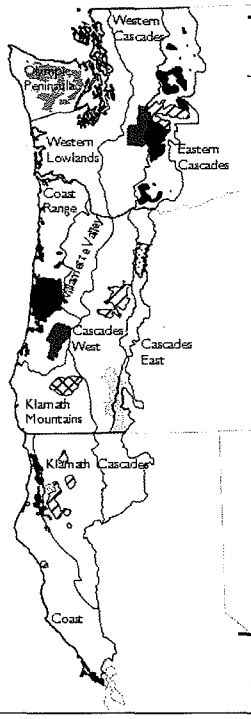
Behavior

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. 2006a).



Demographic Study Area	Land Ownership	# Owls Banded	Fecundity	Apparent Survival	$\lambda_{m,s}$	Population Trend Based on $\Delta\lambda$
Washington						
Wenatchee (WEN)	Mixed	1,200	Declining	Declining	0.917	Declining
Rainier (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 1994a). 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 homerange), 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 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 1992a). 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. 2006a), 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. 2002b). 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 1992a). These threats were characterized for each province as severe, moderate, low or unknown (USDI FWS 1992a) (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 2004a), 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 2008a). 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 1990a). 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 NSOs 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, b). 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 1994b)) 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. 2006a) 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 Final Recovery Plan for the Northern Spotted Owl (USDI FWS 2008a) (recovery plan). The recovery plan identifies 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 2008a). To address these threats, the present recovery strategy has the following three essential elements: barred owl control, dry-forest landscape management strategy, and managed owl conservation areas (MOCAs) (USDI FWS 2008a). The recovery plan lists recovery actions that address research of the competition between spotted and barred owls, experimental control of barred owls to better understand the impact the species is having on spotted owls, and, if recommended by research, management of barred owls (USDI FWS 2008a). The foundation of the plan for managing forest habitat in the non-fire-prone western Provinces of Washington and Oregon is the MOCA network on federal lands, which are intended to support stable and well-distributed populations of spotted owls over time and allow for movement of spotted owls across the network (USDI FWS 2008b). On the fire-dominated east side of the Cascade Mountains in Washington and Oregon, and the California Cascades, the dry-forest habitat management strategy is intended to maintain spotted owl habitat in an environment of frequent natural disturbances (USDI FWS 2008a). Additionally, the recovery plan identifies Conservation Support Areas (CSAs) in Washington, the west side of the Cascades in Oregon, and in California. These CSAs are located on private, state, and federal lands and are expected to support the MOCA network and the dry-forest landscape management approach (USDI FWS 2008a). In addition, the recovery plan recommends a research and monitoring program be implemented to track progress toward recovery, inform changes in recovery strategy by a process of adaptive management, and ultimately determine when delisting is appropriate (USDI FWS 2008a). The three primary elements of this program include 1) the monitoring of spotted owl population trends, 2) an inventory of spotted owl distribution, and 3) a comprehensive program of barred owl research and monitoring (USDI FWS 2008a). The recovery plan estimates that recovery of the spotted owl could be achieved in approximately 30 years (USDI FWS 2008a).

Conservation Efforts on Non-Federal Lands

In the report from the Interagency Scientific Committee (Thomas et al. 1990), the draft recovery plan (USDI FWS 1992b), 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 2008a). 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 2008a). 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 1992b).

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. The three spotted owl-related HCPs 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 2008a).

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 2008a).

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 1992b). 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 1994b) 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 – April 15, 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 April 15, 2011, the Service had consulted on the proposed removal/downgrading of approximately 188,971 acres (Table 2) or 2.5 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 160,566 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 3), 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 (5.5%) all have proportional losses greater than the loss of habitat across all provinces (5.4) (Table 3).

From 1994 through April 15, 2011, habitat lost due to natural events was estimated at approximately 207,262 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 4[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 April 15, 2011.

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Land Ownership	Consulted On Habitat Changes[2]		Other Habitat Changes[3]	
	Removed/ Downgraded	Maintained/ Improved	Removed/ Downgraded	Maintained/ Improved
NWFP (FS,BLM,NPS)	188,971	512,961	207,262	5,481
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	**661,743**	**577,657**	**209,939**	**5,481**

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 USFWS 2001 and subsequent effects reported in the Northern Spotted Owl Consultation Effects Tracking System (web application and database.)
3. Includes effects to suitable NRF habitat (as generally documented through technical assistance, etc.) resulting from wildfires (not from suppression efforts), insect and disease outbreaks, and other natural causes, private timber harvest, and land exchanges not associated with consultation.

Table 3. Aggregate Results of All Adjusted, 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.

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Physiographic Province[2]		Evaluation Baseline[3]	Habitat Removed/Downgraded[4]					% Provincial Baseline Affected	% Range-wide Effects
			Land Use Allocations			Habitat Loss to Natural Events[7]	Total		
		Total	Reserves[5]	Non-Reserves[6]	Total				
WA	Eastern Cascades	706,849	4,522	6,392	10,914	14,307	25,221	3.57	6.37
	Olympic Peninsula	560,217	869	1,711	2,580	299	2,879	0.51	0.73
	Western Cascades	1,112,480	1,681	10,870	12,551	3	12,554	1.13	3.17
OR	Cascades East	443,659	2,500	14,249	16,749	40,884	57,663	12.99	14.55
	Cascades West	2,046,472	3,697	63,941	67,638	24,583	92,221	4.51	23.27
	Coast Range	516,577	527	3,844	4,371	66	4,437	0.86	1.12
	Klamath Mountains	785,589	2,631	55,200	57,831	101,676	159,507	20.3	40.26
	Willamette Valley	5,658	0	0	0	0	0	0	0
CA	Cascades	88,237	0	4,820	4,820	4	4,824	5.47	1.22
	Coast	51,494	464	79	543	100	643	1.25	0.16
	Klamath	1,079,866	1,546	9,428	10,974	25,340	36,314	3.36	9.16
	Total	**7,397,098**	**18,437**	**170,534**	**188,971**	**207,262**	**396,233**	**5.36**	**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 USFWS 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.

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 335,362 (Table 4) acres of habitat on non-federal lands. Most of these losses have yet to be realized because they are part of large-scale, long-term HCPs. Combining effects on federal and non-federal lands, the Service had consulted on the proposed removal of approximately 642,475 acres of spotted owl habitat range-wide, resulting from all management activities, as of November 5, 2010 (Table 4).

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 1990a). 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. 2006a and Forsman et al. *in press* 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 7), while the other modeled the eight study areas that are part of the effectiveness monitoring program of the NWFP (Forsman et al. *in press* 2011).

Table 4. Spotted owl demographic study areas (adapted from Forsman et al. *in press* 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. *in press* 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. *in press* (2011). Forsman et al. *in press* (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. *in press* 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. *in press* (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. *in press* 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. 2006a. Forsman et al. *in press* (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 2008a). 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.

The Assessment included the following (Table 5), describing the Environmental Baseline of spotted owl habitat in the action area by fifth field watershed.

Table 5. Environmental Baseline of Spotted Owl Habitats.
FWS Reference #: 13420-2011-F-0124

Environmental Baseline of Spotted Owl Habitats	
Evans Creek Fifth Field Watershed	**Acres**
Total acres all ownership	143,279
Total acres non-Medford BLM ownership	84,013
Total acres Medford BLM	59,266
Non-habitat	823
Capable	17,957
Dispersal	14,066
NRF	26,420
Total NRF on Non-Medford BLM ownership	21,894
Other Federal NRF	618
Non-Federal NRF	21,276
Trail Creek Fifth Field Watershed	**Acres**
Total acres all ownership	35,309
Total acres non-Medford BLM ownership	20,449
Total acres Medford BLM	14,860
Non-habitat	796
Capable	3,191
Dispersal	2,598
NRF	8,275
Total NRF on Non-Medford BLM ownership	7,045
Other Federal NRF	2,081
Non-Federal NRF	4,964
Upper Cow Creek Fifth Field Watershed	
Total acres all ownership	47,436
Total acres non-Medford BLM ownership	37,771
Total acres Medford BLM	9,665
Non-habitat	502
Capable	2,780
Dispersal	1,089
NRF	5,294
Total NRF on Non-Medford BLM ownership	24,469
Other Federal NRF	17,428
Non-Federal NRF	7,041

The proposed action is planned to occur within the Klamath Mountains and Cascades West Physiographic Provinces. As of April 15, 2011 approximately 626,082 acres of spotted owl NRF

habitat occurs within the Klamath Mountains province (calculated using the data found in Table 3). Management activities have resulted in the loss of approximately 2,631 acres in reserve areas, and additional 55,200 acres 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. The Cascades West physiographic province currently is comprised of approximately 1,954,251 acres of spotted owl NRF habitat (calculated using the data found in Table 3), of which management activities have removed or downgraded approximately 3,697 acres in reserve areas, and approximately 63,941 acres in non-reserves. In addition, approximately 24,583 acres have been lost due to natural events.

Spotted Owl Sites within the Action Area

There are 63 spotted owl sites within the Action Area, with 11 of these being estimated sites (USDI/USDA 2008) (Table 6).

Table 6. Environmental Baseline for Spotted Owl Sites in the Analysis and Action Areas. FWS Reference #: 13420-2011-F-0124

Watershed	Number of Known Spotted Owl Activity Centers within the Affected Watershed Boundaries (analysis area)*			
Evans Creek	**50**			
Trail Creek	**10**			
Upper Cow Creek	**9**			
Status of Known and Estimated Spotted Owl Sites in the Action Area				
Site Type	**Active**	**Unoccupied**	**Status Unknown/Survey Results Pending**	**Total**
Historic Sites	36	14	2	**52**
Estimated Sites	0	1	10	**11**
Total	**36**	**15**	**12**	**63**

*According to the Assessment, this number represents spotted owl sites that primarily occur on federal lands managed by the District, and some sites that occur on federal lands managed by the Forest Service.

Occupancy

Spotted owl sites affected by the proposed action are located in the Klamath Mountains and Cascades West Physiographic Provinces. According to the Forsman et al. (2011, *in press*), populations in both the Klamath and South Cascades demography study areas, considered representative of spotted owl populations in the Klamath Mountains and South Cascades physiographic provinces, each had population trend estimates of less than 1.0 (Table 4); however, the confidence intervals overlapped 1.0, suggesting the population could be stationary. Range-wide, the spotted owl population was declining at an average annual rate of almost 3 percent (Forsman et al. 2011, *in press*). Forsman et al. (2011, *in press)* attempted to illustrate how annual population changes influenced trends in population numbers by estimating realized population changes for each study area. Based on these estimates, populations of territorial owls on the Klamath and South Cascades study areas declined from five to 15 percent from study

initiation, but confidence intervals for these estimates substantially overlapped 1.0, and precision of the estimates was not sufficient to detect such small declines.

As displayed in Table 1, the majority (3,192 acres) of the proposed action will occur within the Klamath Mountains physiographic province. As documented in Davis et al. (2011) for the Klamath Demographic Study Area, 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).

Within the Cascades West physiographic province and for the South Cascades Study Area, (Dugger et al. 2011), biologists surveyed 170 spotted owl sites during the 2010 survey season. Of those 170 sites, spotted owls were detected at 79 (46.5 percent) sites. This percentage represents an increase of two percent over 2009 survey results, which represented the lowest percentage (45 percent) of occupied sites recorded.

Reproduction

Forsman et al. (2011, *in press*) 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 and Southern Cascades study areas, fecundity was shown to be declining through time for both areas (Table 4).

Barred Owls

As discussed in the *Status of the Species* section, the 2008 Final Recovery Plan for the Northern Spotted Owl (USDI FWS 2008b) identifies competition from the barred owl (*Strix varia*) as an important threat to the spotted owl. Barred owls are native to eastern North America, but during the past century, have moved westward, arriving in the Pacific Northwest a couple of decades ago and settling into spotted owl habitat. Since barred owls are less selective about the habitat they use and the prey they feed on, they are 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 press*). In some areas, as many of 60 percent of the spotted owl sites have barred owls detected; specifically for the Klamath and South Cascades study areas, approximately 30 percent of the spotted owl sites have barred owls in recent years. Forsman et al. (2011, *in press*) found evidence barred owl detections were important sources of variation and had negative effects on spotted owl apparent survival and recruitment. Barred owls are attributed to a decline in spotted owls (Forsman et al. 2011, *in press*).

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 been observed in and

around the action area. During spotted owl surveys conducted within the past four years, barred owls were detected at six historic spotted owl sites in the action area.

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 the 2008 Spotted Owl Recovery Plan, the action area, which occurs within the matrix 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 along with the strategy outlined in the Spotted Owl Recovery Plan is the basis for the federal contribution to spotted owl recovery, even in light of spotted owl population declines and threats from such things as barred owls and West Nile virus.

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 vegetational 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, 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).

Effects to Spotted Owls

The Service uses the guidance of 40 percent NRF habitat at the scale of a spotted owl home range to determine if incidental take of the spotted owl is likely to occur when habitat is removed by a timber harvest action. If a proposed action will reduce the amount spotted owl NRF habitat within a provincial home range to less than 40 percent, incidental take of the spotted owl(s) occupying that home range is considered to be likely. The best available information and professional judgment of spotted owl experts support a finding that under those conditions the nesting, foraging, or roosting behavior of affected spotted owls is likely to be disrupted to the degree that harm is likely (USDI/USDA 2008). For similar reasons, the Service has used 50 percent NRF habitat at the scale of a spotted owl core area (500 acres - 0.5 mile radius circle around the activity center) to determine if timber harvest actions are likely to cause take of the spotted owl (USDI/USDA 2008). If the amount of NRF habitat within a specific core area equals less than 250 acres, take of spotted owls may occur. Any habitat removal at or in the immediate vicinity of a spotted owl nest patch (which equals approximately 70 acres) is generally considered by the Service to likely cause take of the spotted owl (USDI/USDA 2008).

The Service believes that this section 7 analysis construct is useful to determine potential effects because of spatial use patterns exhibited by spotted owls. As with any evaluation, local site specific conditions, such as elevation, topography survey information should factor into such an anaylysis.

The District has identified 52 known and 11 estimated spotted owl sites in the action area (Table 6). Collectively, implementation of the proposed action will result in the downgrade of up to 55 acres of spotted owl NRF habitat, portions of which will occur within the provincial home range of four individual spotted owl sites (Table 7). In addition, activities that would treat and maintain 441 acres of spotted owl NRF habitat will occur within the home range of 26 of the 63 sites, as well as within the one half-mile core-use area of seven of the 63 spotted owl sites.

Treat and Maintain

For those activities that treat and maintain (441 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 down wood, snags, hardwoods, etc. thus accommodating spotted owl and 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, Irwin et al. 2010, and Hicks 1999). However, a case study conducted by Meiman et al (2003) did show potential negative effects due to NRF thinning to one owl that was radio-tracked in the Oregon Coast Range. The study areas mentioned above, except Anthony and Wagner, all have northern fly squirrels as the primary prey item, whereas in the action area, both flying squirrels and woodrats are the co-dominate prey items (Forsman et al. 2004). Therefore, spotted owls in southwest Oregon are afforded a more diverse large-prey food source which may result in enhanced energetic benefits.

Spotted owls in southwest Oregon also have relatively smaller home ranges (Thomas et al. 1990, Courtney et al. 2004) which may reflect the broader prey base (Zabel et al. 1995) and more habitat heterogeneity within their ranges. These condition results in spotted owls using a patchier environment in the drier forest system found in southern Oregon relative to elsewhere in species range. For the reasons of large-prey variety/availability, thinning prescriptions maintaining important elements of spotted owl habitat, and observational findings of spotted owl use of thinned NFR habitat, the Service anticipates continued function of NRF habitat post-treatment within the action area. Additionally, none of the proposed NRF thinning treatments will occur in nest patches and with only a few occurring in core-use areas. Much of the treatments will be conducted away from these important spatial use areas. Based on this information, it is the Service's opinion that the treat and maintain activities *may affect, but will not adversely affect spotted owls.*

As mentioned above, approximately 55 acres of NRF habitat will be downgraded at four spotted owls sites (Table 7).

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-0124

	NEST PATCH (300M)		CORE AREA (0.5 MILES)		HOME RANGE (1.3/1.2 MILES)		SALES AFFECTING SITES
	CURRENT NRF ACRES (% NP)	POST NRF ACRES (% NP)	CURRENT NRF ACRES (% CORE)	POST NRF ACRES (% CORE)	CURRENT NRF ACRES (% HR)	POST NRF ACRES (% HR)	
SITE # 11G (BLM)							
ALL NRF	**43 (61)**	**43 (61)**	**186 (37)**	**182 (36)**	**1,293 (38)**	**1,277 (38)**	**SKELETON MOUNTAIN (KLAMATH)**
FEDERAL NRF ONLY	43 (61)	43 (61)	164 (33)	160 (32)	775 (23)	759 (22)	
SITE # 25G (BLM)							
ALL NRF	**9 (12)**	**9 (12)**	**211 (42)**	**211 (42)**	**1360 (40)**	**1357 (40)**	**MUSTY EVANS (KLAMATH)**
FEDERAL NRF ONLY	8 (11)	8 (11)	144 (29)	144 (29)	692 (20)	689 (20)	
SITE # 27G (BLM)							
ALL NRF	**37 (52)**	**37 (52)**	**137 (27)**	**137 (27)**	**1004 (29)**	**1,001 (29)**	**MUSTY EVANS (KLAMATH)**
FEDERAL NRF ONLY	35 (50)	35 (50)	101 (20)	101 (20)	350 (10)	347 (10)	
SITE # 40320 (BLM)							
ALL NRF	**65 (93)**	**65 (93)**	**425 (85)**	**425 (85)**	**2,018 (59)**	**2,002 (59)**	**SKELETON MOUNTAIN (KLAMATH)**
FEDERAL NRF ONLY	65 (93)	65 (93)	336 (67)	336 (67)	1,542 (45)	1,526 (45)	

As detailed in the Assessment, three of the spotted owl sites displayed in Table 7 (11G, 25G, AND 27G) represent estimated sites established using the Methodology for the Estimation of Effects to Northern Spotted Owls (USDI/USDA 2008). Spotted Owl NRF habitat currently exists at or below the guidance thresholds at the core and home range scales at these three estimated sites, and one to two percent of spotted owl NRF habitat is planned to be affected at each individual site (Table 7). To better inform harvest planning, the District has completed protocol (1 of 2 years) surveys of these three sites during the 2010 field survey season, and plans to complete surveys during the 2011 field season. If spotted owl occupancy is determined within

the provincial home range of these estimated sites, the District plans to modify planned activities to avoid and/or minimize any potential adverse effects to newly detected spotted owls at these three sites.

Site number 4032O represents a known spotted owl site. Current amounts of spotted owl NRF habitat are above the guidance amounts at both the home range and core area scales (see Background Information in the Effects of the Proposed Action section above). The District has monitored this site annually since 1993; with confirmed reproduction last occurring in 2002, and non-nesting inferred in 2003 and 2004. A single male was detected at this site in 2005, and no spotted owls were detected from 2006 through 2010. A barred owl was detected at this site in 2007 and in 2010. The District plans to continue protocol surveys at this site through the 2011 field season, as well as over the next one to five years, depending on the harvest schedule of activities included in the proposed action. The District intends to modify harvest units that have the potential to adversely affect spotted owls if spotted owls are found occupying this site.

If the District moves ahead with downgrading NRF habitat, in particular, in currently occupied and habitat deficient home ranges, the Service anticipates adverse effects will occur. This is because best available information indicates spotted owls need a certain amount of habitat within their home range 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)]. As the amount of habitat in an owl's home range decreases, so does site occupancy, reproduction and survival (Courtney et al. 2004).

Specifically for 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. In summary, habitat composition in owl core areas varies by region and study, ranging from a low of 27 percent to a high of 78 percent (mean 43%, 14 SD). Based on the above studies, it is the Service's view that 50 percent or higher cover of suitable habitat within a 0.5 mile radius should be considered as necessary to maintain spotted owl life history functions.

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 suggest that the removal of suitable 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, although site-specific conditions may warrant deviations from this guideline.

Sites 11G, 25G and 27G

For estimated spotted owl sites 11G, 25G, and 27G, it is the Service's opinion that downgrading spotted owl NRF habitat will reduce extant habitat and likely result in reduced fitness of spotted owls, for the reasons provided above. Due to this result, the Service believes that this *action may affect, and is likely to adversely affect* spotted owls,

Effects to Spotted Owl NRF Habitat

Collectively, the proposed action consists of five dry forest restoration timber harvest projects and one stewardship project (Table 1) that, when implemented, will treat up to 3,300 acres, some of which do not consist of habitat for the spotted owl. Of the 3,300 acres, the proposed action will affect up to 496 acres of spotted owl NRF habitat (Table 8) and an additional 2,148 acres of spotted owl dispersal-only habitat (Table 9). The remaining 656 acres (of the 3,300 total acres) will take place in areas that do not currently consist of spotted owl habitat.

Remove or Downgrade

The proposed action, as described in the Assessment, does not include the removal of any NRF habitat. Collectively, implementation of portions of the Evans Sardine, Musty Evans and Skeleton Mountain dry forest restoration treatments, all planned to occur in the Evans Creek fifth field watershed, will downgrade up to 55 acres of spotted owl NRF habitat. The downgrading of 55 acres represents approximately 0.11 percent of the 48,313 acres of extant spotted owl NRF habitat on federally managed lands, in the Evans Creek watershed (Table 8). The 55 acres of NRF habitat downgrade also represent an even smaller percentage (0.06 percent) of the 93,398 acres (Table 8) of extant NRF habitat in the action area.

Table 8. Effects to Spotted Owl NRF Habitat.

Project Name	Amount of Spotted Owl NRF Habitat Pre-Project[1]	Acres Spotted Owl NRF Habitat Downgraded	Acres of Spotted Owl NRF Habitat Treated and Maintained	Amount of Spotted Owl NRF Habitat Post-Project	Percent Change
Evans Creek Fifth Field Watershed					
Evans Sardine		11	11		
Evans Stew		0	0		
Musty Evans		4	13		
Pleasant Fielder		0	9		
Skeleton Mountain		40	259		
Slick Battle		0	128		
Watershed Total	**48,313**	**55**	**420**	**48,258**	**0.11**
Trail Creek Fifth Field Watershed					
Musty Evans		0	6		
Watershed Total	**15,321**	**0**	**6**	**15,321**	**0**
Upper Cow Creek Fifth Field Watershed					
Skeleton Mountain		**0**	**15**		
Watershed Total	**29,764**	**0**	**15**	**29,764**	**0**
Proposed Action Total	**93,398**	**55**	**441**	**93,343**	**0.06**

[1] From Table 6. Represents amount of spotted owl NRF habitat on federal lands managed by the District.

The Service has determined the proposed downgrading of up to 55 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.

Treat and Maintain

The proposed action includes timber harvest and stewardship activities that will treat and maintain up to 441 acres (Table 8) (0.47 percent of the 93,398 total acres of NRF habitat in the action area) of spotted owl NRF habitat. While the majority of the activities are planned to occur within the Evans Creek watershed, a small number of acres (21) will occur in the Trail Creek and upper Cow Creek watersheds (Table 8).

As described in the Assessment, thinning treatments are expected to improve the ecological health of treated stands in the long term. Restoring the health and vigor of the remaining trees will be accomplished by reducing stand densities and competition (Newton et al. 1987). Removal of the smaller diameter trees within a stand allows larger, healthier trees to continue to grow; reduce the chance of tree loss in overstocked stands from suppression mortality; and reduce the intensity and risk of wildfire by removing excess fuels (Main et al. 1996) (Latham et al. 2002).

The Service has determined the implementation of forest restoration treatments that result in the maintenance of up to 441 acres 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 cover from predators and micro habitat conditions for spotted owls.
- 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, uneven-aged tree structure present prior to treatment will be retained, providing cover from predators, nesting opportunities, and prey species habitat.
- No spotted owl nest trees will be removed.

Spotted Owl Recovery Plan

District biologists conducted on-the-ground investigations (USDI BLM et al. 2010) for the purpose of identifying forest stands that meet the definition of older and more structurally complex, multi-layered conifer forests, as defined in recovery action 32 (RA 32) of the Recovery Plan (2008). According to the Assessment, no stands that meet the RA 32 criteria are part of the proposed action.

Effects to Spotted Owl Dispersal-only Habitat

Implementation of the proposed action will treat and maintain up to 2,148 acres of spotted owl dispersal habitat, which occurs within portions of two physiographic provinces and within portions of three individual watersheds (Table 9). Collectively, activities will affect up to 12 percent of the 17,753 acres of dispersal-only habitat in the action area, and will affect up to 1.93 percent of the total amount of dispersal habitat in the action area (the total amount of dispersal habitat includes 93,398 acres of NRF habitat plus 17,753 acres if dispersal habitat). As detailed

in the Assessment, the proposed action does not include the removal of any spotted owl dispersal-only habitat.

Table 9. Effects to Spotted Owl Dispersal Habitat.

Timber Sale / Watershed	Total Acres	Acres Spotted Owl Dispersal Habitat Maintained	Percent of Spotted Owl Dispersal Habitat Affected
Evans Creek Watershed			
Evans Sardine		177	
Musty Evans		623	
Pleasant Fielder		420	
Skeleton Mountain		258	
Slick Battle		431	
Evans Stew		82	
Illinois Total	14,066	1,991	14.15 %
Trail Creek Watershed			
Musty Evans		26	
Trail Creek Total	2,598	26	1.00 %
Upper Cow Creek Watershed			
Musty Evans		122	
Skeleton Mountain		19	
Upper Cow Total	1,089	131	12.02 %
Action Area Total	17,753	2,148	12.10 %

It is the Service's opinion that the maintenance of up to 2,148 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 small amount (12 percent) of the available 17,753 acres of dispersal-only habitat in the action area, and will affect an even smaller amount (1.9 percent) of the total amount of dispersal habitat 17,753 acres of dispersal-only plus an additional 93,398 acres of NRF habitat) within three individual watersheds, minimizing the potential for adverse effects to spotted owl dispersal by

retaining the majority (over 50 % of each watershed) of dispersal habitat, thus facilitating successful dispersal among multiple watersheds (Lint et al. 2005).
- Prescriptions are intended to include areas of "skips and gaps" helping to provide refugia for prey and dispersing spotted owls.

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 information and for the following reasons. First, we recognize that the Northern Spotted Owl Occupancy Map (NSOOM) used by the District to assess potential impacts to spotted owls may overestimate the number of spotted owls in a given area (USDI/USDA 2008). However, given that the proposed action impacts only three estimated sites, the magnitude of the potential over estimate is relatively minimal. Second, we have no data indicating prey species abundance for the action area. Studies have shown variations of prey availability across different stands within the range of the spotted owl, which is likely reflected in the action area, as well. While some reports suggest negative impacts of thinning on flying squirrels (Wilson 2010, Holloway and Smith 2011), there is also some counter information as to these effects (e.g., Gomez et al. 2005, Ransome et al. 2004, Waters and Zabel 1995). Woodrats, both bushy-tailed and dusky-footed (*Neotoma cinerea* and *N. fuscipes*) are important components of the spotted owls' diet in in the action area (Forsman et al. 2004). Some beneficial effects to dusky-footed woodrats due to shrub development in thinned stands may be possible (Sakai and Noon 1993, Suzuki and Hayes 2003). Third, there are observational studies of spotted owls remaining on territories and using treated stands post-treatment (Irwin et al. 2008, Solis 1983, Forsman et al. 1984, King 1993, Anthony and Wagner 1998, and Hicks 1999). Whereas, a case study (Meiman et al. 2003) and anecdotal accounts have shown spotted owls shift their use patterns post-harvest activity. For these reasons, the potential impacts to spotted owls due to the affects to their prey species are difficult to fully ascertain; but are likely to occur from the proposed action. Therefore, the combination of this prey abundance information and the effects of habitat removal suggest some negative effects to spotted owls. However, this is somewhat mitigated in the action area, due to the occurrence of woodrats and neutral to positive effects of thinning on their occurrence.

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 A) 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 four spotted owl sites (estimated sites 11G, 25G, 27G and historic site 4032O), with several of these sites already deficient relative to guidance levels. 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 however, does anticipate that adult spotted owls in the action area are expected to persist for some time, albeit with reduced fitness (Dugger et al 2005). The reduce fitness 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, 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. The Service reached this conclusion because the action area is expected to continue to fulfill its role in the survival and recovery of the spotted owl because implementation of the proposed action will retain over 95 percent of currently occupied or un-surveyed suitable spotted owl NRF and dispersal habitats in the action area. Additionally, three estimated spotted owl sites, which account for only five percent of the total sites in the Action Area, will be negatively impacted by habitat downgrading activities. Further, the District is conducting spotted owl surveys and will use this information to avoid and minimize impacts to occupied spotted owl home ranges. The Service has reached this conclusion, that is, maintenance of current habitat through NWFP implementation and minimization of habitat loss by the measures articulated above, which collectively, should provide for sufficient habitat conditions enabling spotted owl survival and recovery.

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 neither anticipates nor authorizes the incidental take of spotted owls due to the implementation of this proposed action. 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 sites 11G, 25G and 27G due to the downgrading of 55 acres of NRF habitat at the core and/or home range scales, the Service does not believe these adverse effects rise to the level of take for the following reasons: 1) the District plans to conduct pre-implementation protocol surveys at affected spotted owl sites, 2) if spotted owls are found occupying the sites with the new surveys, the District will drop the sale units and/or 3) the District will modify the prescriptions to reduce the effects to spotted owls and avoid take.

Since no take is anticipated or exempted, no reasonable and prudent measures or terms and conditions are provided below. If take is detected during implementation of the proposed action, re-initiation of formal consultation should be requested, and any operations causing such take must cease pending the outcome of the reinitiated consultation.

Effect of Take

Not applicable

Reasonable and Prudent Measures

No reasonable and prudent measures are included in this Opinion, 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

Not applicable

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. Delay implementation of activities as late in the breeding season as possible.
2. As needed, the District is encouraged to discuss updated survey information with the Service for interpretation of 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 the owl (or other listed species) was not analyzed in the Biological Assessment, if the project area changes from what was originally analyzed in the Biological Assessment, if a site has moved, or other information is inconsistent with what is authorized, the District coordinates with project proponents, contractors, managers, local biologists and the Level 1 team to ensure the project impacts remain consistent with the Biological Assessment and the responding consultation document (biological opinion or letter of concurrence). If not, the project will remain stopped until the district implements one or more of the following:

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

REINITIATION NOTICE

This concludes formal consultation on the proposed action outlined in your Assessment. As provided in (50 CFR § 402.16), re-initiation of consultation is required where discretionary federal agency involvement or control over the action has been maintained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded, and in this case, the take limit and project limit of effects are coextensive and expressed in terms of habitat; (2) new information reveals effects of the agencies' action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending re-initiation of formal consultation. This Opinion and the associated Incidental Take Statement are valid for activities included in the proposed actions that are completed prior to October 1, 2020.

LITERATURE CITED

AFRC (American Forest Resource Council). 2004. Estimating timber harvest activity in selected Spotted Owl demographic areas, 1993-2003. Prepared by: Mason, Bruce and Girard, Inc.

Andersen, D. E., O.J. Rongstad, and W. R. Mytton. 1989. Response of nesting red-tailed hawks to helicopter overflights. The Condor 91: 296-299.

Anderson, David E. and K.P. Burnham. 1992. Evidence that Northern Spotted Owl populations are declining, Part II. In USDI FWS 1992b, Draft Recovery Plan for the northern spotted owl, Appendix C.

Anthony, R.G. and F.F. Wagner. 1998. Reanalysis of northern spotted owl habitat use on the Miller Mountain Study Area: Identification and evaluation of northern spotted owl habitat in managed forests of southwest Oregon and the development of silvicultural systems for managing such habitat. Draft Progress Report. Oregon Cooperative Wildlife Research Unit, Oregon State University, Corvallis, OR.

Anthony, R.G., and L.S. Andrews. 2004. Summary Report – Winter habitat use by spotted owls on USDI Bureau of Land Management Medford District Lands within the boundaries of the Timbered Rock Fire. Unpublished report, OCWRU, OSU, Corvallis, Oregon. 29 pages.

Anthony, R.G., E.D. Forsman, A.B. Franklin, D.R. Anderson, K.P. Burnham, G.C. White, C.J. Schwarz, J. Nichols, J.E. Hines, G.S. Olson, S.H. Ackers, S. Andrews, B.L. Biswell, P.C. Carlson, L.V. Diller, K.M. Dugger, K.E. Fehring, T.L. Fleming, R.P. Gerhardt, S.A. Gremel, R.J. Gutiérrez, P.J. Happe, D.R. Herter, J.M. Higley, R.B. Horn, L.L. Irwin, P.J. Loschl, J.A. Reid, and S.G. Sovern. 2006a. Status and trends in demography of northern spotted owls, 1985-2003. Wildlife Mongraph No. 163.

Anthony, R., S. Ackers, R. Claremont, D. McCoskey, N. Nielsen-Pincus, T. Plawman, A. Smoluk. 2006b. The Demography of Northern Spotted Owls (*Strix occidentalis caurina*) on the Willamette National Forest, Oregon: FY 2006b Annual Research Report. Oregon Cooperative Fish and Wildlife Research Unit, Oregon State University. Corvallis, Oregon. 43pp.

Anthony, R.,S. Andrews, F. Wagner, S. Adams, L. Friar, T. O'Brien, T. Phillips and D. Strejc. 2006c. Demographic Characteristics and Ecology of Spotted Owls (*Strix occidentalis caurina*) in the Southern Oregon Cascades: FY 2006 Annual Research Report . Oregon Cooperative Fish and Wildlife Research Unit, Oregon State University, Corvallis. 23 pages.

Barrowclough, G. F. and R. J. Gutiérrez. 1990. Genetic variation and differentiation in the spotted owl. Auk 107:737-744.

Barrowclough, G.F., R.J. Gutiérrez, and J.G. Groth. 1999. Phylogeography of spotted owl (Strix occidentalis) populations based on mitochondrial DNA sequences; gene flow, genetic structure, and a novel biogeographic pattern. Evolution 53(3):919-931.

Barrowclough, G.F., J.G. Groth, and R.J. Gutiérrez. 2005. Genetic structure, introgression and a narrow hybrid zone between northern and California spotted owls (Strix occidentalis). Molecular Ecology 14:1109–1120.

Barrows, C.W., and K. Barrows. 1978. Roost characteristics and behavioral thermoregulation in the spotted owl. Western Birds 9:1-8.

Bart, J. 1995. Amount of suitable habitat and viability of northern spotted owls. Conservation Biology 9 (4):943-946.

Bart J. and E. Forsman. 1992. Dependence of northern spotted owls (Strix occidentalis caurina) on old-growth forests in the western USA. Biological Conservation 1992: 95-100.

Bigley, R. and J. Franklin. 2004. Habitat trends. In: Courtney, S.P., J.A. Blakesley, R.E. Bigley, M.L. Cody, J.P. Dumbacher, R.C. Fleischer, A.B. Franklin, J.F. Franklin, R.J. Gutiérrez, J.M. Marzluff, L. Sztukowski. 2004. Scientific evaluation of the status of the northern spotted owl. Sustainable Ecosystems Institute. Portland, Oregon. September 2004.

Bingham, B.B., and B.R. Noon. 1997. Mitigation of habitat "take": Application to habitat conservation planning. Conservation Biology 11 (1):127-138

Bond, M.L., R.J. Gutierrez, A.B. Franklin, W.S. LaHaye, C.A. May, and M.E. Seamans. 2002. Short-term effects of wildfires on spotted owl survival, site fidelity, mate fidelity, and reproductive success. Wildlife Society Bulletin 30(4):1022-1028.

Buchanan, J., E. Hanson, D. Hays, and L. Young. 1994. An evaluation of the Washington Forest Practices Board Wildlife Committee preferred alternative for a spotted owl protection rule. Washington Forest Practices Board Spotted Owl Scientific Advisory Group. Olympia, Washington.

Buchanan, J.B., L.L. Irwin, and E.L. McCutchen. 1995. Within-stand nest site selection by spotted owls in the eastern Washington Cascades. Journal of Wildlife Management 59:301-310.

Buchanan, J.B. 2004. Managing habitat for dispersing northern spotted owls - are the current management strategies adequate? Wildlife Society Bulletin 32:1333–1345.

Buchanan, J.B. and P. Swedeen. 2005. Final briefing report to the Washington State Forest Practices Board regarding spotted owl status and forest practices rules. Washington Department of Fish and Wildlife, Olympia. 84 pp.

Burnham, K.P., D.R. Anderson, and G.C. White. 1994. Estimation of vital rates of the northern spotted owl. Colorado Cooperative Fish and Wildlife Research Unit, Colorado State University, Fort Collins, Colorado, USA.

Caffrey, C. and C.C. Peterson. 2003. West Nile Virus may not be a conservation issue in northeastern United States. American Birds (103rd Count) 57:14-21.

California Department of Forestry and Fire Protection. 2007. California Forest Practices Rules: 2001. Title 14, California Code of Regulations, Chapters 4, 4.5, and 10. Sacramento, CA.

Campbell, N. A. 1990. Biology. The Benjamin/Cummings Publishing Company, Inc. Redwood City, California.

Carey, A.B., J.A. Reid, and S.P. Horton. 1990. Spotted owl home range and habitat use in southern Oregon coast ranges. Journal of Wildlife Management 54:11–17.

Carey, A. B., S. P. Horton, and B. L. Biswell. 1992. Northern spotted owls: influence of prey base and landscape character. Ecological Monographs 62: 223-250.

Carsia, R. V., and S. Harvey. 2000. Adrenals. Chapter 19 in G. C. Whittow, editor. Sturkie's Avian Physiology. Academic Press, San Diego, California.

Chi, T., A. Henke, J. Smith, and C. Brinegar. 2004. Spotted owl mitochondrial DNA haplotyping. San Jose State University. Unpublished results submitted to U.S. Fish and Wildlife Service.

Chutter, M.J., I. Blackburn, D. Bonin, J. Buchanan, B. Costanzo, D. Cunnington, A. Harestad, T. Hayes, D. Heppner, L. Kiss, J. Surgenor, W. Wall, L. Waterhouse, and L. Williams. 2004. Recovery strategy for the northern spotted owl (Strix occidentalis caurina) in British Columbia. British Columbia Ministry of Environment, Victoria. 74 pp.

Courtney, S.P. and R.J. Gutiérrez. 2004. Scientific evaluation of the status of the northern spotted owl – threats. In: Courtney, S.P., J.A. Blakesley, R.E. Bigley, M.L. Cody, J.P. Dumbacher, R.C. Fleischer, A.B. Franklin, J.F. Franklin, R.J. Gutiérrez, J.M. Marzluff, L. Sztukowski. 2004. Scientific evaluation of the status of the northern spotted owl. Sustainable Ecosystems Institute. Portland, Oregon. September 2004.

Courtney, S. P., J. A. Blakesley, R. E. Bigley, M. L. Cody, J. P. Dumbacher, R. C. Fleischer, A. B. Franklin, J. F. Franklin, R. J. Gutierrez, J. M. Marzluff, and L. Sztukowski. 2004. Scientific Evaluation of the Status of the Northern Spotted Owl. Sustainable Ecosystems Institute, Portland, Oregon, USA. 508 pp.

Crozier, Michelle L., Mark E. Seamans, R. J. Gutiérrez, Peter J. Loschl, Robert B. Horn, Stan G. Sovern and Eric D. Forsman. 2006. Does the presence of barred owls suppress the calling behavior of spotted owls? In The Condor 108: 260-269. The Cooper Ornithological Society 2006.

Davis, Ray, R. Horn, P. Caldwell, S. Cross, R. Crutchley, K. Fukuda, C. Larson, and H. Wise. Demographic Characteristics of the northern spotted owl (*strix occidentalis caurina*) in Klamath Mountain Province of Oregon 1990-2010. Northern spotted owl monitoring. Feb. 6 2010 Annual Report

Delaney, D. K., T. G. Grubb, P. Beier, L. L. Pater, and M. H. Reiser. 1999. Effects of helicopter noise on Mexican spotted owls. Journal of Wildlife Management 63:60-76.

Deubel, V., L. Fiette, P. Gounon, M.T. Drouet, H. Khun, M. Huerre, C. Banet, M. Malkinson, and P. Despres. 2001. Variations in biological features of West Nile viruses. Annals of the New York Academy of Sciences 951:195-206.

Diller, L.V. and D.M. Thome. 1999. Population density of northern spotted owls in managed young-growth forests in coastal northern California. Journal of Raptor Research 33: 275–286.

Dugger, K.M., F. Wagner, R.G. Anthony, and G.S. Olson. 2005. The relationship between habitat characteristics and demographic performance of northern spotted owls in southern Oregon. The Condor 107:863-878.

Dugger, Katie, S. Andrews, E. Fleigel, L. Friar, D. Strejc and F. Wagner. Annual Research Report FY 2010. Demographic Characteristics and Ecology of northern spotted owls (strix occidentalis caurina) in Southern Oregon Cascades.

Dugger, Katie, R.G. Anthony, S. Andrews. Transient Dynamics of Invasive Competition: barred Owls, Spotted Owls, Habitat and the Demons of Competition Present. 2011 in press.

Dunbar, D. L., B. P. Booth, E. D. Forsman, A. E. Hetherington, and D. J. Wilson. 1991. Status of the spotted owl, Strix occidentalis, and barred owl, Strix varia, in southwestern British Columbia.

Fitzgerald, S.D., J.S. Patterson, M. Kiupel, H.A. Simmons, S.D. Grimes, C.F. Sarver, R.M. Fulton, B.A. Fulton, B.A. Steficek, T.M. Cooley, J.P. Massey, and J.G. Sikarskie. 2003. Clinical and pathological features of West Nile Virus infection in native North American owls (family *Strigidae*). Avian Diseases 47:602-610.

Folliard, L. 1993. Nest site characteristics of northern spotted owls in managed forest of northwest California. M.S. Thesis. Univ. Idaho, Moscow, ID.

Forsman, E.D. 1975. A preliminary investigation of the spotted owl in Oregon. M.S. thesis, Oregon State University, Corvallis. 127 pp.

Forsman, E.D. 1981. Molt of the spotted owl. Auk 98:735-742

Forsman, E.D., Meslow, E.C., Wight, H.M. 1984. Distribution and biology of the spotted owl in Oregon. Wildlife Monographs, 87:1-64.

Forsman, E.D., S. DeStafano, M.G. Raphael, and R.G. Gutiérrez. 1996. Demography of the northern spotted owl. Studies in Avian Biology No. 17. 122 pp.

Forsman, E.D., I.A. Otto, S.G. Sovern, M. Taylor, D.W. Hays, H. Allen, S.L. Roberts, and D.E. Seaman. 2001. Spatial and temporal variation in diets of spotted owls in Washington. Journal of Raptor Research 35(2):141-150.

Forsman, E.D., Anthony, R. G., Reid, J. A., Loschl, P. J., Sovern, S. G., Taylor, M., Biswell, B. L., Ellingson, A., Meslow, E. C., Miller, G. S., Swindle, K. A., Thrailkill, J. A., Wagner, F. F., and D. E. Seaman. 2002. Natal and breeding dispersal of northern spotted owls. Wildlife Monographs, No. 149. 35 pp.

Forsman, E.D., R.G. Anthony, E.C. Meslow, and C.J. Zabel. 2004. Diets and foraging behavior of northern spotted owls in Oregon. Journal of Raptor Research 38(3):214-230.

Forsman, E.D., T.J. Kaminiski, J.C. Lewis, K.J. Maurice, and S.G. Sovern. 2005. Home range and habitat use of northern spotted owls on the Olympic Peninsula, Washington. J. Raptor Research 39(4):365-377.

Forsman, Eric D., Robert G. Anthony, Katie M. Dugger, Elizabeth M. Glenn, Alan B. Franklin, Gary C. White, Carl J. Schwarz, Kenneth P. Burnham, David R. Anderson, James D. Nichols, James E. Hines, Joseph B. Lint, Raymond J. Davis, Steven H. Ackers, Lawrence S. Andrews, Brian L. Biswell, Peter C. Carlson, Lowell V. Diller, Scott A.Gremel, Dale R. Herter, J. Mark Higley, Robert B. Horn, Janice A. Reid, Jeremy Rockweit, Jim Schaberel, Thomas J. Snetsinger, and Stan G. Sovern. 2011-in press. POPULATION DEMOGRAPHY OF NORTHERN SPOTTED OWLS: 1985–2008.

Franklin, A.B. 1992. Population regulation in northern spotted owls: theoretical implications for management. Pages 815-827 in D. R. McCullough and R. H. Barrett (eds.)., Wildlife 2001: populations. Elsevier Applied Sciences, London, England.

Franklin, A.B., K.P. Burnham, G.C. White, R.J. Anthony, E.D. Forsman, C. Sanchez, J.D. Nicols and J. Hines. 1999. Range-wide status and trends in northern spotted owl populations. Colorado Coop. Fish and Wildl. Res. Unit, Fort Collins, Colorado and Oregon Coop. Fish and Wildl. Res. Unit, Corvallis, Oregon. Unpublished report.

Franklin, A. B., D. R. Anderson, R. J. Gutierrez, and K. P. Burnham. 2000. Climate, habitat quality, and fitness in northern spotted owl populations in northwestern California. Ecological Monographs 70: 539–590.

Gaines, W.L., R.A. Strand, and S.D. Piper. 1997. Effects of the Hatchery Complex Fires on northern spotted owls in the eastern Washington Cascades. Pages 123-129 in Dr. J.M. Greenlee, ed. Proceedings of the First Conference on Fire Effects on Rare and Endangered Species and Habitats, November 13-16, 1995. International Association of Wildland Fire. Coeur d'Alene, ID.

Garmendia, A.E., H.J. Van Kruiningen, R.A. French, J.F. Anderson, T.G. Andreadis, A. Kumar, and A.B. West. 2000. Recovery and identification of West Nile virus from a hawk in winter. Journal of Clinical Microbiology 38:3110-3111.

Glenn, E.M, M.C. Hansen, and R.G. Anthony. 2004. Spotted owl home-range and habitat use in young forests of western Oregon. Journal of Wildlife Management 68(1):33-50.

Goheen, E.M., E.M. Hansen, A. Kanaskie, M.G. Williams, N. Oserbauer, and W. Sutton. 2002. Sudden oak death caused by Phytophthora ramorum in Oregon. Plant Disease 86:441.

Gomez, D., R G. Anthony, and J.P. Hayes. 2005. Influence of thinning of douglas-fir forests on population parameters and diet of northern flying squirrels. Journal of Wildlife Management 69(4):1670–1682; 2005

Gremel, S. 2005. Factors controlling distribution and demography of Northern Spotted Owls in a reserved landscape. A thesis submitted in partial fulfillment for a Master of Science degree. University of Washington.

Gutiérrez, R.J. 1989. Hematozoa from the spotted owl. Journal of Wildlife Diseases 24:614–618.

Gutiérrez, R.J., A.B. Franklin, and W.S. LaHaye. 1995. Spotted owl (Strix occidentalis) in: A. Poole and F. Gill, editors. The birds of North America, No. 179. The Academy of Natural Sciences and The American Ornithologists' Union, Washington, D.C. 28 pages.

Gutiérrez, R.J. 1996. Biology and distribution of the northern spotted owl. Pages 2-5 in E.D. Forsman, S. DeStefano, M.G. Raphael, and R.J. Guiterrez (Eds): Studies in Avian Biology No. 17.

Gutiérrez, R. J., M. Cody, S. Courtney, and D. Kennedy. 2004. Assessment of the potential threat of the northern barred owl. In: Courtney, S.P., J.A. Blakesley, R.E. Bigley, M.L. Cody, J.P. Dumbacher, R.C. Fleischer, A.B. Franklin, J.F. Franklin, R.J. Gutiérrez, J.M. Marzluff, L. Sztukowski. 2004. Scientific evaluation of the status of the northern spotted owl. Sustainable Ecosystems Institute. Portland, Oregon. September 2004.

Haig, S.M., T.D. Mullins, E.D. Forsman, P. Trail, and L. Wennerberg. 2004. Genetic identification of spotted owls, barred owls, and their hybrids: legal implications of hybrid identity. Conservation Biology 18:1347-1357.

Haig, S.M., R.S. Wagner, E.D. Forsman, and T.D. Mullins. 2001. Geographic variation and genetic structure in spotted owls. Conservation Genetics 2(1): 25-40.

Hamer, T.E. 1988. Home range size of the northern barred owl and northern spotted owl in western Washington. M.S. Thesis. Western Washington University, Bellingham, Washington.

Hamer, T.E., S.G. Seim, and K.R. Dixon. 1989. Northern spotted owl and northern barred owl habitat use and home range size in Washington: preliminary report. Washington Department of Wildlife, Olympia, Washington.

Hamer, T.E., E.D. Forsman, A.D. Fuchs, and M.L. Walters. 1994. Hybridization between barred and spotted owls. Auk 111(2):487-492.

Hamer, T.E., D.L. Hays, C.M. Senger, and E.D. Forsman. 2001. Diets of northern barred owls and

Hanson, E., D. Hays, L. Hicks, L. Young, and J. Buchanan. 1993. Spotted Owl Habitat in Washington: A Report to the Washington Forest Practices Board. Washington Forest Practices Board, Spotted owl Advisory Group. Final Report: December 20, 1993. Olympia, Washington. 116 pages.

Harestad, A., J. Hobbs, and I. Blackburn. 2004. Précis of the Northern Spotted Owl in British Columbia. Pages. 12-14 in Zimmerman, K., K. Welstead, E. Williams, J. Turner, (editors). Northern Spotted Owl Workshop Proceedings. Forrex Series (online No. 14), Vancouver, British Columbia, Canada.

Henke, A.L., T.Y. Chi, J. Smith, C. Brinegar. Unpublished Draft. Microsatellite Analysis of Northern and California Spotted Owls in California. Conservation Genetics Laboratory, Department of Biological Sciences, San Jose State University, San Jose, California.

Hershey, K.T., E.C. Meslow, and F.L. Ramsey. 1998. Characteristics of forests at spotted owl nest sites in the Pacific Northwest. Journal of Wildlife Management 62(4):1398-1410.

Herter, D.R., L.L. Hicks, H.C. Stabins, J.J. Millspaugh, A.J. Stabins, and L.D. Melampy. 2002. Roost site characteristics of northern spotted owls in the nonbreeding season in central Washington. Forest Science 48(2):437-446.

Herter, D.R., and L.L. Hicks. 2000. Barred owl and spotted owl populations and habitat in the central Cascade Range of Washington. Journal of Raptor Research 34(4): 279-286.

Hicks, L.L., H.C. Stabins, and D.R. Herter. 1999. Designing spotted owl habitat in a managed forest. J. Forestry 97(7):20-25.

Hicks, Loren, Dale Herter and Rick Early. 2001. Northern Spotted Owl Monitoring and Modeling—5 Year Summary Report. May 2001.

Hoberg, E.P., G.S. Miller, E. Wallner-Pendleton, and O.R. Hedstrom. 1989. Helminth parasites of northern spotted owls (Strix occidentalis caurina). Journal of Wildlife Diseases 25:246–251.

Holloway, Gillian L. and Winston P. Smith. 2011. A Meta-Analysis of Forest Age and Structure Effects on Northern Flying Squirrel Densities. The Journal of Wildlife Management 75(3): 668-674. 2011.

Horn, R. , P. Caldwell, S. Cross, R. Crutchley , K. Fukuda, C. Larson, J. Lowden, M. O'Hara, J. Stegmeier, and H. Wise. 2009. Demographic Characteristics of Northern Spotted Owls (Strix occidentalis caurina) in the Klamath Mountain Province of Oregon, 1985-2009. Annual research report for 2009.USDA Forest Service, Pacific Northwest Research Station, Corvallis, OR and Dept. of Fish and Wildlife, Oregon State Univ., Corvallis, OR. 17p

Irwin, L.L., D.F. Rock, and G.P. Miller. 2000. Stand structures used by northern spotted owls in managed forests. Journal of Raptor Research 34(3):175-186.

Irwin, Larry, Dennis Rock, and Suzanne Rock. 2008. Adaptive Management Monitoring of Spotted Owls. A Progress Report—August 2008. National Council for Air and Stream Improvement, Inc.

Iverson, W.F. 1993. Is the barred owl displacing the spotted owl in western Washington? M.S. Thesis, Western Washington University, Bellingham, Washington.

Iverson, W.F. 2004. Reproductive success of Spotted Owls sympatric with Barred Owls in western Washington. Journal of Raptor Research 38(1):88-91.

Johnson, D.H. 1992. Spotted owls, great horned owls, and forest fragmentation in the central Oregon Cascades. M.S. Thesis, Oregon State University, Corvallis, Oregon.

Johnson, D. H., K. Norman, Jerry F. Franklin, Jack Ward Thomas, and John Gordon. 1991. Alternatives for Management of Late-Successional Forests of the Pacific Northwest. A report for the Conservation of Late-successional Forests and Aquatic Ecosystems.

Kelly, E.G., E.D. Forsman, and R.G. Anthony. 2003. Are barred owls replacing spotted owls? Condor 105:45-53.

Kelly, E.G. and E.D. Forsman. 2004. Recent records of hybridization between barred owls (Strix varia) and northern spotted owls (S. occidentalis caurina). Auk 121:806-810.

King, G.M. 1993. Habitat characteristics of northern spotted owls in eastern Washington. M.S. thesis. University of California, Berkeley, CA.

King, G.M., K.R. Bevis, M.A. Rowe, E.E. Hanson. 1997. Spotted owls use of habitat impacted by 1994 fires on the Yakama Indian Reservation: three years post fire.

Knight, R. L. and S. K. Skagen. 1988. Effects of recreational disturbance on birds of prey: a review. Pages 355-359 in R. L. Glinski et al., editors. Proceedings of the Southwest Raptor Management Symposium and Workshop, National Wildlife Federation, Washington, D. C.

Komar, N., N.A. Panella, J.E. Burns, S.W. Dusza, T.M. Mascarenhas, and T.O. Talbot. 2001. Serologic evidence for West Nile virus infection in birds in the New York City vicinity during an outbreak in 1999. Emerging Infectious Diseases 7(4):621-5.

LaHaye, W.S., R.J. Guiterrez, and J.R. Dunk. 2001. Natal dispersion of the spotted owl in southern California: dispersal profile of an insular population. Condor 103:691-700.

Laidig, K.J., and D.S. Dobkin. 1995. Spatial overlap and habitat association of Barred Owls and Great Horned Owls in southern New Jersey. J. Raptor Res. 29:151–157.

Latham, P., and J. Tappeiner. 2002. "Response of old-growth conifers to reduction in stand density in western Oregon forests." *Tree Physiology* 22:137-146.

Leskiw, T., and R.J. Gutiérrez. 1998. Possible predation of a Spotted Owl by a Barred Owl. Western Birds 29:225–226.

Lint, J., et al. 2005. DRAFT. Northwest Forest Plan – The first ten years (1994-2003): Status and trend of northern spotted owl populations and habitat. PNW Station Edit Draft (Lint, Technical Coordinator, 2005). USDA Forest Service, PNW Research Station, PNW-GTR-2005. Draft. Portland, OR 230pp

Livezey, K.B. 2005. Iverson (2004) on spotted owls and barred owls: comments on methods and conclusions. Journal of Raptor Research 39(1):102-103.

Main, M. L., and M.P. Amaranthus. "Reducing Stand Densities in Immature and Mature Stands, Applegate Watershed, Southwest Oregon." USDA US Forest Service PNW. General Technical Report PNW-RN-518.

Marra, P. P., S. Griffing, C. Caffrey, A. M. Kilpatrick, R. McLean, C. Brand, E. Saito, A. P. Dupuis, L. Kramer, and R. Novak. 2004. West Nile virus and wildlife. BioScience 54: 393-402.

McGarigal, K., R.G. Anthony, and F.B. Isaacs. 1991. Interactions of humans and bald eagles on the Columbia River estuary. Wildl. Monogr. 115. 47 pp.

McLean, R. G., S. R. Ubico, D. E. Docherty, W. R. Hansen, L. Sileo, and T. S. McNamara. 2001. West Nile virus transmission and ecology in birds: Annals of the New York Academy of Sciences 951: 54–57.

Meiman, S., R. Anthony, E. Glenn, T. Bayless, A. Ellingson, M.C. Hansen and C. Smith. 2003. Effects of commercial thinning on home range and habitat-use patterns of a male northern spotted owl: A Case Study. Wildlife Society Bulletin 2003 31(4) 1254-1262.

Meyer, J.S., Irwin, L.L., and M.S. Boyce. 1998. Influence of habitat abundance and fragmentation on northern spotted owls in western Oregon. Wildlife Monographs 139: 1-51.

Miller, G.S., S.K. Nelson, and W.C. Wright. 1985. Two-year-old female spotted owl breeds successfully. Western Birds 16:69-73.

Miller, G.S. 1989. Dispersal of juvenile northern spotted owls in western Oregon. M.S. Thesis. Oregon State University, Corvallis, Oregon. 139 pages.

Miller, G.S., R.J. Small, and E.C. Meslow. 1997. Habitat selection by spotted owls during natal dispersal in western Oregon. J. Wildl. Manage. 61(1):140-150.

Moen, C.A., A.B. Franklin, and R.J. Gutiérrez. 1991. Age determination of subadult northern spotted owls in northwest California. Wildlife Society Bulletin 19:489-493.

Moeur, Melinda; Spies, Thomas A.; Hemstrom, Miles; Martin, Jon R.; Alegria, James; Browning, Julie; Cissel, John; Cohen, Warren B.; Demeo, Thomas E.; Healey, Sean; Warbington, Ralph. 2005. Northwest Forest Plan–The first 10 years (1994-2003): status and trend of late-successional and old-growth forest. Gen. Tech. Rep. PNW-GTR-646. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 142 pp.

Newton, M., M.L. McCormack Jr., R.L Sajdak, and J.D. Walstad. 1987. Forest vegetation problems in the Northeast and Lake States/Provinces. In Forest Vegetation Management for Conifer Production, ed. J.D. Walstad and P.J. Kuch. Wiley, New York. Pp 77–104.

Noon, B.R. and J.A. Blakesley. 2006. Conservation of the northern spotted owl under the Northwest Forest Plan. Conservation Biology 20:288–296.

North, M.P., G.Steger, R.Denton, G.Eberlein, T. Munton, and K. Johnson. 2000. Association of weather and nest-site structure with reproductive success in California spotted owls. Journal of Wildlife Management 64(3):797-807.

Olson, G.S., E. Glenn, R.G. Anthony, E.D. Forsman, J.A. Reid, P.J. Loschl, and W.J. Ripple. 2004. Modeling demographic performance of northern spotted owls relative to forest habitat in Oregon. Journal of Wildlife Management.

Olson, G.S., R.G. Anthony, E.D. Forsman, S.H. Ackers, P.J. Loschl, J.A. Reid, K.M Dugger, E.M. Glenn, and W.J. Ripple. 2005. Modeling of site occupancy dynamics for northern spotted owls, with emphasis on the effects of barred owls. Journal of Wildlife Management 69(3):918-932.

Oregon Department of Forestry (ODF). 2007. Forest Practices Administrative Rules and Forest Practices Act. Salem, OR.

Parmesan C.and G. Yohe. 2003. A Globally Coherent Fingerprint of Climate Change Impacts Across Natural Systems.

Pearson, R.R., and K.B. Livezey. 2003. Distribution, numbers, and site characteristics of spotted owls and barred owls in the Cascade Mountains of Washington. Journal of Raptor Research 37(4):265-276.

Pierce, D.J., J.B. Buchanan, B.L. Cosentino, and S. Snyder. 2005. An assessment of spotted owl habitat on non-federal lands in Washington between 1996 and 2004. Wildlife Department of Wildlife Research Report.

Ransome, Douglas B., Pontus W.F. Lingren, Druscilla S. Sullivan, and Thomas P. Sullivan. 2004. Long-term responses to ecosystem components to stand thinning in young lodgepole forest. Population dynamics of northern flying squirrels and red squirrels. In Forest Ecology and Management 202 (2004) 355-367.

Rizzo, D.M., M. Garbeloto, J.M. Davidson, G.W. Slaughter, and S.T. Koike. 2002. Phytophthora ramorum as the cause of extensive mortality of Quercus spp. and Lithocarpus densiflorus in California. Plant Disease 86:205-214.

Rosenberg, D.K. and K.S. McKelvey. 1999. Estimation of habitat selection for central-place foraging animals. J. Wildlife Management 63(3):1028-1038.

Rosenberg, D.K., K.A. Swindle, and R.G. Anthony. 2003. Influence of prey abundance on northern spotted owl reproductive success in western Oregon. Canadian Journal of Zoology 81:1715-1725.

Sakai, H.F. and B.R. Noon. 1993. "Dusky-footed woodrat abundance in different-aged forests in northwestern California." *Journal of Wildlife Management* 57:373-382.

Saplosky Robert, L. Michael Romero, and Allan U. Munck. 2000. How do Glucocorticoids affect stress responses? Integrating Permissive, Suppressive, Stimulatory and Preparatory Actions. Http://edrv/endojournals.org/cgi/content. 12-19-2000.

Seattle Audubon et al. v Doug Sutherland et al. 2007. Court opinion enjoining Weyerhaeuser Company from logging spotted owl habitat on private lands. U.S. District Court Western Washington District Court of Seattle.

Schmidt, K. 2003. Northern spotted owl monitoring and inventory, Redwood National and State Parks, 2002 annual report. Redwood National and State Parks, Orick, California.

Schmidt, K. 2006. Northern spotted owl monitoring and inventory, Redwood National and State Parks, 2005 annual report. Redwood National and State Parks, Orick, California.

Singleton, P, S. Graham, W. Gaines, and J. Lehmkuhl. 2005. The ecology of barred owls in fire-prone forests. USDA PNW December 2005 Progress Report; Wenatchee, Washington. Sisco, C.L. 1990. Seasonal home range and habitat ecology of spotted owls in northwestern California. M.S. Thesis. Humboldt State University, Arcata, California.

Sisco, C.L. 1990. Seasonal home range and habitat ecology of spotted owls in northwestern California. M.S. Thesis. Humboldt State University, Arcata, California.

Solis, D. 1983. Summer habitat ecology of northern spotted owls in northwestern California. Ms. Thesis. Humboldt State University, Arcata, CA.

Solis, D. M. And R. J. Gutierrez. 1990. Summer habitat ecology of northern spotted owls in northwestern California. The Condor 92:739-748.

Sovern, S.G., E.D. Forsman, B.L. Biswell, D.N. Rolph, and M. Taylor. 1994. Diurnal behavior of the spotted owl in Washington. Condor 96(1):200-202.

Suzuki, N. and J. P. Hayes. 2003. Effects of thinning on small mammals in Oregon coastal forests. J. Wildlife Management 67(2):352-271.

Swarthout, E.C.H. and R.J. Steidl. 2001. Flush responses of Mexican spotted owls to recreationists. J. Wildlife Management 65(2):312-317.

Tempel D.J. and R. J. Gutiérrez. 2003. Fecal Corticosterone Levels in California Spotted Owls Exposed to Low-intensity Chainsaw Noise.

Tempel D.J. and R. J. Gutiérrez. 2004. Factors Relating to Fecal Corticosterone Levels in California Spotted Owls: Implications for Assessing Chronic Stress.

Thomas, J.W.; E.D. Forsman; J.B. Lint; E.C. Meslow; B.R. Noon; and J. Verner. 1990. A conservation strategy for the northern spotted owl: a report of the Interagency Scientific Committee to address the conservation of the northern spotted owl. Portland, Oregon. U.S. Department of Agriculture, Forest Service; U.S. Department of Interior, Bureau of Land Management, U.S. Fish and Wildlife Service, National Park Service. 427 pp.

Thomas, J.W., M.G. Raphael, R.G. Anthony, E.D. Forsman, A.G. Gunderson, R.S. Holthausen, B.G. Marcot, G.H. Reeves, J.R. Sedell, and D.M. Solis. 1993. Viability assessments and management considerations for species associated with late-successional and old-growth forests of the Pacific Northwest. USDA Forest Service, Portland, Oregon.

Thomas, J.W., and M.G. Raphael (Eds.). 1993. Forest Ecosystem Management: An Ecological, Economic, and Social Assessment. Report of the Forest Ecosystem Management Assessment Team (FEMAT). July 1993. Portland, OR: USDA Forest Service and the USDI Bureau of Land Management.

Thomas, Jack Ward, Jerry F. Franklin, John Gordon, and K. Norman Johnson. 2006. The Northwest Forest Plan: Origins, Components, Implementation Experience, and Suggestions for Change. In Conservation Biology Volume 20, No. 2, 277–287

USDA FS and USDI BLM (Forest Service and Bureau of Land Management). 1994a. Record of decision for amendments to Forest Service and Bureau of Land Management planning documents within the range of the northern spotted owl. U.S. Forest Service, Bureau of Land Management, Portland, OR. 2 vols. and appendices.

USDA FS and USDI BLM (Forest Service and Bureau of Land Management). 1994b. Final supplemental environmental impact statement on management of habitat for late-successional and old-growth forests related species within the range of the northern spotted owl. U.S. Forest Service, Bureau of Land Management, Portland, OR.

USDI BLM, USDA-FS, and USDI FWS (Medford District, Rogue River-Siskiyou National Forest , Fish and Wildlife Service). 2010. Draft RA 32 Habitat Evaluation Methodology. January 2010. 8 pp.

USDI BLM (Bureau of Land Management). 2011. Biological Assessment for timber harvest, fuels reduction, small diameter thinning and road construction/renovation activities associated with the Evans Creek Planning area, that may affect and are likely to adversely affect northern spotted owls. Bureau of Land Management, Medford District Office. Medford, Oregon.

USDI FWS (U.S. Fish and Wildlife Service). 1983. Endangered and threatened species listing and recovery priority guidelines: correction. Federal Register 48:51985.

USDI FWS (U.S. Fish and Wildlife Service). 1989. The Northern Spotted Owl; a status review supplement. Portland, Oregon. 113 pp.

USDI FWS (U.S. Fish and Wildlife Service). 1990a. Endangered and threatened wildlife and plants; determination of threatened status for the northern spotted owl; final rule. Federal Register, 50 CFR 17: 26,114-26,194.

USDI FWS (U.S. Fish and Wildlife Service). 1990b. 1990 status review: northern spotted owl; Strix occidentalis caurina. Report to the U.S. Fish and Wildlife Service, Portland, OR.

USDI FWS (U.S. Fish and Wildlife Service). 1992a. Endangered and Threatened Wildlife and Plants; Draft Recovery Plan for the northern spotted owl.

USDI FWS (U.S. Fish and Wildlife Service). 1992b. Endangered and Threatened Wildlife and Plants; determination of critical habitat for the northern spotted owl. Federal Register 57: 1796-1838.

USDI FWS (U.S. Fish and Wildlife Service). 1994. Final biological opinion for the preferred alternative of the supplemental environmental impact statement on management of habitat for late-successional and old-growth forest related species within the range of the northern spotted owl. Fish and Wildlife Service, Portland, Oregon.

USDI FWS (U.S. Fish and Wildlife Service). 1995. Endangered and threatened wildlife and plants; proposed special rule for the conservation of the northern spotted owl on non-federal lands. Federal Register 60:9483–9527.

USDI FWS (U.S. Fish and Wildlife Service). 2001. A range wide baseline summary and evaluation of data collected through section 7 consultation for the northern spotted owl and its critical habitat: 1994-2001. Portland, OR. Unpublished document. 41 pages.

USDI FWS (U.S. Fish and Wildlife Service). 2003. Estimates of distances at which incidental take of murrelets and spotted owls due to harassment are anticipated from sound-generating, forest-management activities in Olympia National Forest. Lacey, WA.

USDI FWS (U.S. Fish and Wildlife Service). 2004. Northern Spotted Owl Five Year Review: Summary and Evaluation, Portland, OR. 72pp.

USDI FWS (U.S. Fish and Wildlife Service). 2007. 2007 Draft Recovery Plan for the Northern Spotted Owl, *Strix occidentalis caurina*: Merged Options 1 and2. Portland, Oregon. 170 pp.

USDI FWS (U.S. Fish and Wildlife Service). 2008a. Endangered and Threatened Wildlife and Plants; revised designation of critical habitat for the northern spotted owl; final rule. Federal Register Vol. 73. 157:47326-47522. August 13, 2008.

USDI FWS (U.S. Fish and Wildlife Service). 2008b. Recovery Plan for the Northern Spotted Owl. Region 1. U.S. Fish and Wildlife Service. Portland, Oregon.

USDI FWS and USDC NMFS (Fish and Wildlife Service, National Marine Fisheries Service). 1998. Procedures for Conducting Consultation and Conference Activities under Section 7 of the Endangered Species Act.

USDI/USDA (Fish and Wildlife Service, Bureau of Land Management and Forest Service). 2008. Methodology for estimating the number of northern spotted owls affected by proposed federal actions. Oregon Fish and Wildlife Office, Fish and Wildlife Service, Portland, OR.

Wagner, F.F., E.C. Meslow, G.M. Bennett, C.J. Larson, S.M. Small, and S. DeStefano. 1996. Demography of northern spotted owls in the southern Cascades and Siskiyou, Mountains, Oregon. Pages: 67-76 In: Forsman, E.D., S. DeStefano, M.G. Raphael, and R.J. Gutierrez, (editors). 1996. Demography of the northern spotted owl. Studies in Avian Biology No. 17. Cooper Ornithology Society.Ward, J. W. Jr. 1990. Spotted owl reproduction, diet and prey abundance in northwest California. M.S. Thesis. Humboldt State University, Arcata.

Ward, J. W. Jr. 1990. Spotted owl reproduction, diet and prey abundance in northwest California. M.S. Thesis. Humboldt State University, Arcata.

Ward, J. W. Jr., R.J. Gutiérrez, and B.R. Noon. 1998. Habitat selection by northern spotted owls: the consequences of prey selection and distribution. Condor 100:79-92.Weathers, W.W., P.J. Hodumand, and J.A. Blakesley. 2001. Thermal ecology and ecological energetics of California spotted owls. The Condor 103:678-690.

Washington Forest Practices Board. 1996. Permanent rules for the northern spotted owl. Washington Department of Natural Resources, Olympia, Washington.

Wasser, S. K., K. Bevis, G. King, and E. Hanson. 1997. Noninvasive physiological measures of disturbance in the northern spotted owl. Conservation Biology 11: 1019-1022.

Waters, J.R. and C.J. Zabel. 1995. Northern flying squirrel densities in fir forests of northeastern California. Journal of Wildlife Management 59:858-866.

Weathers, W.W., Hodum, P.J., and J.A. Blakesley. 2001. Thermal ecology and ecological energetics of California spotted owls. The Condor 103: 678-690.

Weidemeier, Douglas J. and Scott B. Horton. 2000. Detection rates and occupancy trends of spotted and barred owls in the Olympic experimental state forest.

White, C. M., and T. L. Thurow. 1985. Reproduction of ferruginous hawks exposed to controlled disturbance. The Condor 87:14-22.

Wilson, T. 2010. Limiting factors for northern flying squirrels in the Pacific Northwest: A spatial-temporal analysis. PhD. Thesis. Union Institute and University, Cincinnati, OH.

Zabel, C. J., K. M. McKelvey, and J. P. Ward, Jr. 1995. Influence of primary prey on home-range size and habitat-use patterns of northern spotted owls (Strix occidentalis caurina). Canadian Journal of Zoology 73:433-439.

Zabel C.J., S.E. Salmons, and M. Brown. 1996. Demography of northern spotted owls in southwestern Oregon. Studies in Avian Biology 17:77-82.

Zabel, C. J., J. R. Dunk, H. B. Stauffer, L. M. Roberts, B. S. Mulder, and A. Wright. 2003. Northern spotted owl habitat models for research and management application in California. Ecological Applications 13:1027–1040.

APPENDIX A. PROJECT DESIGN CRITERIA

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

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

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

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

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

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

Mandatory Project Design Criteria (spotted owls)

A. Activities (such as tree felling, yarding, road construction, hauling on roads not generally used by the public, prescribed fire, muffled blasting) that produce loud noises above ambient levels will not occur within specified distances (Table 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 B. 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 ☐ Tech Assistance ☐ Tech Asst Nat Event	Reinitiation Cross-Ref.#	Consultation Author (full name)			Fiscal Year Signed
	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 (w/o 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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