United States Department of the Interior

FISH AND WILDLIFE SERVICE

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June 10, 2010

Memorandum

To: Mary Smelcer, Acting 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 Bureau of Land Management (BLM) proposed Grants Pass Resource Area Fiscal Year 2010-2011 timber harvest activities (FWS Reference number 13420-2010-F-0082).

This memorandum transmits the Fish and Wildlife Service's (Service) biological opinion (Opinion) based on our review of proposed timber harvest activities on lands administered by the Medford District (District) of the BLM, and their effect on the threatened northern spotted owl (*Strix occidentalis caurina*) (spotted owl). The Service prepared the attached Opinion 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 Biological Assessment (Assessment) (USDI BLM 2010) dated April 1, 2010, on April 5, 2010.

The attached Opinion includes a finding that implementation of the proposed actions are not likely to jeopardize the continued existence of the spotted owl. According to the Assessment, the proposed actions will not occur within designated critical habitat for the spotted owl.

In accordance with regulation, reinitiation 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, 2020.

If you have any questions regarding the attached 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)
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Biological Opinion
on the Effects of
Proposed Grants Pass Resource Area Fiscal Year 2010-2011 Timber Harvest Activities
(FWS Reference Number 13420-2010-F-0082)

U.S. Department of the Interior
U.S. Fish and Wildlife Service
Roseburg Field Office
June 10, 2010

Signature: _____
Jim Thrailkill
Field Supervisor

Date Signed: 6/10/2010

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DEFINITIONS (used in this document)

NW Forest Plan Land Use Allocations (USDA FS and USDI BLM 1994a):

AMAs (Adaptive Management Areas) generally follow Matrix guidance (defined below), but encourage adaptive management approaches to forest management.

LSRs (Late-Successional Reserves) are managed to protect and enhance habitat conditions for late-successional and old-growth related species. These reserves are designed to maintain a functional, interacting late-successional and old-growth ecosystem.

KOACs (Known Spotted Owl Activity Centers): 100-acre Cores (LSR) are the best 100 acres around northern spotted owl activity centers that were documented as of January 1, 1994, on Matrix and AMA lands, and are managed as LSRs.

Riparian Reserves are areas along all streams, wetlands, ponds, lakes, and unstable and potentially unstable areas where riparian-dependent resources receive the primary emphasis of land management activities.

Congressionally Reserved Areas require Congressional enactment for their establishment, such as national parks, wilderness, and wild and scenic rivers (USDI BLM 1995, p. 103).

Administratively Withdrawn Areas include areas withdrawn from scheduled timber harvest such as recreation areas, rights-of-way corridors, and timber production capability classification withdrawals (USDI BLM 1995, p. 39).

Matrix consists of those Federal lands not in the categories above. Matrix includes northern and southern General Forest Management Areas. Green tree retention ranges from 6 to 25 trees per acre following regeneration harvest in Matrix lands (USDI BLM 1995, pp. 38-39).

Northern Spotted Owl Sites:

Documented Spotted Owl Sites are defined 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. Documented spotted owl sites are tracked in the BLM northern spotted owl database. The majority of the documented sites were established through protocol level surveys completed in the late 1980s and early 1990s. Currently, documented spotted owl sites are recorded in an opportunistic manner, because protocol surveys are no longer conducted. Additional site locations have been established through a spotted owl demographic study taking place on portions of the District. All documented sites, except sites found non-nesting through protocol surveys, receive seasonal protection (see Appendix C, PDC).

Known Spotted Owl Activity Center (KOACs) are small LSRs representing the best 100 acres associated with known spotted owl activity centers in Matrix and AMAs (as of January 1, 1994). The criteria for mapping these areas are identified on pages C-10 and C-11 of the Northwest Forest Plan (NWFP) Standards and Guidelines (USDA FS and USDI BLM 1994a)

Computer Generated ("G") Sites are estimated utilizing the Methodology for Estimating the Number of Northern Spotted Owls Affected by Proposed Federal Actions (USDI/USDA 2008), a

process used to estimate effects to spotted owls in areas where survey information is not available. The methodology relies on known spotted owl locations, derived from spotted owl surveys, as the foundation for generating a map of likely of spotted owl locations.

Provincial Home Range is defined, for purposes of this document, as a circle located around an activity center and represents the area that spotted owls are assumed to use for nesting and foraging in any given year. The home ranges of adjacent spotted owl pairs may overlap. Provincial home range radii vary based on the physiographic province in which they are located: Klamath Mountains Province = 1.3 miles (approximately 3,400 acres), and Cascades West Province = 1.2 miles (approximately 2,900 acres).

Core Area is a 0.5-mile radius circle (encompassing approximately 500 acres) around a spotted owl nest or center of activity used to delineate the area presumably most heavily used by spotted owls during the nesting season; it is included in the provincial home range circle. Core areas represent the areas which are more readily defended by territorial spotted owls and generally do not overlap the core areas of adjacent spotted owl pairs.

Nest Patch is the 300-meter radius area around a known or likely spotted owl nest site; it is included in the core area.

Northern Spotted Owl Habitat:

The District identifies spotted owl habitat based on the following definitions.

Nesting, Roosting, and Foraging (NRF) Habitat for the spotted owl consists of habitat used for nesting, roosting, *and* foraging. Spotted owl NRF habitat also functions as dispersal habitat. Generally, this habitat is multistoried, 80 years old or more (depending on stand type and structural condition), and has sufficient snags and down wood to provide opportunities for nesting, roosting, and foraging. The canopy closure generally exceeds 60 percent, but canopy closure or age alone does not qualify a stand as spotted owl NRF habitat. Other attributes of NRF habitat include: a high incidence of large trees with various deformities (e.g., large cavities, broken tops, mistletoe infestations, and other evidence of decadence); large snags; large accumulations of fallen trees and other woody debris on the ground; and sufficient open space below the canopy for spotted owls to fly (Thomas et al. 1990). Spotted owl NRF habitat in southwest Oregon is typified by mixed-conifer forest, recurrent fire history, patchy habitat components, and a relatively high incidence of woodrats, a high quality spotted owl prey species in the area. Forsman et al. (1984) described some of the differences in NRF habitat within the Klamath Mountains Province, that are typical of large parts of the Medford District:

> "Eighty-one percent of all nests in northwestern Oregon were in cavities, compared to only 50 percent in the Klamath Mountains. These differences appeared to reflect regional differences in availability of the different nest types. Dwarf mistletoe infections in Douglas-fir (and numerous debris platforms that were associated with dwarf mistletoe infections) were common in the mixed coniferous forests of the Klamath Mountains and the east slopes of the Cascades, but did not occur in western Oregon."

Habitat Capable is forest land that is currently not spotted owl habitat but can become spotted owl NRF or dispersal habitat in the future, as trees mature and the canopy fills in.

Dispersal-only (dispersal) is a subcategory of "all dispersal" habitat for spotted owls. Thomas et al. (1990), defined dispersal habitat as forested habitat more than 40 years old, with canopy closure more than 40 percent, average tree diameter greater than 11 inches, and flying space for spotted owls in the understory, but lacking other components found in spotted owl NRF habitat. Dispersal habitat provides temporary shelter for spotted owls moving through the area between spotted owl NRF habitat and some opportunity for spotted owls to find prey, but does not provide all of the requirements to support a spotted owl throughout its life.

Forest Management Treatment Types within Spotted Owl Habitat:

Forest stands in southwest Oregon are often multiple-aged with multiple canopy levels that have resulted from previous harvesting or from past natural stand disturbance such as repeated historic low intensity fire (USDI FWS 1992a, Vol. II, 2-37). The interpretation of treatment impacts to spotted owls are defined by the Resource Area wildlife biologists in collaboration with their Interdisciplinary Team and Field and District Managers. Effects of individual forest management activities have been determined by the District following these descriptions.

Treat and Maintain Spotted Owl NRF or Dispersal Habitat means an action or activity will occur within spotted owl NRF or dispersal habitat, but will not change the habitat classification, post treatment. Affected stands of spotted owl NRF habitat will retain at least 60 percent canopy cover, large trees, multistoried canopy cover, standing and down dead wood, diverse understory adequate to support prey, and may have some mistletoe or other decay. Spotted owl dispersal habitat will continue to provide at least 40 percent canopy cover, flying space, and trees 11 inches diameter at breast height (dbh) or greater, on average.

Downgrade Spotted Owl NRF Habitat means to alter the function of spotted owl NRF habitat to an extent that it no longer supports nesting, roosting, and foraging behavior, but will retain enough tree cover to support spotted owl dispersal.

Remove Spotted Owl Habitat means to alter known spotted owl NRF or dispersal habitat to an extent that it no longer supports spotted owl nesting, roosting, foraging, or dispersal. Removal of spotted owl NRF is usually considered an adverse effect (LAA) to owls. Removal of dispersal habitat is usually considered to be not likely to adversely affect (NLAA) spotted owls because dispersal habitat is abundant in the Medford District and is not thought to limit the movements of spotted owls in most cases. However, removal of dispersal habitat from designated critical habitat is considered an adverse effect to spotted owls because it removes a portion of a defined primary constituent element of spotted owl critical habitat (USDI/USDA 2008).

CONSULTATION HISTORY

The Althouse Sucker, Cheney Slate, and East Fork Illinois projects were analyzed in the Service's October 2003 Biological Opinion (FWS loc # 1-15-03-F-511). This Biological Opinion was withdrawn on November 2, 2005 in response to the Ninth Circuit opinion in *NEDC* v. *Allen/USFWS* (*NEDC I*), No. 05-1279 (D. Or.).

The Tennessee Lime, Althouse Sucker, Cheney Slate and East Fork Illinois projects were analyzed in the Service's August 2006 Biological Opinion (FWS log # 1-15-06-F-162). This

Biological Opinion was withdrawn in March, 2007 in response to the Ninth Circuit opinion in *ONRC v. Allen,* No. 05-35830 (9th Cir.).

Tennessee Lime, Althouse Sucker, Cheney Slate and East Fork Illinois timber sales, as well as other projects, were included in a programmatic biological assessment submitted to the Service in October, 2008. Subsequently, the Service and District staffs engaged in discussions regarding the analysis of the proposed action in the context of the Service's 2008 Northern Spotted Owl Recovery Plan (FWS 2008) (Recovery Plan); specifically, how the activities included in the proposed action may affect forest stands that meet the definition of "older, structurally complex, multi-layered conifer forests," as defined in recovery action 32. During the interim, the District submitted a request for informal consultation to the Service (received in our office on November 25, 2009) that included a suite of vegetation management activities (from the 2008 Assessment) the District had determined not likely to adversely affect spotted owls, and which did not involve recovery action 32 defined stands. The Service issued a letter of concurrence (Tails # 13420-2009-I-0093) for these activities to the District on December 23, 2009. The Service and the District are continuing to discuss potential modifications to the other projects included in the 2008 biological assessment.

As described in the Assessment, the District has dropped approximately 1,200 acres of proposed harvest in spotted owl NRF habitat from the original timber harvest plans (included in the 2008 biological assessment) for the four timber sales included in the Assessment.

This Opinion is based primarily on the information presented in the District's Assessment and other information cited herein. A complete decision record for this consultation is on file at the Service's Roseburg Field Office, in Roseburg, Oregon.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

All projects included in the proposed action are planned to occur within Matrix and AMAs, defined above and discussed in the Northwest Forest Plan (NWFP) (USDA FS and USDI BLM 1994a). According to the Assessment, the District will use a combination of cable- and tractor-yarding systems to implement timber harvest operations. As described in the Assessment, the proposed action includes timber harvest and fuels reduction treatments as described below.

The "footprint" of the four timber harvest projects included in the proposed action (Table 1) consists of timber harvest activities followed by fuels reduction treatments designed to treat slash created by the timber harvest operations and residual, small, high density trees. Fuels treatments will include biomass removal, selective slashing, hand pile burning, as well as follow-up maintenance under burns within 7-10 years.

According to the Assessment, the District has designed the four proposed timber harvest projects in a manner that avoids older and more structurally complex, multi-layered conifer forests (Recovery Action 32), identified as important to the recovery of spotted owls in the Recovery Plan (FWS 2008). Resource Area biologists conducted on-the-ground investigations for the purpose of identifying forest stands that meet the definition of older and more structurally complex, multi-layered conifer forests, using the January 2010 draft Medford Bureau of Land Management and Rogue River-Siskiyou National Forest methodology. This methodology

represents an interagency effort by the District, Forest and Service to define the term "older and more structurally complex, multi-layered conifer forests" at the local level.

Table 1. Proposed Timber Harvest and Road Construction Activities.

Project Name	Number of Timber Harvest Acres	Number of Road Construction Miles	Land Use Allocation	Treatment Type
Illinois Watershed				
Althouse Sucker	192	1.05	Matrix	DM/UR, DM/GS, SR
East Fork Illinois	77	0.89	Matrix	CT, DM/UR
Tennessee Lime	206	1.14	Matrix	CT, DM/MGS, DM/UR
Applegate Watershed				
Cheney Slate	188	1.42	Adaptive Management Area	DM/UR, DM/MGS, RH
Total	663	4.5		

Density Management (DM), Commercial Thinning (CT), Understory Reduction (UR), Modified Group Selection (MGS), Group Selection (GS), Regeneration Harvest (RH), and Structural Retention for Stand Regeneration (SR).

The proposed action includes the following activities, as defined in the Assessment:

Timber Harvest

Commercial Thinning: typically prescribed for even-aged stands with a single canopy layer. In these stands, growth rates are beginning to decline due to competition. These treatments would thin stands by spacing the residual trees based on the crown radius of the healthiest dominant and co-dominant trees to achieve an average relative density of 35 percent with some variation for site differences (range between 25 and 45 percent relative density).

Density Management: typically prescribed for uneven-aged stands for the primary purpose of widening the spacing of residual trees to promote growth and structural development of the remaining stand. These treatments thin stands by spacing the residual trees based on the crown radius of the healthiest dominant and co-dominant trees to achieve an average relative density of 35 percent with some variation (between 25 and 45 percent relative density) for site differences.

Understory Reduction Treatments: primarily involve thinning (the smallest diameter trees) from below to achieve a target canopy closure of 60 percent in stands of spotted owl NRF habitat, and 40 percent in stands of spotted owl dispersal habitat. The prescription for these areas includes the retention of the most vigorous, large trees in patches, while thinning lower and intermediate tree layers in an effort to accelerate development of multi-layered tree structure**.**

Modified Group Selection: the removal of trees (usually Douglas-fir) that are competing with vigorous pines and non-tanoak hardwoods with greater than 30 percent live crown ratio. Typically, openings created by these treatments would be between one quarter to one half acre in

size, with the occasional openings of up to one acre in size if the pines and non-tanoak hardwoods require more release.

Group Selection: used in small patches (less than three acres), that lack conifer regeneration because of intense conifer, hardwood or brush competition or in areas where the overstory trees are showing signs of declining health (stagnating growth patterns, dead, dying, or diseased). A "regeneration opening" would be created by cutting and removing large hardwoods and/or conifers, potentially burning hardwoods on site when yarding is not feasible. Openings created would be planted with conifer seedlings and young stand management treatments would occur as needed.

Regeneration Harvest: Northern General Forest Management Area guidelines described in the 1995 Medford District Resource Management Plan will be followed. Prescriptions consist of the retention of six to eight large conifers per acre.

Structural Retention for Stand Regeneration T**reatments:** retain 16 to 25 large, green conifers (greater than 20 inches dbh) per acre across the natural range of diameters present in a particular treatment stand. Trees greater that six inches diameter at breast height would be removed between the trees selected for retention. Two large hardwoods per acre will be retained. Douglas-fir/Tanoak series stands containing an established and competitive tanoak component would retain nine to 16 large trees per acre.

Fuels Reduction

Biomass Removal: the removal of any dead or living vegetation in a fuel treatment unit that is less than or equal to 8 inches in diameter for conifers, and less than or equal to 12 inches for hardwoods. On slopes of less than 35 percent, mechanized, low ground pressure machinery will cut, skid, haul or chip the biomass materials. On slopes greater than 35 percent, biomass materials will be cable-yarded.

Selective Slashing: understory vegetation density will be reduced by cutting and spacing of conifers less than eight inches 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 2 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 the fall and spring outside of the breeding season for spotted owls.

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, all mandatory PDC will be applied to all activities associated with the proposed action where applicable. Recommended PDC will be incorporated during project implementation when practical. Detailed descriptions of the PDC are provided in Appendix A.

DESCRIPTION OF THE ACTION AREA

The action area is defined as "all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action" (50 CFR 402) (USDI FWS 1992b). For the purposes of this Opinion, the action area includes all treatment units, as well as all 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).

According to the Assessment (USDI BLM 2010), the proposed action is planned to occur within the Klamath Mountains Physiographic Province in southwest Oregon, an area where fire is recognized as a key natural disturbance mechanism (Atzet and Wheeler 1982). Federal public lands managed by the District in the action area 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 spotted owl's entire range and the inadequacy of existing regulatory mechanisms to conserve the spotted owl (USDI FWS 1990a). The Service recovery priority number for the spotted owl is 6C, on a scale of 1C (highest) to 18 (lowest) (USDI FWS 1983, 2004). This number reflects a high degree of threat, a low potential for recovery, and the spotted owl's taxonomic status as a subspecies. The "C" reflects conflict with development, construction, or other economic activity. 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 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 spotted owl is a medium-sized owl and is the largest of the three subspecies of spotted owls (Gutiérrez et al. 1995). 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 FWS 2008). The 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 (Forsman 1981, Moen et al. 1991). The spotted owl superficially resembles the barred owl (*Strix varia*), a species with which it occasionally hybridizes (Kelly and Forsman 2004). Hybrids exhibit physical and vocal characteristics of both species (Hamer et al. 1994).

Current and Historical Range
The current range of the spotted owl extends from southwest British Columbia through the Cascade Mountains, coastal ranges, and intervening forested lands in Washington, Oregon, and California, as far south as Marin County (USDI FWS 1990b). The range of the spotted owl is partitioned into 12 physiographic provinces (see Figure 1) based on recognized landscape subdivisions exhibiting different physical and environmental features (Thomas et al. 1993). 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 Mountains
- 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 (Thomas and Raphael 1993).

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).

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

1997). Spotted owls use smaller home ranges during the breeding season and often dramatically increase their home range size during fall and winter (Forsman et al. 1984, Sisco 1990).

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

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 (Thomas et al. 1990). 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 breast height (dbh) of greater than 30 inches); a high incidence of large trees with various deformities (large cavities, broken tops, mistletoe infections, and other evidence of decadence); large snags; large accumulations of fallen trees and other woody debris on the ground; and sufficient open space below the canopy for spotted owls to fly (Thomas et al. 1990). Forested stands with high canopy closure also provide thermal cover (Weathers et al. 2001) and protection from predators.

While spotted owls nest almost exclusively in trees, foraging habitat generally has attributes similar to those of nesting and roosting habitat, but such habitat may not always support successfully nesting pairs (USDI FWS 1992b). 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 (USDI FWS 1992a). Although Forsman et al. (2002) found that spotted owls could disperse through highly fragmented forest landscapes, 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, Carey et al. 1992, Thomas et al. 1990). 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 Mountains 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. (2006a). 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 (Forsman et al. 1984, 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 (USDI FWS 1990b, 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 (USDI FWS 1990b, 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 (Miller et al. 1997, Forsman et al. 2002). Natal dispersal occurs in stages, with juveniles settling in temporary home ranges between bouts of dispersal (Miller et al. 1997, Forsman et al. 2002). 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 (USDI FWS 1990b, Miller 1989). Known or suspected causes of mortality during dispersal include starvation, predation, and accidents (Miller 1989, USDI FWS 1990a, 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). 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, 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 and Oregon, while dusky-footed wood rats (*Neotoma fuscipes*) are a major part of the diet in the Oregon Klamath Mountains, California Klamath, and California Coastal provinces (Forsman et al. 1984, 2001, 2004, Ward et al. 1998, Hamer et al. 2001). 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 spotted 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 deer mice (*Peromyscus* ssp), in the spotted owl diet should not be underestimated (Forsman et al. 1984, 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 (Forsman et al. 1984, Gutiérrez et al. 1995). 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 spotted 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 spotted 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: 26114). More specifically, threats to the spotted owl included low populations, declining populations, limited habitat, declining habitat, inadequate distribution of habitat or populations, isolation of provinces, predation and competition, lack of coordinated conservation measures, and vulnerability to natural disturbance (USDI FWS 1992b). These threats were characterized for each province as severe, moderate, low or unknown (USDI FWS 1992b) (The range of the spotted owl is divided into 12 provinces from Canada to northern California and from the Pacific Coast to the eastern Cascades; see Figure 1). 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 2004 (USDI FWS 2004), for which the Service prepared a scientific evaluation of the status of the spotted owl (Courtney et al. 2004). An analysis was conducted assessing how the threats described in 1990 might have changed by 2004. Some of the key threats identified in 2004 are:

- "Although we are certain that current harvest effects are reduced, and that past harvest is also probably having a reduced effect now as compared to 1990, we are still unable to fully evaluate the current levels of threat posed by harvest because of the potential for lag effects…In their questionnaire responses…6 of 8 panel member identified past habitat loss due to timber harvest as a current threat, but only 4 viewed current harvest as a present threat" (Courtney and Gutiérrez 2004:11-7)
- "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 2004:11-8)
- "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 2004:11-8)

Barred Owls. 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 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 1988, 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, Gremel 2005, 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. 2003:51). 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 H.J. 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 FWS 2008). 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 2004:808).

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 spotted owls have been already fully realized" (Gutiérrez et al. 2004:7-38).

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 Mountains 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. 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. 1997). 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 in the relatively dry East Cascades and Klamath provinces has been greater than expected (see "Habitat Trends" below). Moeur et

al. (2005) suggested that 12 percent of late-successional forest rangewide would likely be negatively impacted by wildfire during the first 5 decades of the NWFP. Currently, the overall total amount of habitat affected by wildfires has been relatively small (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. West Nile virus (WNV) has killed millions of wild birds in North America since it arrived in 1999 (McLean et al. 2001, 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, Komar et al. 2001). Recent tests of tree squirrels from Los Angeles County, California, found over 70 percent were positive for WNV (R. Carney, pers. comm., cited in USDI FWS 2004). One captive spotted owl in Ontario, Canada, is known to have contracted WNV and died.

Health officials expect that WNV will eventually spread throughout the range of the spotted owl (Courtney et al. 2004), but it is unknown how WNV will ultimately affect spotted owl populations. Susceptibility to infection and mortality rates of infected individuals vary among bird species, even within groups (Courtney et al. 2004). Owls appear to be quite susceptible. For example, breeding Eastern screech owls (*Megascops asio*) in Ohio experienced 100 percent mortality (T. Grubb, pers. comm., cited in Courtney et al. 2004). Barred owls, in contrast, showed lower susceptibility (B. Hunter, pers. comm., cited in Courtney et al. 2004). Some level of innate resistance may occur (Fitzgerald et al. 2003), which could explain observations in several species of markedly lower mortality in the second year of exposure to WNV (Caffrey and Peterson 2003). Wild birds also develop resistance to WNV through immune responses (Deubel et al. 2001). The effects of WNV on bird populations at a regional scale have not been large, even for susceptible species (Caffrey and Peterson 2003), perhaps due to the short-term and patchy distribution of mortality (K. McGowan, pers. comm., cited in Courtney et al. 2004) or annual changes in vector abundance and distribution.

Courtney et al. (2004) offer competing propositions for the likely outcome of spotted owl populations being infected by WNV. One proposition is that spotted owls can tolerate severe, short-term population reductions due to WNV, because spotted owl populations are widely distributed and number in the several hundreds to thousands. An alternative proposition 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. Thus far, no mortality in wild, spotted owls has been recorded; however, WNV is a potential threat of uncertain magnitude and effect (Courtney et al. 2004).

Sudden Oak Death. Sudden Oak Death was recently identified as a potential threat to the spotted owl (Courtney et al. 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 meters. 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 et al. 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 reduced genetic variation and past bottlenecks in Washington, Oregon, or California (Barrowclough et al. 1999, Haig et al. 2004, Henke et al. unpublished). 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). It is possible (but not necessarily the case) that the 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 spotted owl populations, is not explicitly addressed in the NWFP. Climate change could have direct and indirect impacts on spotted owls and their prey. However, the emphasis on maintenance of seral stage complexity and related organismal diversity in the Matrix under the NWFP should contribute to the resiliency of the federal forest landscape to the impacts of climate change (Courtney et al. 2004). There is no indication in the literature regarding the direction (positive or negative) of the threat.

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

Disturbance-Related Effects. The effects of noise on spotted owls are largely unknown, and whether noise is a concern has been a controversial issue. The effect of noise on birds is extremely difficult to determine due to the inability of most studies to quantify one or more of the following variables: 1) timing of the disturbance in relation to nesting chronology; 2) type, frequency, and proximity of human disturbance; 3) clutch size; 4) health of individual birds; 5) food supply; and 6) outcome of previous interactions between birds and humans (Knight and Skagen 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 spotted owls to disturbance is limited, research indicates that recreational activity can cause Mexican spotted owls (*S. o. lucida*) to vacate otherwise suitable habitat (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).

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 and Gutiérrez 2003, Tempel and 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 and Gutiérrez 2004).

Post-harvest fuels treatments may also create above-ambient smoke or heat. Although it has not been conclusively demonstrated, it is anticipated that nesting 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 habitat capable of supporting clusters or local population centers of spotted owls (e.g., 15 to 20 breeding pairs) throughout the spotted owl's range distributed across a variety of ecological conditions within the spotted owl's range to reduce risk of local or widespread extirpation;

2. Habitat conditions and spacing between local spotted owl populations throughout its range that facilitate survival and movement;

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

4. 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 Interagency Scientific Committee (ISC)'s Conservation Strategy (Thomas et al. 1990); they continued with the designation of critical habitat (USDI FWS 1992b), the Draft Recovery Plan (USDI FWS 1992a), 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). 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.

Northwest Forest Plan

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 was designed around reserve/connectivity functions that are expected to be achieved through a variety of land-use allocations (LUAs). Each LUA has a distinct set of Standards and Guidelines that established goals and directs management actions that are consistent with NWFP expectations for ensuring appropriate management of reserves (large blocks) of late-successional and old-growth forest habitat to support multiple pairs of nesting spotted owls and for connectivity between reserves in the intervening matrix. LUAs in the plan that are designed to support or contribute to supporting population clusters are: 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 may, in the short-term, contribute demographic support but is designed to support timber production while also retaining biological legacy components important to old-growth obligate species (in 100-acre owl cores, 15 percent

late-successional provision, etc. (USDA FS and USDI BLM 1994a, USDI FWS 1994)) which would persist into future managed timber stands.

The NWFP with its range-wide system of LSRs was based on work completed by three previous studies (Thomas et. al. 2006): the 1990 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 1992a) 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 1994a, 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 (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 (Courtney et al. 2004, 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 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.

Northern Spotted Owl Recovery Plan
In May, 2008, the Service published the 2008 Final Recovery Plan for the Northern Spotted Owl (FWS 2008). This 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 (FWS 2008). To address these threats, the present recovery strategy has the following three essential elements: barred owl control, dry-forest landscape management strategy, and MOCAs (FWS 2008). The 2008 Final 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 (FWS 2008). The foundation of the 2008 Final Recovery 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 (FWS 2008). These areas generally overlap LSRs on the forest service lands.

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 (FWS 2008). Additionally, the 2008 Final 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 (FWS 2008). In addition, the 2008 Final 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 (FWS 2008). 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 (FWS 2008). The 2008 Final Recovery Plan estimates that recovery of the spotted owl could be achieved in approximately 30 years (FWS 2008).

The Effect of Barred Owls on NWFP Implementation
The Service believes that the NWFP in concert with the guidance from the 2008 Northern Spotted Owl Recovery Plan helps to provide the federal contribution to spotted owl recovery even with the uncertainty surrounding the effect of barred owls on spotted owls.

Reserve Network. The most important aspect of the NWFP for spotted owls are the substantial forest reserves and related management standards. These reserves are separated by matrix habitat (suitable for dispersal and some breeding) and non-federal lands (which also have some roles as breeding and dispersal habitats). Invasion of protected reserves (such as the Olympic National Park area) by barred owls may lead to the loss of some conservation function of the reserve network. For example, Schmidt (2003) reported a decline of spotted owls in one such reserve in northern California. Pearson and Livezey (2003) established that the density of barred owls was highest in Gifford Pinchot National Forest LSRs and other reserve areas and lower in areas subject to harvest. Annual reports by Anthony et al. (2006b, 2006c) in both the central and southern Oregon Cascades show continued annual declines in spotted owl pair occupancy in the major land-use allocations of LSR, Adaptive Management Areas (AMA) and Matrix, while

barred owl frequency is increasing, although the latter information is not presented by land-use allocation. No information is provided in terms of spotted owl survival by land-use allocation.

The inability of a reserve strategy of the federal land base (USDA FS and USDI BLM 1994a) to deal with invasive species, such as the barred owl is a concern. If late-successional reserves fail to protect breeding populations of spotted owls, then the overall conservation strategy for the species could be based on an untenable premise and may be questionable. The above data suggests that reserves are insufficient protection against invasive owls, and other habitat management options, such as increased habitat protection (although see habitat discussion below) outside reserves may not have an additive affect of helping spotted owl populations against barred owls. It is recognized however, that the NWFP has made important conservation contributions, and without the NWFP the situation of spotted owls would be far bleaker.

*Dispersal-Matrix Habitat***.** The NWFP provision for dispersal habitat in the matrix is an important component of long-term spotted owl conservation. Management of matrix habitat (15 percent of the NWFP federal land base) has been of lower impact on spotted owls than anticipated (Courtney et al. 2004, Lint 2005), yet decline in spotted owl populations are occurring in some areas. The NWFP provided for some protection of spotted owl nesting and foraging habitat within the matrix (e.g., reserves around know nest sites) as well as maintenance of general conditions within the matrix that would facilitate dispersal of spotted owls and recovery of spotted owl habitat following logging (e.g., variable retention harvesting). For these reasons, spotted owls are likely using matrix habitat more than anticipated as a consequence of lack of harvest activity in the matrix. However, the long-term suitability of matrix areas under a fully-implemented NWFP is impossible to assess at this point (Courtney et al. 2004) and dispersal remains a difficult topic to study (Buchanan 2004).

Because dispersal habitat in the matrix is important for spotted owl conservation and if barred owls now occupy matrix habitat, one suggestion is that such areas may be less suitable for dispersal of young spotted owls, due to both direct antagonism (and possibly predation) and indirect inhibition (Courtney et al. 2004). An alternative view, and tenable under the current understanding of dispersal dynamics of spotted owls (Forsman et al. 2002), is that barred owl presence in matrix habitat may promote a more rapid dispersal of juvenile spotted owls through lower quality habitat. If barred owls exclude spotted owls, then spotted owls will likely spend less time in matrix habitat occupied by barred owls. If this were accomplished without reduced survivorship of spotted owls, there might be few or no negative consequences of barred owls occupying matrix habitat (Courtney et al. 2004).

Barred owls are known to use a wide variety of forest types, including early successional habitats, and some authors have suggested that timber harvest activities may favor the species (Hamer 1988, Iverson 1993, Pearson and Livezey 2003). For instance, fragmentation of forest habitat may have created favorable conditions for survival and reproduction. By contrast, spotted owls appear to be more generally associated with old growth forest or forests that are structurally complex over a greater part of the species' range (Courtney et al. 2004). Under such conditions, timber harvest may have increased interpolation and contact of the two species' preferred and potential habitats, leading to increased competition between the species. Hicks et al. (2001) have attempted to examine this hypothesis in the northern part of the range by determining the amounts of different habitat types surrounding spotted owl territories that both have and have not been invaded by barred owls. Their results (Hicks et al. 2001) detected no

effect of surrounding habitat on the probability of replacement. Also, under the Plum Creek Habitat Conservation Plan (HCP), harvest was deferred for areas of nesting, roosting and foraging habitat around 30 productive spotted owl sites. After six years, only 10 sites had any spotted owl presence – this rate of decline is very similar to that seen at other areas where timber harvest occurred. These results suggest something other than timber harvest is influencing occupancy in this location, although, overall, it is unclear if forest management affects the outcome of the interaction between the two species (Courtney et al. 2004, Chapter 8).

It is also clear that, in some portions of the spotted owl's range, barred owls are increasing and spotted owls are declining to some degree independently of forest management history in the area. For example, the population of spotted owls has decreased on both the Plum Creek Cascades HCP area (with extensive harvest) and nearby reserve areas without harvest (Courtney et al. 2004). Similarly, barred owls are increasing while spotted owls are declining throughout the Olympic peninsula in both industrial and national forest land, but also in the unharvested areas of the Olympic National Park (Anthony et al. 2006a for trend information). On the Gifford Pinchot National Forest in Washington, the density and impact of barred owls appears higher in areas without timber harvest (Pearson and Livezey 2003). Although there is a strong overall correlation between barred owl increases and spotted owl declines, many historical spotted owl sites are not currently known to be occupied by either species (Wiedemeier and Horton 2000, Herter and Hicks 2000). Large numbers of truly vacant sites are not to be expected if the main cause of spotted owl decline is barred owl invasion and pre-emption of suitable sites (Courtney et al. 2004). Habitat loss to timber harvest is often postulated to be a major factor in spotted owl decline, but habitat is still present in the study areas (indeed some areas where spotted owls are in the worst decline, such as Olympic National Park, have never been harvested). Further, these results are not inconsistent with other factors that are known to negatively affect spotted owls. For example, Franklin et al. (2000) predicted, based on past weather data that there could be long periods of decline in a spotted owl population due solely to weather effects.

The Reserve and Matrix strategy of the NWFP has been successful in that spotted owl populations are persisting, and (largely) performing as predicted (Courtney et al. 2004). Continued cutting of spotted owl suitable habitat, in absence of a NWFP, might have accelerated the decline of the species and, possibly, facilitated more rapid displacement or occupation of vacated habitat by barred owls. However, the provision of suitable habitat for spotted owls was an essential contribution of the NWFP but has not protected it from competition from the invasive and highly competitive barred owl. At present, based on the habitat use patterns of both species and what little is known of interspecific competition, it is unclear whether additional habitat protection would improve conditions from the spotted owl.

Spotted Owl Population Declines and NWFP. Anthony et al. (2006a) noted precipitous declines in adult spotted owl populations on all four study areas in Washington. In northern Oregon, spotted owl population declines were noted in all three of the study areas, although the declines were generally less than those in Washington (Anthony et al. 2006a). The spotted owl has continued to decline in the northern portion of its range, despite the presence of a high proportion of protected habitat on federal lands in that area. Although Courtney et al. (2004) indicate that the population decline of the spotted owl over the last 14 years was expected, they conclude that the greater than expected downward trends in certain study areas in Washington where little timber harvest was taking place suggest that something other than timber harvest is responsible for the recent decline. Anthony et al. (2006a) stated that determining the cause of this decline

was beyond the scope of their study, and that they could only speculate among the numerous possibilities including: competition from barred owls, loss of habitat from wildfire, timber harvest including lag effects from prior harvest, poor weather conditions, and defoliation from insect infestations. Not unexpectedly, considering the fact that the spotted owl is a predator species, Anthony et al. (2006a) also noted the complexities of the relationships of prey abundance on predator populations, and identified declines in prey abundance as another possible reason for declines in apparent survival of spotted owls.

In southern Oregon and northern California, spotted owl populations are more stationary than in Washington (Anthony et al. 2006a) despite the fact that more timber harvest is taking place in these areas than in areas experiencing greater than expected declines. The fact that spotted owl populations in some portions of the range were stationary was not expected within the first ten years, given the general prediction of continued declines in the population over the first several decades of NWFP implementation (Lint 2005). The cause of the better demographic performance on the southern Oregon and northern California study areas, and the cause of declines in the Washington study areas are both unknown (Anthony et al. 2006a). Although population declines in the Washington demographic areas exceeded anticipated levels, Courtney et al. (2004) noted that a rangewide decline in the spotted owl population was not unexpected during the first decade, and that the observed rangewide population change during this period was not a reason to doubt the effectiveness of the core NWFP conservation strategy. It is clear that there is no simple correlation with timber harvest patterns (AFRC 2004), and barred owl invasion is certainly a viable hypothesis for this regional pattern (Courtney et al. 2004).
The synergistic effects of past threats and new threats are unknown. Although, the science behind the NWFP appears valid, new threats from barred owls, and potential threats from West Nile Virus and Sudden Oak Death may result in spotted owl populations in reserves falling to lower levels (and potentially at a faster rate) than originally anticipated, which would further retard spotted owl recovery (Courtney et al. 2004). According to the USDI FWS (2004), the current scientific information, including that showing the declines in Washington and northern Oregon, and Canada, indicate that the spotted owl continues to meet the definition of a threatened species. Populations are still relatively numerous over most of the species' historic range, which suggests that the threat of extinction is not imminent, and that the subspecies is not endangered even in the northern part of its range where greater than expected population declines were documented (USDI FWS 2004). The USDI FWS (2004) did not consider the increased risk to spotted owl populations due to the uncertainties surrounding barred owls and other factors sufficient to reclassify the species as endangered at this time. However, a problem in assessing this decline is that we lack a strong benchmark to know whether this decline is greater or less than that predicted under the NWFP (Courtney et al. 2004).

A complication noted by some biologists in studying spotted owls is their belief that spotted owls are silent in the presence of barred owls (Olson et al. 2005, Crozier et al. 2006). Hence, an area may be recorded as vacated by spotted owls, when in fact the birds are merely unresponsive to surveyors' calls. Evidence contradictory to this hypothesis comes from the meta-analysis, where, if this scenario were true, we would expect to observe a decline in recapture rates for banded spotted owls in areas where barred owls are increasing, but this does not seem to be the case for any study area (Anthony et al. 2006a).

Given the observed inverse correlations of some barred owl and spotted owl population trends, it is important to evaluate the relative effects of interspecific competition as a cause of spotted owl

decline, as compared to other factors such as habitat loss. Historically, much of the observed loss of old-growth habitat occurred well before barred owls arrived in the region. Hence, there must have been substantial effects of habitat loss on spotted owl populations prior to the period 1965 to 1980 (when the barred owl arrived in western states) (Gutiérrez et al. 2004). However, the arrival of the barred owl has introduced a new threat.

Previous estimates of spotted owl demographic parameters in 1994 (Burnham et al. 1994) and 1998 (Franklin et al. 1999) have produced substantial evidence that some populations at least are in decline. Of particular concern was the 1994 meta-analysis result that there was an accelerating rate of adult female mortality over the period of study for the various demographic study areas. This trend was not apparent in the 1998 meta-analysis although some populations apparently were declining. Although habitat loss is one plausible explanation for such population trends, an alternative explanation is that barred owl invasion has been depressing spotted owl survival and reproduction. Recent studies have shown strong effects (Franklin et al. 2000) and relatively weak effects (Olson et al. 2005) of some habitat conditions on spotted owl survival and reproduction. In demographic study areas where barred owls have been present the longest, and have been increasing through time, Anthony et al. (2006a) noted strong evidence for negative effects of barred owls on spotted owl survival in the Olympic and Wenatchee study areas, weak evidence for a barred owl effect on survival on the Cle Elum study area, but no effect of barred owls on fecundity on any demographic study population (Table 3). Even a low level of competition may contribute to depressed demographic parameters.

Demographic data collected over 15 years document declining populations across the species range with the most pronounced declines in British Columbia, Washington, and northern Oregon. This area of pronounced decline constitutes approximately 50 percent of the geographic range of the spotted owl, but supports about 25 percent of all known spotted owl activity centers, and contains approximately 25 percent of all spotted owl habitat, greater than 90 percent of which is federally managed. These declines in Washington and northern Oregon demographic study areas, as well as Canada, indicate the spotted owl meets the definition of a threatened species. However, populations are still relatively numerous over most of the species historic range, suggesting the threat of extinction is not imminent, and the subspecies in not "endangered" even in the northern part of the range where the demographic results are least promising (USDI FWS 2004, p. 54)

In summary, a decline of spotted owl populations under the NWFP during the past decade was anticipated, however, Anthony et al. (2006a) and Courtney et al. (2004) identified greater than expected spotted owl population declines in Washington and northern portions of Oregon, and more stationary populations in southern Oregon and northern California. These reports did not find a direct correlation between habitat conditions and changes in spotted owl populations, and they were inconclusive as to the cause of the declines. Lag effects from prior harvest of suitable habitat, competition with barred owls, and habitat loss due to wildfire were identified as current threats. Complex interactions are likely among the various factors. The status of the spotted owl population, and increased risk to spotted owl populations due to uncertainties surrounding barred owls were reported as not sufficient to reclassify the species to endangered at this time. Similarly, the reports did not identify cause for changing the basic conservation strategy in the NWFP.

Conservation Efforts on Non-Federal Lands

In the report from the Interagency Scientific Committee (Thomas et al. 1990), the Draft Recovery Plan (USDI FWS 1992a), and the report from the Forest Ecosystem Management Assessment Team (Thomas and Raphael 1993), it was noted that limited federal ownership in some areas constrained the ability to form a network of old-forest reserves to meet the conservation needs of the spotted owl. In these areas in particular, non-federal lands would be important to the range-wide goal of achieving conservation and recovery of the spotted owl. The Service's primary expectations for private lands are for their contributions to demographic support (pair or cluster protection) to federal lands, or their connectivity with federal lands (FWS 2008, page 55). 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 some current habitat conservation plans (HCP) in Washington, Oregon and California that have incidental take permits issued for spotted owls. 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.

California. The California State Forest Practice Rules, which govern timber harvest on private lands, require surveys for spotted owls in suitable habitat and to provide protection around activity centers (California Department of Forestry and Fire Protection 2007). Under the Forest Practice Rules, no timber harvest plan can be approved if it is likely to result in incidental take of

federally listed species, unless the take is authorized by a federal incidental take permit (California Department of Forestry and Fire Protection 2007). The California Department of Fish and Game initially reviewed all timber harvest plans to ensure that take was not likely to occur; the Service took over that review function in 2000. Several large industrial owners operate under spotted owl management plans that have been reviewed by the Service and that specify basic measures for spotted owl protection. Four HCPs authorizing take of spotted owls have been approved; these HCPs cover more than 669,000 acres of non-federal lands. Implementation of these plans is intended to provide for spotted owl demographic and connectivity support to NWFP lands.

Current Condition of the Spotted Owl

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

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

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

NWFP Lands Analysis 1994 – 2001. In 2001, the Service conducted an assessment of habitat baseline conditions, the first since implementation of the NWFP (USDI FWS 2001). This range-wide evaluation of habitat, compared to the Final Supplemental Environmental Impact Statement (FSEIS), was necessary to determine if the rate of potential change to spotted owl habitat was consistent with the change anticipated in the NWFP. In particular, the Service considered habitat effects that were documented through the section 7 consultation process since 1994. In general, the analytical framework of these consultations focused on the reserve and connectivity goals established by the NWFP land-use allocations (USDA FS 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 from 1994 to August 3, 2009. 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 spotted owl habitat, the Service designed the Consultation Effects Tracking System database which records impacts to spotted owls and their habitat at a variety of spatial and temporal scales. Data are entered into the 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 spotted owl habitat were estimated to exist on federal lands managed under the NWFP. As of April 13, 2010, the Service had consulted on the proposed removal and had natural events resulting in the loss of approximately 393,375 acres (Table 3) or 5.32 percent of 7.4 million acres (Table 3) of spotted owl suitable habitat on federal lands. Of the total federal acres consulted on for removal, approximately 225,481 acres (Table 3) or 3.05 percent of 7.4 million acres of spotted owl habitat were removed as a result of timber harvest. These changes in suitable spotted owl habitat are consistent with the expectations for implementation of the NWFP (USDA FS and USDI BLM 1994a).

April 13, 2004, marked the start of the second decade of the NWFP. Decade specific baselines and summaries of effects by State, physiographic province and land use function from proposed management activities and natural events are not provided here, but can be calculated using the Service's Consultation Effects Tracking System.

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 (84.29 %), especially within its Klamath (49.97%) and Western Cascades (24.15%) Provinces (Table 3), followed by much smaller habitat losses in Washington (7.43%) and California (8.28%) (Table 2). When habitat loss is evaluated as a proportion of provincial baselines, the Oregon Klamath Mountains (25.02%), Oregon Eastern Cascades (7.97%), and the California Cascades (5.45%) all have proportional losses greater than the range-wide mean (4.90%) (Table 3).

From 1994 through April 14, 2010, habitat lost due to natural events was estimated at approximately 167,894 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 spotted owl habitat, including habitat within five LSRs. Approximately 18,630 acres of spotted owl habitat were lost due to the B&B Complex and Davis Fires in the Oregon Eastern Cascades Province.

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 406,012 acres (Table 2) of habitat on non-federal lands. Most of these losses have yet to be realized because they are part of large-scale, long-term HCPs. Combining effects on federal and non-federal lands, the Service had consulted on the proposed removal of approximately

657,704 acres of spotted owl habitat range-wide, resulting from all management activities, from 1994 to April 13, 2010 (Table 2).

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 et al. (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 et al. (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 spotted 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 spotted 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 diameter at breast height (dbh) size class increased by only an estimated 102,000 to 127,000 acres. The estimates were based on change-detection layers for losses due to harvest and fire and re-measured 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 spotted owl habitat, the significance of these acres to 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 (Forsman et al. 1984, USDI FWS 1989, Thomas et al. 1990).

The current range of the spotted owl extends from southwest British Columbia through the Cascade Mountains, coastal ranges, and intervening forested lands in Washington, Oregon, and California, as far south as Marin County (USDI FWS 1990b). The range of the spotted owl is partitioned into 12 physiographic provinces (Figure 1) based on recognized landscape subdivisions exhibiting different physical and environmental features (Thomas et al. 1993). 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 recognized by 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 1992b, Thomas et al. 1993). In addition, historical sites may no longer be 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), 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) to estimate trends in the populations of the spotted owl.

In January 2004, two meta-analyses modeled rates of population change for up to 18 years using the re-parameterized Jolly-Seber method (λ_{RJS}). One meta-analysis modeled all 13 long-term study areas excluding the Marin study area, while the other modeled the eight study areas that are part of the effectiveness monitoring program of the NWFP (Anthony et al. 2006a). Data were analyzed separately for individual study areas, as well as across all study areas in a meta-analysis.

Point estimates of λ_{RJS} ranged from 0.896 to 1.005 for the 13 long-term study areas, and in all study areas but one—the Tyee study area—these estimates were less than 1.0 (Anthony et al. 2006a). There was strong evidence that populations in the Wenatchee, Cle Elum, Warm Springs, and Simpson study areas decreased during the period of study. There also was evidence that populations in the Rainier, Olympic, Oregon Coast Range, and H.J. Andrews study areas were decreasing. The precision of the λ_{RJS} estimates for Rainier and Olympic study areas was poor and not sufficient to detect a statistically significant difference from 1.00; however, the estimate

of λ_{RJS} for the Rainier study area (0.896) was the lowest of all of the areas. Populations in the Tyee, Klamath, South Oregon Cascades, Northwest California, and Hoopa study areas appeared to be stationary during the study, but there was some evidence that the spotted owl population in the Northwest California study area was decreasing (λ_{RJS} = 0.959 to 1.011). The weighted mean λ_{RJS} for all of the study areas was 0.963 (standard error [SE] = 0.009, 95 percent confidence interval [CI] = 0.945 to 0.981), suggesting that populations over all of the study areas decreased by about 3.7 percent per year from 1985 to 2003. Anthony et al. (2006a) explains that the indication populations were declining was based on the fact that the 95 percent confidence intervals around the estimate of the 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 Wenatchee, Cle Elum, and Rainier study areas in Washington and the Warm Springs study area in Oregon. Estimates of population declines in these areas ranged from 40 to 60 percent during the study period of 1990 to 2003 (Anthony et al. 2006a). Decreases in apparent adult survival rates were an important factor contributing to decreasing population trends. Survival rates decreased over time in five of the 14 study areas: four study areas in Washington, which showed the sharpest declines, and one study area in the California Klamath Province of northwest California (Anthony et al. 2006a). In Oregon, there were no time trends in apparent survival for four of six study areas, and remaining areas had weak, non-linear trends. In California, three study areas showed no trend and one showed a significant linear decrease (Anthony et al. 2006a). Like the trends in annual rate of population change, trends in the rate of adult survival showed clear decreases in some areas but not in others.

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. Prior to initiating the captive-breeding program, the population of spotted owls in Canada was declining by as much as 35 percent per year (Chutter et al. 2004). The amount of previous interaction between spotted owls in Canada and the United States is unknown (Chutter et al. 2004).

Table 2. Changes to Northern Spotted Owl Suitable[1] Habitat Acres from Activities Addressed in Section 7 Consultations (both formal and informal) and other Causes, Range-wide from 1994 to April 13, 2010.

Land Ownership		Consulted On Habitat Changes[2]		Other Habitat Changes[3]	
		Removed/ Downgraded	Maintained	Removed/ Downgraded	Maintained
Federal - Forest Plan	Bureau of Land Management	100,923	56,166	760	0
	Forest Service	116,819	472,573	36,911	5,481
	National Park Service	3,916	5,286	3	0
	Multi-agency[4]	15,320	23,314	0	0
	Subtotal	236,978	557,339	37,674	5,481
Other Management and Conservation Plans (OMCP)	Bureau of Indian Affairs and Tribes	110,123	28,398	2,398	0
	Habitat Conservation Plans	295,889	14,430	0	0
	OMCP Subtotal	406,012	42,828	2,398	0
Other Federal Agencies & Lands[5]		241	466	28	70
Other Public & Private Lands[6]		14,473	880	30,240	20,949
TOTAL Changes		657,704	601,513	70,340	26,500

[1] Nesting, roosting, foraging 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 by USDI FWS (2001) and subsequent effects compiled in the Spotted Owl Consultation Effects Tracker (web application and database).

[3] Includes effects to NRF habitat (as documented through technical assistance) 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.

[4] The 'Multi-agency' grouping is used to lump a variety of NWFP mixed agency or admin unit consultations that were reported together prior to 6/26/2001, and cannot be split out.

[5] Includes lands that are owned or managed by other federal agencies not included in the NWFP.

[6] Includes lands not covered by Habitat Conservation Plans that are owned or managed by states, counties, municipalities, and private entities. Effects that occurred on private lands from right-of-way permits across Forest Service and BLM lands are included here.

Table 3. Acres of Northern Spotted Owl Suitable (NRF[1]) Habitat Loss on Federal Lands from 1994 to April 13, 2010 from Proposed Management Activities and Natural Events: Baseline and Summary of Effects by State, Physiographic Province and Land Use Function.

Physiographic Province[4]		Evaluation Baseline[2]			Habitat Removed/Downgraded[3]				% Provincial Baseline Affected	% of Range-wide Effects
		Reserves[5]	Non-reserves[6]	Total	Reserves[5]	Non-reserves[6]	Habitat loss to natural events[7]	Total		
WA	Olympic Peninsula	548,483	11,734	560,217	867	24	299	1,190	0.21	0.30
	Eastern Cascades	506,340	200,509	706,849	3,946	5,748	5,754	15,448	2.19	3.93
	Western Cascades	864,683	247,797	1,112,480	1,681	10,924	0	12,605	1.13	3.20
	Western Lowlands	0	0	0	0	0	0	0	0.00	0.00
OR	Coast Range	422,387	94,190	516,577	734	3,877	66	4,677	0.91	1.19
	Klamath Mountains	448,509	337,789	785,589	23,402	71,479	101,676	196,557	25.02	49.97
	Eastern Cascades	247,624	196,035	443,659	2,343	13,448	19,547	35,338	7.97	8.98
	Western Cascades	1,012,426	1,033,337	2,046,472	4,020	66,396	24,583	94,999	4.64	24.15
	Willamette Valley	593	5,065	5,658	0	0	0	0	0.00	0.00
CA	Coast Range	47,566	3,928	51,494	455	65	100	620	1.20	0.16
	Cascades	61,852	26,385	88,237	0	4,808	0	4,808	5.45	1.22
	Klamath	734,103	345,763	1,079,866	1,545	9,719	15,869	27,133	2.51	6.88
Total		4,894,566	2,502,532	7,397,098	38,993	186,488	167,894	393,375	5.32	100.00

[1] Nesting, roosting, foraging 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] 1994 FSEIS baseline (USDA FS and USDI BLM 1994b).

[3] Includes consulted-on effects reported by USDI FWS (2001) and subsequent effects compiled in the Northern Spotted Owl Consultation Effects Tracking System database.

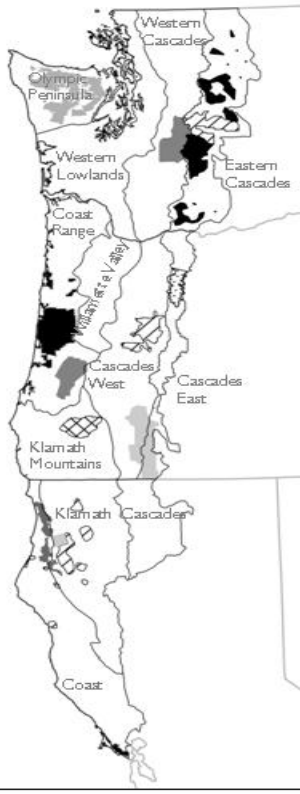
[4] Defined by the NWFP as the twelve physiographic provinces, as presented in Figure 3&4-1 on page 3&4-16 of the FSEIS.

[5] Land-use allocations intended to provide large blocks of habitat to support clusters of breeding pairs

[6] Land-use allocations intended to provide habitat to support movement of spotted owls among reserves.

[7] Acres for all physiographic provinces, except the Oregon Klamath Mountains and Oregon Eastern Cascades, are from the Scientific Evaluation of the Status of the Northern Spotted Owl (Courtney et al. 2004).

Figure 1. Physiographic provinces, northern spotted owl demographic study areas, and demographic trends (Anthony et al. 2006a).



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

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

Table 4. Spotted Owl Demographic Parameters from Demographic Study Areas (adapted from Anthony et al. 2006a).

Study Area	Fecundity	Adult Survival	$^{\lambda}$RJS	Population Change
Wenatchee	Declining	Declining	0.917	Declining
Cle Elum	Declining	Declining?	0.938	Declining
Rainier	Stable	Declining	0.896	Declining
Olympic	Stable	Declining	0.956	Declining
Coast Ranges	Declining?	Stable	0.968	Declining
HJ Andrews	Stable?	Stable	0.978	Declining
Warm Springs	Stable	Stable	0.908	Declining
Tyee	Increasing	Stable	1.005	Stationary
Klamath	Stable	Stable	0.997	Stationary
S. Cascades	Declining	Stable	0.974	Stationary
NW California	Declining	Declining	0.985	Declining?
Hoopa	Increasing	Stable	0.98	Stationary
Simpson	Declining	Stable	0.97	Declining
Marin	Stable	Stable	NA	NA

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 within the action area which are contemporaneous with the consultation in progress.

Table 5 of the Assessment included the following information describing the Environmental Baseline of spotted owl habitats in the action area.

Table 5. Environmental Baseline of Spotted Owl Habitats in the Action Area.

Illinois Watershed	Acres
Total acres all ownership	632,699
Total acres Medford BLM	66,551
Non-habitat	7,495
Capable	22,264
Dispersal	9,649
NRF	27,142
Total NRF on Non-Medford BLM ownership	16,357
Other Federal NRF	143,161
Non-Federal NRF	25,196
Applegate Watershed	**Acres**
Total acres all ownership	492,449
Total acres Medford BLM	148,036
Non-habitat	12,092
Capable	51,263
Dispersal	22,034
NRF	62,647
Total NRF on Non-Medford BLM ownership[1]	114,175
Other Federal NRF	84,090
Non-Federal NRF	30,085

The proposed action is planned to occur within the Klamath Mountains Physiographic Province. As of April 13, 2010 approximately 589,032 of spotted owl NRF habitat occurs within this province (Table 3). Management activities have resulted in the loss of approximately 71,479 acres of spotted owl NRF habitat in non-reserves, while an additional 101,676 acres of spotted owl NRF habitat were lost due to natural events (Table 3).

Spotted Owl Sites in the Action Area

Table 6 displays the number of historic and computer-generated spotted owl sites (USDI/USDA 2008) in the action area.

Table 6. Spotted Owl sites within the action area, by Section Seven Watershed and Project Area.

	Number of spotted owl sites (centers) within Watershed boundary *	Number of spotted owl home ranges Associated with the Action Area
Illinois	**50***	
Althouse Sucker		**7**
East Fork Illinois		**1**
Tennessee Lime		**3**
Applegate	**84***	
Cheney Slate		**7**

* This number represents spotted owl sites on District-managed lands, as well as adjacent Forest Service spotted owl sites within the Watershed Boundary. There are likely more owl sites on Forest Service lands not included in this number.

According to the Assessment, limited surveys have been conducted at these sites in the past decade. As a result, the history of spotted owl activity at every site within the action area is lacking. Since 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 (FWS 2008). All sites affected by the proposed actions are located in the Klamath Mountains Province. According to the 2004 Status and Trends in Demography of Northern Spotted Owls report, populations in the Klamath demography study area (which occurs in the Klamath Mountain Province) were stationary at the time when the meta-analysis was conducted (Anthony et al. 2006a). The data from all of the demographic study areas located across the range of the spotted owl were analyzed again in 2009. This document is under review, but initial reports indicate spotted owls are still declining across most of its range (Forsman et al. in press). As documented in the 2009 annual report (Davis et al. 2010) for the Klamath Demographic Study Area, 156 spotted owl locations in both the matrix and LSR land use allocations were surveyed to protocol. Spotted owls occupied 62.8 percent of the sites visited. The 2008 annual report (Lint et al. 2008), documents protocol surveys of 156 spotted owl locations in both matrix and LSR land allocations, with spotted owls occupying approximately 72 percent of the sites visited.

Barred Owls

As discussed in the *Status of the Species* section, the 2008 Final Recovery Plan for the Northern Spotted Owl (FWS 2008) 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 have moved west 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

(FWS 2008). The effects of the barred owl on spotted owl survival and reproduction is known to be mostly negative (Anthony et al. 2006a). Barred owl detections on the District have generally occurred opportunistically; however, these opportunistic detections indicate there is a trend of increasing numbers of barred owls within the District boundary.

The following text describes details of barred owl detections in the Klamath Demographic Study Area (KSA), a portion of which occurs within the administrative boundary of the District:

> "There were at least 58 non-juvenile barred owls (*Strix varia*) detected on the KSA during 2009. At 19 sites we detected a pair of barred owls and there was 1 known spotted-barred owl hybrid located within the KSA. At least 6 of these sites were known to have fledged young, the highest number documented on the KSA. A comparison was made of the percentage of sites that were surveyed where at least one spotted owl was detected versus at least one barred owl detected (Figure 3). The barred owl detections were incidental to spotted owl surveys; therefore the number of sites with at least one barred owl detection is probably underestimated. The percentage of sites surveyed for spotted owls with barred owl detections is trending upward from a relatively low 1.7% in 1998, to 10.7% in 2003, 21.8% in 2008, and 25.0% in 2009. The percentage of sites with a barred owl detection exceeded 10% for the first time during 2003, and has remained above 10% since (Davis et al. 2010)."

Role of the Action Area in Spotted Owl Survival and Recovery

The proposed action is scheduled to occur within the matrix land use allocation (LUA), as designated under the NWFP. The NWFP also provides a conservation framework for the spotted owl. This framework utilizes reserve and non-reserve allocations with the reserve allocations contributing primarily to supporting population clusters of breeding spotted owls, whereas, the non-reserve allocations are intended to provide for connectivity, or dispersal habitat between the reserves.

The action area is located within the Oregon Klamath Mountains physiographic province. At the beginning of the NWFP monitoring period (1994), about 55 percent of the habitat-capable area in the Oregon Klamath province was in spotted owl habitat (Lint 2005). When examined in 2004, 51 percent of the habitat-capable area was in spotted owl habitat. However, no recruitment of habitat was accounted for in this analysis (Lint 2005). Loss to stand-replacing events inside the habitat blocks was greater than outside the Klamath province. About 11.5 percent of the habitat-capable area in spotted owl habitat inside the blocks was lost in contrast to 2.5 percent outside. In either case, a high percentage of habitat-capable area most similar to that used by spotted owl pairs was maintained even in the province where the loss to wildfire was greatest (Lint 2005).

The non-reserve land-use allocations are intended to provide dispersal habitat supporting spotted owl movement between reserve habitat blocks. The Oregon Klamath province has approximately 48 percent of federal land in dispersal habitat (Lint 2005). The spatial assessment of dispersal

habitat indicates that both numerically and visually, nearly half of the federal forest acres are providing dispersal habitat for spotted owls within the action area (Lint 2005). In addition, Forsman et al. (2002) show movement patterns, regardless of LUA, of spotted owls within and among the provinces encompassing the action area. The movement records provide evidence that spotted owls are dispersing across the landscape under the NWFP and genetic or demographic isolation of local populations is not likely because dispersal between reserves is likely to be a common occurrence even if the landscapes between the reserves consists of highly fragmented forests (Lint 2005; Forsman et al. 2002). Given the relatively small amount of habitat impact and spatially distributed nature of the proposed action, dispersal habitat for spotted owls is likely to be maintained.

EFFECTS OF THE ACTION

Effects to Spotted Owls

As discussed in the Assessment, the District has identified 134 spotted owl home ranges which occur on federal lands managed by the District, as well as on adjacent federal land managed by the Rogue River- Siskiyou National Forest (Forest) within the action area (Table 6). Of those 134 spotted owl home ranges, the treatment units included in the proposed action intersect 18 spotted owl home ranges. Table 7 displays the anticipated effects of the four proposed actions to seven spotted owl sites. Within an additional two spotted owl home ranges (site numbers 1951 and 122G), the District plans to implement activities in forest stands that meet the definition of spotted owl dispersal habitat within the nest patch of the affected spotted owl sites. Those two sites were not included in Table 7; however, a discussion of the potential effects to all nine affected spotted owl sites follows Table 7. Within the remaining nine spotted owl sites that may be affected due to the implementation of the proposed action, the District plans to implement activities that treat and maintain spotted owl NRF or dispersal habitats, and which will not occur within the nest patch of the individual spotted owl sites. The Assessment did not provide additional details on these sites.

Table 7. Effects to Spotted Owl NRF Habitat at the Nest Patch, Core Area, and Home Range Scales.

	Nest Patch (300m)		Core Area (0.5 miles)		Home Range (1.3 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 #	**0091O (BLM)**						T. Lime
All NRF	48 (68.7)	48 (68.7)	251 (50.5)	251 (50.5)	1,388 (40.8)	1,380 (40.6)	
Federal NRF Only	47 (67.2)	47 (67.2)	174 (35.0)	174 (35.0)	647 (19.0)	639 (18.8)	
Site #	**2229O (BLM)**						Althouse Sucker
All NRF	61 (87.3)	61 (87.3)	169 (34.1)	127 (25.6)	369 (10.8)	319 (9.4)	

	Nest Patch (300m)		Core Area (0.5 miles)		Home Range (1.3 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)	
Federal NRF Only	59 (84.4)	59 (84.4)	157 (31.6)	115 (23.1)	322 (9.5)	271 (8.0)	
Site #	**3929O (BLM)**						
All NRF	42 (60.1)	42 (60.1)	231 (46.4)	229 (46.1)	1,069 (31.4)	1,041 (30.6)	Cheney Slate
Federal NRF Only	42 (60.1)	42 (60.1)	207 (41.7)	205 (41.3)	902 (26.5)	874 (25.7)	
Site #	**4041O (BLM)**						
All NRF	9 (12.9)	9 (12.9)	126 (25.4)	126 (25.4)	1,048 (30.8)	1,023 (30.1)	Cheney Slate
Federal NRF Only	8 (11.5)	8 (11.5)	82 (16.5)	82 (16.5)	634 (18.7)	609 (17.9)	
Site #	**59G (Private)**						
All NRF	57 (81.5)	57 (81.5)	175 (35.2)	175 (35.2)	1,181 (34.7)	1,154 (34.0)	Cheney Slate
Federal NRF Only	0 (0)	0 (0)	4 (0.8)	4 (0.8)	355 (10.4)	328 (9.7)	
Site #	**67G (BLM)**						
All NRF	48 (68.7)	44 (62.7)	327 (65.8)	289 (58.2)	1,408 (41.4)	1,359 (40.0)	Cheney Slate
Federal NRF Only	48 (68.7)	44 (62.7)	291 (58.6)	253 (50.9)	1,140 (33.5)	1,091 (32.1)	
Site #	**6WRRDO (FS)**						
All NRF	36 (51.5)	36 (51.5)	350 (70.4)	350 (70.4)	1,137 (33.4)	1,084 (31.9)	East Fork
Federal NRF Only	36 (51.5)	36 (51.5)	336 (67.6)	336 (67.6)	1,000 (29. 4)	947 (27.9)	

In the Assessment, the District described the potential effects to nine affected spotted owl sites as follows.

Site #0091O

Implementation of the proposed action will result a reduction of up to eight acres of spotted owl NRF habitat within the home range of this site (Table 7). Currently, the amount of spotted owl

NRF habitat on federal lands managed by the District is below the suggested amount of 40 percent, as described in the ITS methodology (USDI/USDA 2008). According to the Assessment, the District has determined this reduction of spotted owl NRF habitat is likely to adversely affect spotted owls that may be using this site. Adverse effects associated with the removal of spotted owl NRF habitat may include the loss of 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. Once harvested, treated stands are not expected to provide suitable NRF habitat for many years post-treatment.

Site #2229O

Implementation of the proposed action will result in the downgrading of 42 acres of spotted owl NRF habitat to dispersal habitat within the 0.5 mile core area of this site, as well as the downgrading of up to 51 acres of spotted owl NRF habitat within the home range of this site (Table 7). The District has determined the downgrading of up to 93 acres of spotted owl NRF habitat is likely to adversely affect spotted owls that are likely using this site. Adverse effects associated with the removal of spotted owl NRF habitat may include the loss of 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. Once harvested, treated stands are not expected to provide suitable NRF habitat for many years post-treatment.

The amounts of spotted owl NRF habitat at both the home range and core area scales are currently well below the suggested amounts of 40 percent at the home range and 50 percent at the core area, as defined in the ITS methodology (USDI/USDA 2008) and as displayed in Table 7. In the Assessment, the District cited Bart and Forsman (1992), which found that areas with less than 20 percent suitable habitat had few spotted owls and less reproductive success than areas with more suitable habitat. Additionally, in a southern Oregon study, Dugger et al. (2005) showed that spotted owl survival and reproduction was relatively higher in spotted owl core areas having least 50-60 percent older forest habitat. Federal ownership provides only 17 percent of the land within this home range. The remaining acres consist of private tax lots, agricultural land, and private timber land, not suitable for spotted owl nesting. The private timber land approximately 0.13 miles south of this site center was clear-cut in 2005 and no longer provides habitat for spotted owls.

As detailed in the Assessment, records indicate a pair of spotted owls was located at this site in 1990. However, no spotted owls have been observed since that time during several years of surveys in the early 1990's, 2001, 2002, 2005, 2006, and 2008. These surveys were a combination of protocol and non-protocol surveys. In the opinion of District biologists, this site likely served as an alternate nest for spotted owls later found occupying sites in township 40 south, range 7 west, sections 9 and 15, where more suitable habitat is available. Therefore, District biologists believe spotted owls are not likely to occupy this site.

Site #3929O

As displayed in Table 7, implementation of the proposed action will result in a reduction of two acres of spotted owl NRF habitat in the core area and 28 acres of spotted owl within the home range of this site. The District has determined this reduction of spotted owl NRF habitat is likely to adversely affect spotted owls that may utilize the site. Adverse effects associated with the removal of spotted owl NRF habitat may include the loss of 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. Once harvested, treated stands are not expected to provide suitable NRF habitat for many years post-treatment.

Site #4041O

As displayed in Table 7, implementation of the proposed action will result in a reduction of 27 acres of spotted owl NRF habitat within the home range of this site. The District has determined this reduction of spotted owl NRF habitat is likely to adversely affect spotted owls that may utilize the site. Adverse effects associated with the removal of spotted owl NRF habitat may include the loss of 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. Once harvested, treated stands are not expected to provide suitable NRF habitat for many years post-treatment.

Sites # 59G and 67G

Harvest of one proposed timber harvest unit will result in the downgrade of up to 27 acres of spotted owl NRF habitat (Table 7) within the home range of spotted owl site number 57G, a spotted owl site computer generated as described in the ITS methodology (USDI/USDA 2008). According to the Assessment, no spotted owls occur at this site. Pre-treatment acres of spotted owl NRF habitat on federal lands managed by the District occur below the 40 percent threshold levels (USDI/USDA 2008) at both sites.

Harvest of the same timber harvest unit is likely to affect site number 59G (also generated as described in the ITS methodology) and will result in the downgrade of spotted owl NRF habitat at the home range, core and nest patch scales (Table 7).

According to the Assessment, the District intends to complete protocol surveys of suitable spotted owl habitat, using the 2010 Northern Spotted Owl Survey Protocol (USDI FWS 2010) during the next two to five years at both of these sites, depending on the harvest schedule, to determine occupancy by spotted owls. If spotted owls are found during surveys, the District plans to drop the proposed harvest unit(s) to reduce the amount of potential harm associated with the proposed action.

Site #6WRRDO

Implementation of the East Fork Timber Sale will reduce the amount of spotted owl NRF habitat by 53 acres within the home range of this site (Table 7). The District has determined this reduction in spotted owl NRF habitat is likely to adversely affect spotted owls that may utilize this site. Adverse effects associated with the removal of spotted owl NRF habitat may include the loss of 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. Once harvested, treated stands are not expected to provide suitable NRF habitat for many years post-treatment.

To sum up thus far, the District has determined implementation of the proposed action may affect, is likely to adversely affect spotted owls at these seven sites due to reasons provided above. The Service agrees with this determination.

Sites # 1951O and 122G

These two sites are not included in Table 7 because harvest activities planned at these sites will treat and maintain spotted owl dispersal-only habitat. As detailed in the Assessment, harvest treatments are planned to occur within the nest patch of both sites, an area where the ITS methodology (USDI/USDA 2008) suggests potential harm to spotted owls is likely to occur. The District has determined implementation of activities that result in the maintenance of spotted owl dispersal habitat are not likely to adversely affect spotted owls that may utilize these sites for the following reasons:

Site # 1951O

- Approximately 1.1 acres of dispersal maintain treatments would occur within the nest patch, resulting in less than 0.1 percent of the nest patch being impacted.
- The existing 60 acres of spotted owl NRF habitat within the nest patch occur on federal public lands managed by the District. The proposed action does not include any treatment in spotted owl NRF habitat at this site.
- Records indicate a pair was located at this site in 1987. Limited protocol surveys have been conducted since that original observation. Auditory responses from a male and female spotted owl were heard in 1993. These responses occurred once and on separate occasions. Therefore, pair status was not confirmed at this site. Protocol surveys were completed in 2008. No spotted owls were detected. A barred owl pair was observed within the historic nest patch location in 2008. Therefore, in the opinion of resource area biologists, this site is not likely to be occupied by spotted owls.

Site # 122G

- Approximately 20 acres of dispersal maintain treatments from light-thinning prescriptions would occur within the nest patch of this generated spotted owl site.
- The local biologist has determined the proposed treatments are designed to maintain the current condition of the stand within the nest patch. As stated in the ITS methodology (pg. 14), these types of treatments may be considered not likely to adversely affect (NLAA) spotted owls because light thinning treatments of dispersal habitat within the nest patch are expected to maintain a similar stand function pre- and post- thinning.
- In the opinion of Resource Area biologists, this computer generated site is unlikely to be occupied by spotted owls due to the fact that spotted owl habitat conditions at this location, as assessed in the field by Resource Area biologists, would not likely support spotted owl nesting due to low amounts of spotted owl NRF habitat at the nest patch scale (6.3 percent).

The District has determined implementation of activities that treat and maintain spotted owl dispersal habitat in the nest patch of sites 1951O and 122G may affect, are not likely to adversely affect spotted owls. We agree with this effects determination, because of the light-thinning prescription and the low likelihood of spotted owl occupancy at these sites.

Effects to Spotted Owl NRF Habitat

Collectively, implementation of the four proposed timber harvest projects will remove up to 22 acres and downgrade up to 231 acres of spotted owl NRF habitat in the action area. The removal and downgrading of 253 acres represents approximately 0.07 percent of the extant spotted owl NRF habitat in the two affected watersheds (Table 8).

Table 8. Effects to Spotted Owl NRF Habitat.

Project Name	Amount of Spotted Owl NRF Habitat Pre-Project	Acres Spotted Owl NRF Habitat Removed	Acres of Spotted Owl NRF Habitat Downgraded	Amount of Spotted Owl NRF Habitat Post-Project	Percent
Illinois Watershed					
Althouse Sucker		0	74		
East Fork Illinois		0	60		
Tenessee Lime		0	20		
Watershed Total	**195,499**	**0**	**154**	**195,345**	**0.07**
Applegate Watershed					
Cheney Slate		22	77		
Watershed Total	**176,822**	**22**	**77**	**176,723**	**0.05**
Proposed Action Total	**372,321**	**22**	**231**	**372,068**	**0.07**

According to the Assessment, the District has determined the removal of 22 acres and downgrading of up to 231 acres of spotted owl NRF habitat is likely to adversely affect spotted owls for the following reasons:

- Regeneration harvest prescriptions that result in the removal of spotted owl NRF habitat are likely to 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.
- Regeneration harvest prescriptions are likely to result in forest stands reduced to below 40 percent canopy cover, and the simplification of existing multi-canopy, uneven age tree structure. Once harvested, treated stands are not expected to provide suitable NRF habitat for many years post-treatment.
- Implementation of treatments that remove and downgrade spotted owl NRF habitat are likely to reduce nesting, roosting, foraging and dispersal opportunities in the action area for spotted owls.
- Loss of habitat is likely to reduce future reproduction and survival of young spotted owls in the action area.

Based on the assessment provided above, the Service agrees the removal and downgrading of up to 253 acres of spotted owl NRF habitat is likely to adversely affect spotted owls for the reasons discussed above under “Effects to Spotted Owls.”

Effects to Spotted Owl Dispersal Habitat

Collectively, implementation of the proposed action will result in the removal of up to 69 acres as well as the maintenance of up to 333 acres of spotted owl dispersal habitat, distributed among two watersheds (Table 9).

Table 9. Effects to Spotted Owl Dispersal Habitat.

Project Name	Amount of Spotted Owl Dispersal Habitat Pre-Project	Acres Spotted Owl Dispersal Habitat Removed	Acres of Spotted Owl Dispersal Habitat Maintained	Amount of Spotted Owl Dispersal Habitat Post-Project	Percent
Illinois Watershed					
Althouse Sucker		43	72		
East Fork Illinois		0	15		
Tenessee Lime		0	183		
Watershed Total	**86,240**	**43**	**270**	**86,197**	**0.05**
Applegate Watershed					
Cheney Slate		26	63		
Watershed Total	**78,220**	**26**	**63**	**78,194**	**0.03**
Proposed Action Total	**164,460**	**69**	**333**	**164,391**	**0.04**

According to the Assessment, implementation of regeneration harvest treatments included in the proposed action will reduce the overall canopy cover below 40 percent in treated stands. In addition, regeneration harvest will simplify existing uneven age tree structure within harvest units. The Assessment states these treated stands are not anticipated to recover their ability to provide for the dispersal of spotted owls for many years post-harvest. However, the District has determined the removal of up to 69 acres of spotted owl dispersal habitat is not likely to adversely affect spotted owls because:

- The removal of up to 43 acres of spotted owl dispersal habitat in the Illinois Watershed represents 0.05 percent of the 86,240 acres of the dispersal habitat in the watershed; the removal of up to 26 acres of spotted owl dispersal habitat in the Applegate watershed represents 0.03 percent of the 78,220 acres of dispersal habitat in the watershed; collectively, the removal of up to 69 acres of spotted owl dispersal habitat represents 0.05 percent of the 164,460 acres in both watersheds (Table 9).
- According to the Assessment, spotted owl dispersal habitat is widely distributed and abundant in the action area, and will not be appreciably diminished due to the implementation of the proposed action.
- Treatments that result in the removal of spotted owl dispersal habitat will not occur within designated critical habitat.

- According to the Assessment, proposed treatments that result in the removal of spotted owl dispersal habitat will be dispersed among the two affected watersheds, discounting local adverse effects in the action area.

For the above reasons, the Service concurs with the District's determination.

The District has determined the implementation of treatments will maintain up to 333 acres of spotted owl dispersal habitat, and is not likely to adversely affect spotted owls because:

- Prescriptions direct maintaining 40 percent canopy cover in treated stands, which is important for spotted owls to continue to use treated stands for dispersal in the action area.
- Decadent woody material, such as large snags and down wood that provide important habitat for spotted owl prey species, will remain post-harvest; providing foraging opportunities for dispersing spotted owls.
- Proposed treatments will not remove structural components that provide for dispersing spotted owls, such as conifer and deciduous trees.
- According to the Assessment, treatments in spotted owl dispersal habitat have been designed to improve the ecological sustainability of the residual habitat.
- Proposed treatments are dispersed among two individual watersheds, minimizing the concentration of affects to spotted owls.

For the above reasons, the Service concurs with the District's determination.

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 problematic based on the following best available information. We recognize that the Northern Spotted Owl Occupancy Map (NSOOM) (USDI/USDA 2008) used by the District to assess potential impacts to spotted owls likely overestimates the number of spotted owls in a given area (USDI/USDA 2008). In addition, 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, 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. 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). There are documented cases of spotted owls remaining on territories after commercial thinnings have been implemented, and sometimes increased use of thinned stands post-treatment (Irwin et al. 2008). 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.

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, Anderson 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 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). 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 and 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 and 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 included in the proposed action outside of the spotted owl breeding season, as well as beyond recommended disturbance distance thresholds of known or generated spotted owl nest patches. Based on the information provided above, the District and the Service anticipate disturbance to spotted owls as a result of the implementation of the proposed action is not likely to occur.

Spotted Owl Recovery Plan-Recovery Action 32

District biologists conducted on-the-ground investigations for the purpose of identifying forest stands that meet the definition of older and more structurally complex, multi-layered conifer forests, as defined in the Recovery Plan (2008) using the January 2010 draft Medford Bureau of Land Management and Rogue River-Siskiyou National Forest methodology. Stands meeting that definition, as determined by District biologists, were not included in the projects included in the proposed action.

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

Spotted owl NRF habitat at site numbers 0091O, 2229O, 3929O, 4041O, 59G, 67G and 6WRRDO, currently occurs at levels less than the suggested amounts of 40 percent at the home range and 50 percent at the core area levels (USDI/USDA 2008). For post project implementation, amounts of spotted owl NRF habitat will be further reduced at the home range only scale at site numbers 0091O, 4041O, 59G and 6WRRDO; while at spotted owl site numbers 2229O, 3929O and 67G, amounts of spotted owl NRF habitat will be further reduced at both the core and home range scales (Table 7).

Due to these negative impacts to spotted owl habitat, adult spotted owls are expected to continue to persist for some time, but likely with reduced fitness (Dugger et al 2005), meaning survival and reproduction may be negatively affected. In addition, site occupancy through time may become reduced, thus the moving and searching for a new territory will potentially cause the adults to be exposed to a greater predation risk along with increased energetic demands, than that which the adult spotted owls experienced within their established territories. Predation on spotted owls has not been directly observed, but is suspected by northern goshawks (*Accipiter gentiles*), cooper's hawks (*Accipiter cooperi*), red-tailed hawks, great horned owls (*Bubo virginianus*), and barred owls (*Strix varia*) (Courtney et al. 2004, page 2-8).

The further impact to sites associated with the implementation of the proposed projects may delay the ability of spotted owls to achieve reproduction levels that will replace themselves, therefore diminishing contributions to the recovery of the species.

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, such as loss of NRF habitat, 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. 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 Grants Pass Resource Area fiscal year 2010-2011 timber harvest activities, *are 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 99 percent of currently occupied or unsurveyed spotted owl NRF and dispersal habitats in the action area. The Service has determined this outcome (maintenance of currently

occupied habitat and minimization of unoccupied habitat loss) will provide sufficient habitat for spotted owl survival and recovery (FWS 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.

The measures described below are non-discretionary, and must be undertaken by the District so that they become binding conditions of any grant or permit issued to any applicant, as appropriate, for the exemption in section 7(o)(2) to apply. The District has a continuing duty to regulate the activities covered by this Incidental Take Statement. If the District (1) fails to assume and implement the terms and conditions or (2) fails to require cooperators to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the District must report the progress of the action and its impact on the species to the Service as specified in the Incidental Take Statement. [50 CFR §402.14(i)(3)]

Amount or Extent of Take

The Service anticipates the incidental take of spotted owl eggs, nestlings or juveniles at four spotted owl sites (site numbers 0091O, 3929O, 4041O and 6WRRDO) due to harm caused by the reduction of spotted owl NRF habitat at these sites, as described in the Effects of the Action section of this Opinion. Take is not anticipated at the five additional sites (site numbers 2290O, 59G, 67G, 1951O and 122G) for the reasons provided in the Effects to Spotted Owl section of this Opinion.

The proposed activities will remove 22 acres of spotted owl NRF habitat, downgrade 154 acres of spotted owl NRF habitat, and remove up to 69 acres of dispersal-only habitat. Take will be in the form of harm resulting from post-harvest habitat conditions that further reduce the levels of NRF habitat at these sites.

Effect of Take

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

Reasonable and Prudent Measures

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

Terms and Conditions

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

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

CONSERVATION RECOMMENDATIONS

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

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

1. Delay implementation of activities likely to result in disturbance to spotted owls as late in the breeding season as possible.

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.

REINITIATION NOTICE

This concludes formal consultation on the four actions outlined in your Assessment. As provided in (50 CFR § 402.16), reinitiation 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 address implementation of the proposed actions prior to October 1, 2020.

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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 (Appendix B-1) of any documented or projected

owl site between March 1 and June 30 (or until two weeks after the fledging period) – unless protocol surveys have determined the activity center to be not occupied, non-nesting, or failed in their nesting attempt. The distances may be shortened if significant topographical breaks or blast blankets (or other devices) muffle sound traveling between the work location and nest sites.

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

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

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

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

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

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

Activity	Documented Owl Site	Projected Owl Site**
Heavy Equipment (including non-blasting quarry operations)	105 feet	761 feet
Chain saws	195 feet	851 feet
Impact pile driver, jackhammer, rock drill	195 feet	851 feet
Small helicopter or plane	360 feet*	1016 feet
Type 1 or Type 2 helicopter	0.25 mile*	0.512 mile
Blasting; 2 lbs of explosive or less	360 feet	1016 feet
Blasting; more than 2 lbs of explosives	1 mile	1.12 miles

* If below 1,500 feet above ground level

** Radius distances were increased by 656 feet (200 meters) around estimated nest sites to provide additional protection, since the exact location of owls is unknown in these areas.

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).

Recommended Project Design Criteria--Murrelets

Restrict operations from March 1 through September 30 (through the extended breeding period) within disturbance distances (unless protocol surveys demonstrate non-nesting).

Table B-2. Mandatory Marbled Murrelet Project Design Criteria

Impacts	Species: Marbled Murrelet
Disturbance	(II) Mandatory -For Survey Areas A and B work activities (such as tree felling, yarding, road and other construction activities, hauling on roads not generally used by the public, muffled blasting) which produce noises above ambient levels will not occur within specified distances (see table below) of any occupied stand or unsurveyed suitable habitat between April 1 – August 5. For the period between August 6 – September 15, work activities will be confined to between 2 hours after sunrise to 2 hours before sunset. See Fuels management PDCs for direction regarding site preparation and prescribed fire.
Disturbance	(III) Mandatory -Clean up trash and garbage daily at all construction and logging sites. Keep food out of sight so as to not attract crows and ravens (predators on eggs or young murrelets).
Disturbance	(IV)Mandatory- Blasting (open air/unmuffled) – No blasting activities during the critical breeding period (1 April through 15 August) within 1.0 mile of occupied stands or unsurveyed suitable habitat. This distance may be shortened if significant topographical breaks or blast blankets (or other devices) muffle sound traveling between the blast and nest sites or less than 2 lbs of explosives are used If so, then use described distance.
Disturbance	1) Recommended Delay project implementation until after September 15 where possible
Disturbance	2) Recommended Between 1 April and 15 September, concentrate disturbance activities spatially and temporally as much as possible (e.g., get in and get out, in as small an area as possible; avoid spreading the impacts over time and space).
Disturbance	(IV)Mandatory- Blasting (open air/unmuffled) – No blasting activities 1 April through 15 September within 1.0 mile of occupied stands or unsurveyed suitable habitat. This distance may be shortened if significant topographical breaks or blast blankets (or other devices) muffle sound traveling between the blast and nest sites or less than 2 lbs of explosives are used If so, then use described distance.
Disturbance	1) Recommended Delay project implementation until after September 15 where possible
Disturbance	2) Recommended Between 1 April and 15 September, concentrate disturbance activities spatially and temporally as much as possible (e.g., get in and get out, in as small an area as possible; avoid spreading the impacts over time and space).
Restoration projects	Mandatory To minimize the number of potential spotted owl or murrelet nest trees used for instream structures, only the following sources shall 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 or murrelets or contributing to trees with suitable nesting structure, as determined by an action agency wildlife biologist.
Fuels	Mandatory (I) Burning would not take place within 0.25 mile of known occupied marbled murrelet sites, or unsurveyed marbled murrelet habitat between April 1 and August 6 unless substantial smoke will not drift into the occupied site or suitable habitat. (II) All broadcast and under-burning operations (except for residual "smokes") will be completed in the period from two hours after sunrise to two hours

	before sunset. (IV) During helicopter operations, flights over suitable habitat will be restricted (helicopter should be a least 1,500 feet above ground level); if not possible, fly a minimum of 500 feet above suitable habitat (above canopy).
Wildfire	Mandatory Whenever possible, protect known nest sites of any listed species from high intensity fire. Update Resource Information Book annually; incorporate new nests or sites as soon as possible.
Wildfire	Mandatory (I) From 1 April - 5 August noise disturbance should be minimized inside occupied stands and within 0.25 mile of the edge of these stands. In order to accomplish this objective, minimize repeated aircraft flights that are less than 1,500 feet Above Ground Level (AGL). Also, minimize the use of fire line explosives within 1 air mile of occupied stands during the protection period.
	Light Hand Tactics or Minimize Impact Suppression Tactics (MIST) should receive consideration for use within the protection zones for northern spotted owls and murrelets.
Quarries	Mandatory For any occupied stands or unsurveyed suitable habitat within 0.25 miles of the quarry operation, restrict operation of the quarry from April 1 to August 5. Agency biologists also have the discretion to modify the 0.25-mile zone depending on topography and the level of noise - what equipment will be present (crusher or dozer/ripper or only loading of existing stockpiled rock). Recommended 2) For active nest stands or unsurveyed suitable habitat within 0.25 mile of the quarry operation, restrict operation of the quarry from April 1 through September 15 (unless protocol surveys demonstrate non-nesting).

APPENDIX B: PROJECT IMPLEMENTATION AND MONITORING FORM

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

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

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

Section II: Ownership and Location Identifier Information[1]

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

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

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

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

[3] California only.

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

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

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

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

Section II & III: General Note and Comments

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