United States Department of the Interior

FISH AND WILDLIFE SERVICE

Washington Fish and Wildlife Office
Central Washington Field Office
215 Melody Lane, Suite 119
Wenatchee, WA 98801

June 15, 2009

In Reply Refer To:
USFWS Reference: 13260-2009-F-0074
13260-2009-B-0006
Hydrologic Unit Code: 17-03-00-01-12
RE: Teanaway Fuel Breaks

Judy Hallisey
District Ranger
Cle Elum Ranger District
803 West Second Street
Cle Elum, Washington 98922

Dear Ms. Hallisey:

This correspondence transmits the U.S. Fish and Wildlife Service's (Service) Biological Opinion (BO) based upon our review of the proposed Teanaway Fuel Breaks Project (Project) for the Cle Elum Ranger District of the Okanogan –Wenatchee National Forests. The attached BO describes the effects of the Project on the northern spotted owl (*Strix occidentalis caurina*) and designated critical habitat for the northern spotted owl in accordance with Section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.). The March 12, 2009, cover letter and final Biological Assessment (BA) for this Project were received in the Service's Central Washington Field Office (CWFO) on March 13, 2009. The complete record for this consultation is on file in the CWFO.

The Service concludes in the attached BO that the implementation of the Project is not likely to jeopardize the continued existence of the northern spotted owl or result in the adverse modification of designated critical habitat for the northern spotted owl.

The Service appreciates the efforts of the Okanogan-Wenatchee National Forests to minimize Project effects to the northern spotted owl especially in light of the negative population trend data observed in Washington. We further commend your staff for outstanding attention to detail and clarity in the preparation of the Project BA and accompanying maps.

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If you have further questions about this BO or your responsibilities under the Act, please contact Gregg Kurz of the CWFO in Wenatchee at 509-665-3508.

Sincerely,

Jessica L Gonzales for

Ken S. Berg, Manager
Washington Fish and Wildlife Office

Attachment
cc:
Bill Gaines, Okanogan and Wenatchee National Forests, USFS, Wenatchee

U.S. FISH AND WILDLIFE SERVICE
BIOLOGICAL OPINION

for the

Teanaway Fuel Breaks Project

U.S. Department of Agriculture, Forest Service
Okanogan and Wenatchee National Forests
Cle Elum Ranger District

USFWS Reference Number: 13260-2009-F-0074
Cross Reference: 13260-2009-B-0006

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Executive Summary

The Cle Elum Ranger District, Okanogan and Wenatchee National Forest (OWNF), U.S. Forest Service (USFS), has proposed to treat approximately 3,176 acres to meet forest health, hazardous fuel reduction, and late-successional forest protection objectives in the upper Teanaway watershed. Planned mechanical treatments include commercial thinning, precommercial thinning, and non-commercial treatments (limbing and pruning). Activity fuels will be hand- or machine-piled and then burned, and then underburned. Natural fuel underburning will occur on an additional 2,728 acres outside of mechanical treatment areas. Hazardous fuel treatments are strategic in location to break up fuel continuity, reduce fuel loading, and improve access such that fire-suppression activities in wildland-urban interface (WUI) areas have a greater likelihood of success. Late-successional habitat is believed to be protected to some degree when vegetation management increases fire-suppression effectiveness, thereby reducing wildfire size and habitat loss.

The Teanaway Fuel Breaks Project (Project) is located on National Forest System lands in the Teanaway River fifth field watershed (HUC 1703000102). Treatments will occur in Late Successional Reserve (LSR), Matrix, and Administratively Withdrawn land use allocations, as described in the Northwest Forest Plan (NWFP) Record of Decision (USDA and USDI 1994a). There are also 1,110 acres of Riparian Reserve within proposed treatment areas. The Project area includes areas designated as critical habitat for the spotted owl (*Strix occidentalis caurina*) (spotted owl). Project activities are expected to take place over a period of ten years beginning in 2009.

In the Washington Eastern Cascades physiographic province, habitat removal due to management activities has been minor (less than 10,000 acres) since 1994. Habitat removal due to wildland fires and insect and disease outbreaks has been more extensive (estimated at about 36,000 acres), with fire effects concentrated in the northern parts of the province and insect and disease effects more prominent in the south. The provincial critical habitat and Northwest Forest Plan reserve networks have been degraded, primarily by wildland fire, but they retain roughly the same level of functionality for spotted owls as they had in 1994, although the resilience of some areas has been reduced. Population declines in the province have been steep, and large reserves expected to contribute to the persistence of spotted owls over the long term may no longer be fulfilling that expectation. The negative effects of the barred owl (*Strix varia*) may be partially responsible, but the potential effects of barred owls are poorly understood and may be confounded by lag effects of habitat removal and other factors.

The rangewide status of designated critical habitat for the spotted owl was "reset" by the revision which became effective on September 12, 2008. Since this reset, the Service has completed consultation on only two projects that resulted in effects on revised critical habitat. Effects from these two projects in Oregon have not changed the functionality of the affected critical habitat units and subunits; i.e., the functionality of the revised network of critical habitat units remains as designated. The Service's revised critical habitat designation includes four sub-units near the Teanaway River watershed. These sub-units largely overlap original critical habitat units that were in the area, but they are smaller and less contiguous. All of these sub-units have over 95 percent of their total area modeled as capable of producing suitable spotted owl habitat.

However, all of these sub-units have less than 40 percent of their total area modeled as currently supporting suitable habitat. In terms of functionality, this pattern suggests that the baseline habitat condition of critical habitat units in the watershed makes these units only marginally capable of fulfilling their conservation role in the survival and recovery of the spotted owl. Current information about the actual status of spotted owl pairs within these sub-units is not available, but we expect that owl abundance levels are also less than 40 percent of the estimated potential.

At the action area scale, planned treatments will downgrade nesting, roosting and foraging (NRF) habitat and will remove, and/or degrade dispersal habitat within the home range areas of 8 known spotted owl pairs, and potentially a 9th undetected pair located in unsurveyed habitat in upper Stafford or Miller Creek. Treatments will also reduce the availability of suitable habitat within the estimated home range areas of 7 of the 8 known owl pairs, and may result in incidental take of 2 active nesting pairs. Available habitat for both of these pairs is currently below the threshold for incidental take.

Planned harvest and underburning will remove or degrade a substantial amount of the dense dispersal habitat within the breeding and home range areas for spotted owl pair SO-398 and may further restrict their habitat base. Removal and downgrade of suitable habitat within their home range area, but entirely outside the breeding area, will further reduce habitat for this pair below the incidental take threshold. Treatment of dense dispersal habitat within the breeding area may pose an additional impact to this pair and lead to possible abandonment of this site.

The Project is likely to affect one critical habitat subunit (WA – 43). Subunit 43 has suitable habitat for spotted owls on about 36 percent of its total acres, far below its potential based on habitat-capable acres. Spotted owl numbers, reproduction, and distribution in the subunit remain compromised by past timber harvest. Within the action area, consulted-upon effects and natural disturbances have played a relatively minor role in terms of effects to suitable habitat since 1994. The proposed action would degrade about 4 acres and downgrade 38 acres of suitable habitat within sub-unit WA-43. Effects to dispersal habitat are more extensive (about 207 acres removed and 226 acres degraded). These effects are very small proportionally, representing less than 1 percent of the suitable habitat in critical habitat subunit WA-43 and about 2.2 percent of known dispersal habitat in the subunit. The limited amount of dispersal habitat removal proposed is too small in extent to influence functional connectivity among spotted owl populations.

Cumulative effects may include both the beneficial effects of habitat preservation and restoration and the negative effects of residential and recreational development. The balance of these effects is difficult to predict or estimate, but given intense development pressure in the action area, the Service assumes that cumulative effects will exert a net negative effect on spotted owl numbers, distribution, and reproduction in the area. Based on our review the Service does not believe that the proposed action will jeopardize the continued existence of the spotted owl. The proposed action will not cause an appreciable reduction in the numbers, distribution, or reproduction of spotted owls, or compromise the functional suitability of the LSR network. The minor adverse effects of the Project on spotted owl critical habitat are unlikely to change the existing ability of critical habitat sub-unit WA-43 to support its intended conservation role in the survival and

recovery of the spotted owl. Given that critical habitat will remain functional across scales from sub-unit to rangewide, and retain the current ability for Primary Constituent Elements (PCE) to become functionally established, we conclude that the action, as proposed, will not destroy or adversely modify designated critical habitat for the spotted owl.

INTRODUCTION

Decades of fire suppression have altered forest conditions in the upper Teanaway River watershed, particularly in dry forest plant associations typically found on steep south- and west-facing slopes. These areas historically supported very large (30-60"dbh), widely-spaced ponderosa pine (*Pinus ponderosa*) and Douglas-fir (*Pseudotsuga menziesii*) trees with open and/or patchy understory structure. In the prolonged absence of fire, however, a new cohort of Douglas-fir and grand fir (*Abies grandis*) trees became established under these older trees. These younger trees have since grown into a moderately dense intermediate stratum comprised of medium- to large-sized trees, 60-80 years old.

The Teanaway River watershed is characterized by steep, mountainous topography, where historically, open stands on south- and west-facing slopes stood in sharp contrast to dense stands of Douglas-fir and grand fir on north slopes and valley bottoms. The historic landscape was a mosaic characterized by a mixed severity fire regime, with frequent low intensity fires on southerly slopes, less frequent but higher intensity (i.e., stand-replacing) fire on northerly slopes and valley bottoms, and highly variable fire intensities and fire intervals on slopes in between. Larger expanses of open forests on south and west slopes likely functioned as persistent fuel breaks, limiting fire intensity and rate of spread across the landscape. With the increased live tree densities and fuel accumulations in drier stands today, even south slopes are likely to burn at high intensity, and to carry fire into surrounding denser stands. As a result, both the Teanaway and Swauk Late Successional Reserves (LSRs) are at increased risk to uncharacteristically large high intensity fire.

Additionally, a recent and prolonged outbreak of spruce budworm has killed young, intermediate and overstory trees across much of the Teanaway watershed, creating snags, gaps in forest canopy and concentrations of logs/fuels. The effects on forest structure from the current outbreak area highly variable, but are severe enough in places to have drawn public attention to the area, and raised concerns about wildfire. During wildfire events, open roads along valley bottoms are the only means for quick egress by firefighters and the recreating public. Extensive spruce budworm mortality along roads may result in intense fire behavior that could prevent use of these roads for escape.

The objectives of the Teanaway Fuel Breaks Project (Project) are to moderate fire behavior along escape routes by reducing hazardous fuels and thinning trees adjacent to open roads, reduce hazardous fuel loads, restore open late successional forest structure in historically open stands, and to treat areas large enough to moderate fire behavior at a landscape scale.

To accomplish these objectives, the Cle Elum Ranger District, Okanogan and Wenatchee National Forest (OWNF), U.S. Forest Service (USFS), has proposed to treat approximately 3,176 acres in the upper Teanaway watershed. Planned mechanical treatments include commercial thinning, shelterwood harvest, precommercial thinning, and non-commercial treatments (limbing and pruning). Natural fuel underburning will occur on an additional 2,728 acres outside of mechanical treatment areas. Hazardous fuel treatments are strategic in location to break up fuel continuity, reduce fuel loading, and improve access such that fire-suppression activities in wildland-urban interface (WUI) areas have a greater likelihood of success.

The U.S. Fish and Wildlife Service's (USFWS or Service) objective of the following Biological Opinion (BO) is to determine whether the proposed Project is likely to "jeopardize the continued existence of" the spotted owl (*Strix occidentalis caurina*) or is likely to "destroy or adversely modify" designated critical habitat for the spotted owl. The standards for determining jeopardy and destruction or adverse modification of designated critical habitat are described in Section 7(a)(2) of the Endangered Species Act of 1973 (Act), as amended (16 U.S.C. 1531 *et seq.*) and further defined in 50 C.F.R. 402.14.

Jeopardy Determination

In accordance with policy and regulation, the jeopardy analysis in this Biological Opinion relies on four components: (1) the *Status of the Species*, which evaluates the spotted owl's rangewide 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 relationship of the action area to the survival and recovery of the spotted owl; (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 policy and regulation, the jeopardy determination is made by evaluating the effects of the proposed Federal action in the context of the spotted owl's current status, taking into account cumulative effects, to determine if 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 in the wild.

The jeopardy analysis in this Biological Opinion places an emphasis on consideration of the rangewide survival and recovery needs of the spotted owl and the role of the action area in the survival and recovery of the spotted owl as the context for evaluating the significance of the effects of the proposed Federal action, taken together with cumulative effects, for purposes of making the jeopardy determination.

Adverse Modification Determination

This Biological Opinion does not rely on the regulatory definition of "destruction or adverse modification" of critical habitat at 50 CFR 402.02. Instead, we have relied upon the statutory provisions of the ESA to complete the following analysis with respect to critical habitat.

In accordance with policy and regulation, the adverse modification analysis in this Biological Opinion relies on four components: (1) the *Status of Critical Habitat*, which evaluates the rangewide and provincial condition of designated critical habitat for the spotted owl in terms of primary constituent elements (PCEs), the factors responsible for that condition, and the intended recovery function of the critical habitat at the provincial and rangewide scales; (2) the *Environmental Baseline*, which evaluates the condition of the critical habitat in the action area, the factors responsible for that condition, and the recovery role of affected critical habitat units in

the action area; (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 PCEs and how that will influence the recovery role of affected critical habitat units; and (4) *Cumulative Effects*, which evaluates the effects of future, non-Federal activities in the action area on the PCEs and how that will influence the recovery role of affected critical habitat units.

For purposes of the adverse modification determination, the effects of the proposed Federal action on spotted owl critical habitat are evaluated in the context of the rangewide condition of the critical habitat at the provincial and rangewide scales, taking into account any cumulative effects, to determine if critical habitat at the rangewide scale would remain functional (or would retain the current ability for the PCEs to be functionally established in areas of currently unsuitable but capable habitat) to serve its intended recovery role for the spotted owl.

The analysis in this Biological Opinion places an emphasis on using the intended rangewide and provincial scale recovery functions of spotted owl critical habitat and the role of the action area relative to those intended functions as the context for evaluating the significance of the effects of the proposed Federal action, taken together with cumulative effects, for purposes of making the adverse modification determination.

Please note that a "may affect, likely to adversely affect" determination for spotted owl critical habitat that triggers the need for completing an adverse modification analysis under formal consultation is warranted in cases where a proposed Federal action will: (1) reduce the quantity or quality of existing spotted owl nesting, roosting, foraging, or dispersal habitat at the stand level to an extent that it would be likely to adversely affect the breeding, feeding, or sheltering behavior of an individual spotted owl; (2) result in the removal or degradation of a known spotted owl nest tree when that removal reduces the likelihood of owls nesting within the stand; or (3) prevent or appreciably slow the development of spotted owl habitat at the stand scale in areas of critical habitat that currently do not contain all of the essential features, but have the capability to do so in the future; such actions adversely affect spotted owl critical habitat because older forested stands are more capable of supporting spotted owls than younger stands. Adverse effects to an individual tree within spotted owl critical habitat will not trigger the need to complete an adverse modification analysis under formal consultation if those effects are not measurable at the stand level.

This BO is based upon information provided in the Biological Assessment (BA), the Federal Register notice for the final rule revising designated critical habitat for the spotted owl, published literature and unpublished reports. A complete record of this consultation is on file in the Service's Central Washington Field Office in Wenatchee, Washington.

CONSULTATION HISTORY

The following chronology documents the key points of the consultation process that culminated in this BO for the spotted owl and its designated critical habitat, and informal consultation for other listed species:

1. June 26, 1990: The Service issued its final rule for listing the spotted owl as a threatened species (USDI 1990a). The primary reason for listing includes widespread habitat loss and an inadequacy of regulatory mechanisms to protect the species. The Service found that critical habitat for the spotted owl was "not presently determinable" and required additional analysis to determine if designating critical habitat would be prudent.

2. January 15, 1992: The Service issued its final rule designating critical habitat for the spotted owl. One hundred and ninety critical habitat units (CHUs), consisting of approximately 6,887,000 acres, were designated on federal lands in California, Oregon, and Washington. The primary constituent elements of critical habitat for the spotted owl includes nesting, roosting, and foraging habitat (also known as NRF or "suitable" habitat), and dispersal habitat (USDI 1992a).

3. April 13, 1994: The Departments of Agriculture and Interior jointly issued the Record of Decision (ROD) on Management of Habitat for Late-Successional and Old-Growth Forest Related Species within the Range of the Spotted owl (USDA and USDI 1994a), amending U.S. Department of Interior, Bureau of Land Management (BLM) and USFS land management plans within the Northwest Forest Plan (NWFP) area. Alternative 9, as modified, was selected from the Final Supplemental Environmental Impact Statement (FSEIS) on Management of Habitat for Late Successional and Old-Growth Forest Related Species on Federal Lands within the Range of the Spotted owl (USDA and USDI 1994b). The ROD describes land-use allocations (LUAs), various mitigations, and standards and guidelines to be applied throughout the NWFP area.

4. May 31, 1995: Interagency agreement on the consultation process is described in the Streamlined Consultation Procedures for Section 7, as updated, pursuant to the Act. This guidance sets forth timelines and the analytical approach to be used for evaluating project effects, and designated interagency teams and hierarchy for project review and policy oversight (e.g., Level 1 teams are the primary reviewers of projects, Level 2 teams provide oversight and local dispute resolution functions, etc.).

5. October 8, 1997: The Regional Ecosystem Office (REO) and Interagency Late-Successional Reserve Work Group issued the findings of their review of the Wenatchee National Forest Late Successional Reserve Assessment (LSRA). The REO concluded that the LSRA (USDA 1997) provides sufficient information and objectives to guide future management consistent with the NWFP. The LSRA also compared the relationship of LSR and Managed Late-Successional Area (MLSA) LUA's with the CHU's, and included an assessment of sustainability, desired future condition, and restoration opportunities.

6. July 1, 2008: Utilizing the streamlining process, USFS district staff met with the Level 1 team to review and finalize the Project BA. The proposed action was described and presented by key members of the USFS, and the Level 1 team provided comments and clarifications to ensure the BA was "adequate" following 50 C.F.R. 402.12.

7. August 13, 2008. The Service publishes a final rule in the Federal Register revising designation of critical habitat for the spotted owl. This final rule became effective on September 12, 2008. The revised critical habitat overlaps the action area, and the proposed project is likely to result in adverse effects to the primary constituent element of critical habitat.

8. March 12, 2009: The Service received an official request for consultation on the Teanaway Fuel Breaks Project. These documents were date-stamped and entered into the Service's document management system, beginning the official timeline for completion of the BO.

BIOLOGICAL OPINION

1.0 PROJECT DESCRIPTION

Silvicultural treatments will occur on 3,176 acres of National Forest system lands in the Teanaway River watershed. Mechanical treatments totaling 1,065 acres will take place in previously harvested stands located along existing roads. These include commercial "thinning from below," shelterwood harvest, precommercial thinning in plantations, and noncommercial treatments (Table 1).

Table 1. Teanaway Fuel Breaks: Summary of proposed silvicultural treatments.

Treatment	*Acres*
Commercial thin using ground-based logging systems (tractor and/or short-span skyline), treat activity fuels (hand or machine pile, burn piles, then underburn) (14 stands, ranging in size from 2 to 264 acres)	*916*
Shelterwood harvest using tractor logging system; treat activity fuels (machine-pile, burn piles), underburn. (1 stand)	*59*
Precommercial thin (plantations), hand-pile cut trees, and burn piles. (6 stands, 1 to 32 ac in size)	*67*
Non-commercial treatment: remove seedlings and saplings, prune lower limbs, hand-pile activity fuels only, burn piles (1 stand in riparian)	*23*
Thin from below with prescribed fire (natural fuels underburn, 8 stands, 219 to 470 acres in size)	*2111*
Total Area Treated	***3176***

Commercial Harvest: In commercial harvest areas, slopes less than 35% will be tractor-logged. Slopes above 35% will be logged using short-span skyline systems. In some smaller units, cut trees will be winched to the road. Tractor portions of some stands will be logged over snow. All other areas will be logged in spring, summer, or fall.

Landings will be located on existing road surfaces or, if terrain is flat (<20% gradient), will utilize existing openings in overstory vegetation. Landings will not be located in wetlands or on soils susceptible to compaction. Roadside landings will be located on the uphill sides of roads, away from streams. At completion of the project, landings will be ripped, mulched, and reseeded.

Slash generated by commercial harvest operations will either be hand- or machine-piled and then burned, followed by underburning. Public firewood removal may be permitted prior to underburning; however, any use of temporary roads or FS Rd 9701203 by the public will be brief in duration (days or weeks preceding planned burns), and will not impede planned closure of temporary roads by the timber sale purchaser, or planned closure of FS Rd 9701203.

Piles will be burned in fall. Underburns may take place in early spring or late fall, whenever burning conditions permit. Whenever possible, commercial harvest areas will be underburned in conjunction with planned natural fuels underburns.

Noncommercial Treatment: Trees thinned in noncommercial stands will be hand-felled and hand-piled for burning in fall, or will be hand-carried and stacked adjacent to open roads and made available to the public as firewood (the public will collect firewood by hand; off-road motorized vehicle use will not be permitted for firewood collection). Firewood collection activities will occur as stands are treated.

Natural fuels underburning ("NFUB") is planned for an additional 2,111 acres outside of mechanical treatment areas. Underburns will be conducted in fall, to emulate natural disturbance and minimize impacts to nesting landbirds. If fall burning poses unacceptable safety risks or will not meet objectives for tree and log retention, burning may occur in spring (preferably prior to May 15), subject to some operating restrictions for nesting spotted owls. Helicopters may be used for aerial ignitions, again subject to provisions for protection of active spotted owl nests. See the list of planned conservation measures that follow for details pertaining to spotted owls.

Site preparation for underburning (in natural fuels or in harvest areas) may include fireline construction using hand-tools, chainsaws, and/or a small tracked excavator. With maximum use of natural barriers as fireline, we anticipate approximately 4 miles of fireline construction will be needed for the project (out of 15 miles of total burn perimeter). Firelines will be constructed only where needed to protect sensitive resources, and/or to prevent fire encroachment into adjacent dense forest, including 100-ac core areas for spotted owls. Constructed firelines will be water-barred during mop-up operations, and seeded for erosion control as soon after burning as can be accomplished effectively. Firelines that are visible from open roads and trails will also be camouflaged from view using native materials to prevent attracting off-road motorized use.

Planned Road Actions: Commercial thinning and harvest will require construction of 9 temporary roads, ranging from 0.1 to 0.6 miles in length, and totaling 2.2 miles. One of these is located on a user-built unauthorized road. Temporary roads in one harvest area will require the installation of two culverts on perennial non-fish-bearing streams. These culverts will be removed by the purchaser upon completion of logging, as part of the planned temporary road obliterations. All temporary roads will remain closed to public use for the duration of the timber sale contract (except for brief periods prior to underburning to allow targeted public firewood removal). When logging is completed, all temporary roads, including the unauthorized road, will be obliterated by the purchaser as part of the timber sale contract.

One change in management status of an existing USFS system road is planned. USFS Road 9701203 (1.3 miles in length) will be changed from management level 2 (open) to management level 1 (closed). A gate or berm will be installed at the road's entry point onto National Forest land, as soon as treatments are completed. This closure is needed to mitigate the expected loss of cover for deer and elk due to logging and burning.

Connected Actions: Connected actions include hazard tree abatement along roads used for timber haul, treatment of noxious weeds using herbicides before, during, and after planned silvicultural treatments, and the installation of a gate on USFS Road 9701203. This gate will remain closed year-round, except for *emergency* administrative use.

Hazard tree management along haul routes is expected to affect an additional 100 acres outside of silvicultural treatment areas. Hazard tree management will be done in a manner consistent with that described in the Okanogan and Wenatchee Forestwide Programmatic for Selected Forest Management Activities (USFWS Reference: 13260-2008-I-0076).

Treatments for Noxious Weeds: An integrated noxious weed control strategy will be implemented on all treatment areas and associated haul routes to control existing noxious weed populations and prevent weed encroachment into areas that are currently weed-free. This strategy will be multi-phased over time and will utilize one or a combination of the following treatment methods:

- Prevention (seeding or planting with desirable species and mulching heavily disturbed areas, cleaning equipment before arrival at project areas; post-project monitoring to determine if noxious weed treatment is necessary).
- Manual control (hand pulling or grubbing with hand tools)
- Mechanical control (mowing or clipping)
- Cultural control (seeding and/or planting with desirable species)
- Chemical control (spot application only to target invasive plant species using a truck or ATV-mounted sprayer. The herbicides used would be clopyralid (Transline), picloram (Tordon 22K®) and/or glyphosate (e.g. the aquatic formulation of Glypro or Aquamaster), depending on the target invasive plant species and its proximity to water. Where a surfactant is needed to increase the efficiency of the herbicide, the proposed surfactant is Agri-Dex®. Herbicide application from wheeled vehicles will only occur along existing open roads.

In areas where noxious weeds are currently present, an integrated approach utilizing the five described methods will be used. As prevention and initial control treatments are implemented and weed populations decline, herbicide treatment will ultimately be replaced with manual, mechanical and cultural methods described above. Herbicides will be used where methods other than herbicides have been found to be ineffective or are not feasible.

Duration of the Project: All mechanical treatments will be completed within 5 years of timber sale award (2009-2013). All burning (natural fuels underburning and burning within thinning areas) will be completed within 10 years (2009-2018). Noxious weed treatments will occur throughout the 10-year life of this project.

1.1 Conservation Measures

When used in the context of the Act, conservation measures are actions that are included by the Federal agency as an integral part of the proposed action. Because conservation measures are

pledged in the Project description by the action agency, their implementation is required under the terms of the consultation (USDI and USDC 1998, page 4-19). As stated in the Project BA, the following conservation measures will be employed during Project implementation.

Vegetation: Trees selected for retention in commercial thinning areas will occur singly and in clumps, to mimic historic tree distribution. The largest trees, snags, and logs available will be retained at levels consistent with the historic range of variability for open ponderosa pine stands, and the Wenatchee National Forest LSRA (USDA 1997).

Retention of Snags and Logs: Target densities for snags and log retention in proposed treatment areas are as follows:

- In open upland forest: on average, retain at least 6 snags per acre > 10" diameter and > 10' tall (>20" diameter if available), and at least 3 logs per acre > 10" diameter and >16'long (>16" diameter and 33' long if available).
- In upland swales, dry draws, and open riparian forest: on average, retain at least 7 snags and 5 logs per acre (diameters and lengths described above).
- In mesic and wet riparian forest: on average, retain at least 12 snags and 7 logs per acre (diameters and lengths as above).

All standing snags and logs >20" in diameter will be retained wherever it can be accomplished safely, even if located in areas likely to burn at high intensity.

In roadside areas subject to hazard tree management, where it can be accomplished safely, create large wildlife trees by high-topping, rather than falling hazardous trees that are >24" dbh. Resulting snags and desirable logs will be marked for retention and recorded in a wildlife tree database to facilitate future monitoring.

Where it can be accomplished safely, the following decayed wood elements will be targeted for retention and protected during harvest and burning operation:

- Snags or dead-topped living trees extending high above the surrounding forest canopy.
- Trees, snags, or logs >30" dbh;
- Hollow trees, snags, logs, stumps or stobs.
- Trees, snags, logs, or stumps with cavities, or other signs of avian excavation.
- Trees with dwarf mistletoe brooms that may have been used as nests. Indications of nesting include presence of pellets, prey remains, and/or white fecal material on the ground. Nest trees will be retained and protected from high intensity fire.

Protection of Riparian Areas: No harvest, mechanical thinning, yarding, slash treatment, or deliberate ignition will occur with the inner gorges of any perennial, intermittent, or ephemeral streams. Commercial thinning within Riparian Reserves will be designed to improve structure and composition of riparian vegetation. Treatments will retain the largest trees, and will move the stand toward a more sustainable condition.

All existing large woody debris will be retained within treated Riparian Reserves. Activity fuels within Riparian Reserves will be hand-piled or scattered outside of inner gorges, in a manner that maintains vegetative cover. For specific information regarding Riparian Reserve prescriptions

for sustaining canopy cover, attaining shade allocations and meeting Aquatic Conservation Strategy (ACS) objectives please see pages 13-17 of the Project BA (USDA 2009).

Spotted owls: There will be no use of chainsaws, small tracked excavators, or heavy equipment within ¼ mi of active spotted owl nests. This restriction applies to planned harvest activities and burn operations.

During the breeding period for spotted owls (March 1 to August 31), hand-held drip torches will be used to ignite burns within 1.0 km of active nests. Helicopters may be used to ignite fall burns, and spring burns within 1 km of non-nesting pairs. Helicopter landings will not be located within 1 km of active nests, unless they are to be used outside the breeding period or in non-nesting years.

Burns within 1 km of active spotted owl nests will be designed to produce a plume trajectory that is at least 45 degrees on either side of the nest tree. A test-fire will be used to determine smoke trajectory, prior to full ignition. See Appendix A of the Project BA for further explanation of planned smoke management around active nests.

Landings will not be located within ¼ mile of known spotted owl nests, unless they are to be used outside the breeding period or in years in which owls are not nesting.

Additional Conservation Measures: The location of treatment units on the landscape maintains late-successional habitat connectivity between the Teanaway and Swauk LSRs. All actions would be consistent with the objectives outlined in the Northwest Forest Plan (USDA and USDI 1994a) and the Wenatchee National Forest LSRA (USDA Forest Service 1997).

The Project also includes several conservation measures associated with road management, landing construction and rehabilitation, felling and yarding, fuels management, slash disposal and herbicide application. For detailed descriptions of these measures please refer to pages 17-21 of the Project BA (USDA 2009).

1.2 Definition of the Action Area

The action area is defined as all areas to be affected directly or indirectly by the Federal action, including interrelated and interdependent actions, and not merely the immediate area involved in the action (50 C.F.R. 402.02). Subsequent analyses of the environmental baseline, effects of the action, cumulative effects, and levels of incidental take are based upon the action area as determined by the Service.

For the purposes of this analysis, the Service defines the action area as the portions of the Teanaway fifth field watershed (HUC 1703000102) contained in the following legal description:

Sec. 35, T. 23 N., R. 15 E.,
Secs. 2, 3, 10, 11-14, 24, and 25, T. 22 N., R. 15 E.,
Secs. 17-20, 23-26, 28, 29, 31, and 29-32, T. 22 N., R. 16 E.,
Sec. 6, T. 21 N., R. 16 E., and
Secs. 1 and 2, T. 21 N., R. 15 E., W.M.

This action area also overlaps parts of subunit WA-43 of the Entiat unit of revised critical habitat for the spotted owl (73 FR 47326). However, the effects of the action are analyzed at multiple scales to put the effects into a meaningful context. For the spotted owl, effects of the action are analyzed primarily at the scale of action area, but also at the watershed, province and rangewide scales.

2.0 STATUS OF THE SPECIES FOR THE SPOTTED OWL

2.1 Legal Status

The spotted owl was listed as threatened on June 26, 1990 due to widespread loss and adverse modification of suitable habitat across the owl's entire range and the inadequacy of existing regulatory mechanisms to conserve the owl (USDI FWS 1990a, p. 26114). The U.S. Fish and Wildlife Service recovery priority number for the spotted owl is 6C (USDI FWS 2004, pp. 55), on a scale of 1C (highest) to 18 (lowest). This number reflects a high degree of threat, a low potential for recovery, and the owl's taxonomic status as a subspecies (USDI FWS 1983b, pp. 51895). The "C" reflects conflict with development, construction, or other economic activity (USDI FWS 1983a, pp. 43104). 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, pp. 55).

2.2 Life History

2.2.1 Taxonomy

The northern spotted owl is one of three subspecies of spotted owls currently recognized by the American Ornithologists' Union. The taxonomic separation of these three subspecies is supported by genetic, (Barrowclough and Gutiérrez 1990, pp.741-742; Barrowclough et al. 1999, pp. 928; Haig et al. 2004, pp. 1354) morphological (Gutiérrez et al. 1995, pp. 2), and biogeographic information (Barrowclough and Gutiérrez 1990, pp.741-742). 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, pp.2). Recent studies analyzing mitochondrial DNA sequences (Haig et al. 2004, pp. 1354, Chi et al. 2004, pp. 3; Barrowclough et al. 2005, pp. 1117) and microsatellites (Henke et al., unpubl. data, pp. 15) 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, pp. 1116).

2.2.2 Physical Description

The northern spotted owl is a medium-sized owl and is the largest of the three subspecies of spotted owls (Gutiérrez 1996, pp. 2). It is approximately 46 to 48 centimeters (18 inches to 19 inches) long and the sexes are dimorphic, with males averaging about 13 percent smaller than females. The mean mass of 971 males taken during 1,108 captures was 580.4 grams (1.28 pounds) (out of a range 430.0 to 690.0 grams) (0.95 pound to 1.52 pounds), and the mean mass of 874 females taken during 1,016 captures was 664.5 grams (1.46 pounds) (out of a range 490.0 to 885.0 grams) (1.1 pounds to 1.95 pounds) (P. Loschl and E. Forsman, pers. comm. cited in USDI 2008a, pp. 43). The northern spotted owl is dark brown with a barred tail and white spots

on its head and breast, and it has dark brown eyes surrounded by prominent facial disks. Four age classes can be distinguished on the basis of plumage characteristics (Moen et al. 1991, page 493). The northern spotted owl superficially resembles the barred owl, a species with which it occasionally hybridizes (Kelly and Forsman 2004, pp. 807). Hybrids exhibit physical and vocal characteristics of both species (Hamer et al. 1994, pp. 488).

2.2.3 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 1990a, pp. 26115). The range of the spotted owl is partitioned into 12 physiographic provinces (see Figure 1) based on recognized landscape subdivisions exhibiting different physical and environmental features (USDI 1992b, pp. 31). These provinces are distributed across the species' range as follows:

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

The spotted owl is extirpated or uncommon in certain areas such as southwestern Washington and British Columbia. Timber harvest activities have eliminated, reduced or fragmented spotted owl habitat sufficiently to decrease overall population densities across its range, particularly within the coastal provinces where habitat reduction has been concentrated (USDI 1992a, pp. 1799).

2.2.4 Behavior

Spotted owls are territorial. However, home ranges of adjacent pairs overlap (Forsman et al. 1984, pp. 22; Solis and Gutiérrez 1990, pp. 746) 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, pp. 4). 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, pp. 822). Little is known about floaters other than that they exist and typically do not respond to calls as vigorously as territorial birds (Gutiérrez 1996, pp. 4).

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, pp. 10).

Figure 1. Physiographic provinces, spotted owl demographic study areas, and demographic trends (Anthony et al. 2004a).

Demographic Study Area	Land Ownership	# Owls Banded	Fecundity	Apparent Survival	λ_{RJS}	Population Trend Based on $\Delta\lambda$
Washington						
Wenatchee (WEN)	Private	1,200	Stable	Declining	0.917	Declining
Rainer (RAI)	USFS	217	Stable	Declining	0.896	Declining
Olympic (OLY)	NPS & USFS	985	Stable	Declining	0.956	Declining
Cle Elum (CLE)	USFS	724	Declining[1]	Declining?[2]	0.938	Declining
Oregon						
Oregon Coast Range (COA)	USFS & BLM	1,025	Declining?[1]	Stable	0.968	Declining
Tyee (TYE)	BLM & Private	1,032	Increasing	Stable	1.005	Stationary
South Oregon Cascades (CAS)	USFS & BLM	881	Declining	Stable	0.974	Stationary
H.J. Andrews (HJA)	USFS	1,095	Stable?[3]	Stable	0.978	Declining
Klamath (KLA)	BLM & Private	1,147	Stable	Stable	0.997	Stationary
Warm Springs (WSR)	Tribal	381	Stable	Stable	0.908	Declining
California						
Marin (MAR)	NPS	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)	USFS	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.

2.2.5 Habitat Relationships

2.2.5.1 Home Range. Home-range sizes vary geographically, generally increasing from south to north, which is likely a response to differences in habitat quality (USDI 1990a, pp. 26117). 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, pp. IX-15) vary by province and range from 2,955 acres in the Oregon Cascades (Thomas et al. 1990, pp. 194) to 14,211 acres on the Olympic Peninsula (USDI 1994a, pp. 3). Zabel et al. (1995, pp. 436) 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, pp. 22; Solis and Gutiérrez 1990, pp. 746), suggesting that the defended area is smaller than the area used for foraging. Within the home range there is a smaller area of concentrated use during the breeding season (~20% of the homerange), often referred to as the core area (Bingham and Noon 1997, pp. 133-135). 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, pp. 134). 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, pp. 21-22; Sisco 1990, pp. iii).

Although differences exist in natural stand characteristics that influence home range size, habitat loss and forest fragmentation effectively reduce habitat quality in the home range. A reduction in the amount of suitable habitat reduces spotted owl nesting success (Bart 1995, pp. 944) and abundance (Bart and Forsman 1992, pp. 98-99).

Shortly after their listing in 1990, the Service developed guidance for protecting spotted owl habitat in proximity to the nest tree or activity center (more recently summarized by Bart 1995). This guidance describes various "thresholds" or amounts of suitable habitat within prescribed distances from the nest tree or activity center. The Service uses this guidance to evaluate the existing habitat condition, the effects of the proposed action, and the potential for incidental take of spotted owls (see the Incidental Take Statement). Removing habitat below threshold values increases the likelihood of site abandonment, reduced fecundity, and other significant impairments of normal behavioral patterns.

To be considered "at threshold" in the Washington Eastern Cascades, suitable habitat must comprise (1) 100 acres of the best habitat nearest the nest tree or activity center, (2) 500 acres within a 0.7 mile radius of the activity center, and (3) 2,663 acres within a 1.82 mile radius of the activity center (i.e., 40 percent of the home range). The "100 acres of best habitat" is also known as the 100-acre core; although the Service initially described a 70-acre core, this area was expanded to a 100-acre core with the adoption of the NWFP. Even if no longer occupied by spotted owls, the ROD (USDA and USDI 1994a) specified that the 100-acre core should be maintained as an "unmapped LSR" (ROD, page C-10 and C-39), and managed consistent with LSR objectives. This standard and guideline was developed for areas outside of "reserve" LUA's (e.g., Congressionally Reserved, Administratively Withdrawn, LSR, MLSA, and Riparian Reserves); "unmapped LSRs" may benefit other late-successional species or provide a "stepping stone" for spotted owls moving across the landscape.

2.2.5.2 Habitat Use. Forsman et al. (1984, pp.15-16) 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, pp. 27; Forsman et al. 1984, pp. 15-16).

Roost sites selected by spotted owls have more complex vegetation structure than forests generally available to them (Barrows and Barrows 1978, pp.3; Forsman et al. 1984, pp.29-30; Solis and Gutiérrez 1990, pp.742-743). 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, pp.30; Hershey et al. 1998, pp.1402). 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, pp. 40; Buchanan et al. 1995, pp.1402; Hershey et al. 1998 pp. 1404).

Foraging habitat is the most variable of all habitats used by territorial spotted owls (USDI 1992b, pp. 20). Descriptions of foraging habitat have ranged from complex structure (Solis and Gutiérrez 1990, pp. 742-744) to forests with lower canopy closure and smaller trees than forests containing nests or roosts (Gutiérrez 1996, pp.5).

2.2.5.3 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, pp. 19). Nesting spotted owls consistently occupy stands with a high degree of canopy closure that may provide thermoregulatory benefits (Weathers et al. 2001, pp. 686) and protection from predators.

Foraging habitat for spotted owls provides a food supply for survival and reproduction. Foraging activity is positively associated with tree height diversity (North et al. 2000, pp. 524), canopy closure (Irwin et al. 2000, pp. 180; Courtney et al. 2004, pp. 5-15), snag volume, density of snags greater than 20 in (50 cm) dbh (North et al. 2000, pp. 524; Irwin et al. 2000, pp. 179-180; Courtney et al. 2004, pp. 5-15), density of trees greater than or equal to 31 in (80 cm) dbh (North et al. 2000, pp. 524), volume of woody debris (Irwin et al. 2000, pp. 179-180), and young forests with some structural characteristics of old forests (Carey et al. 1992, pp. 245-247; Irwin et al. 2000, pp. 178-179). Northern spotted owls select old forests for foraging in greater proportion

than their availability at the landscape scale (Carey et al. 1992, pp. 236-237; Carey and Peeler 1995, pp. 235; Forsman et al. 2005, pp. 372-373), but will forage in younger stands with high prey densities and access to prey (Carey et al. 1992, pp. 247; Rosenberg and Anthony 1992, pp. 165; Thome et al. 1999, pp. 56-57).

Dispersal habitat is essential to maintaining stable populations by filling territorial vacancies when resident spotted owls die or leave their territories, and to providing adequate gene flow across the range of the species. Dispersal habitat, at a minimum, consists of stands with adequate tree size and canopy closure to provide protection from avian predators and at least minimal foraging opportunities. Dispersal habitat may include younger and less diverse forest stands than foraging habitat, such as even-aged, pole-sized stands, but such stands should contain some roosting structures and foraging habitat to allow for temporary resting and feeding for dispersing juveniles (USDI 1992a, pp. 1798). Forsman et al. (2002, pp. 22) found that spotted owls could disperse through highly fragmented forest landscapes. However, the stand-level and landscape-level attributes of forests needed to facilitate successful dispersal have not been thoroughly evaluated (Buchanan 2004, pp. 1341).

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, pp. 158; Diller and Thome 1999, pp. 275). 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, pp. 304). 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, pp. 41).

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, pp. 437).

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, pp. 24-25; Carey et al. 1990 pp. 14-15; Forsman et al. 2005, pp. 372-373). Glenn et al. (2004, pp. 46-47) 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, pp. 62) 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, pp. 436) 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, pp. 1038; Franklin et al. 2000, pp. 573-579; Meyer et al. 1998, pp. 43). In Oregon Klamath and Western Oregon Cascade provinces, Dugger et al. (2005, pp. 876) 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, pp. 873-874). 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, pp. 876) stated was generally much lower than those in Franklin et al. (2000) and Olson et al. (2004), and the low reproductive rate and survival in their study area, which they reported were generally lower than those studied by Anthony et al. (2006). Olson et al. (2004, pp. 1050-1051) 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, pp. 1049-1050) 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.

2.2.6 Reproductive Biology

The spotted owl is relatively long-lived, has a long reproductive life span, invests significantly in parental care, and exhibits high adult survivorship relative to other North American owls (Gutiérrez et al. 1995, pp. 5). 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, pp. 93; Franklin 1992, pp. 821; Forsman et al. 2002, pp. 17). Breeding females lay one to four eggs per clutch, with the average clutch size being two eggs; however, most spotted owl pairs do not nest every year, nor are nesting pairs successful every year (Forsman et al. 1984, pp. 32-34, Anthony et al. 2006, pp. 28), and renesting after a failed nesting attempt is rare (Gutiérrez 1996, pp. 4). 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, pp. 4).

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, pp. 32). After they leave the nest in late May or June, juvenile spotted owls depend on their parents until they are able to fly and hunt on their own. Parental care continues after fledging into September (Forsman et al. 1984, pp. 38). 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, pp. 38). Telemetry and genetic studies indicate that close inbreeding between siblings or parents and their offspring is rare (Haig et al. 2001, pp. 35, Forsman et al. 2002, pp. 18).

2.2.7 Dispersal Biology

Natal dispersal of spotted owls typically occurs in September and October with a few individuals dispersing in November and December (Forsman et al. 2002, pp. 13). Natal dispersal occurs in stages, with juveniles settling in temporary home ranges between bouts of dispersal (Forsman et al. 2002, pp. 13-14; Miller et al. 1997, pp. 143). The median natal dispersal distance is about 10 miles for males and 15.5 miles for females (Forsman et al. 2002, pp. 16). Dispersing juvenile spotted owls experience high mortality rates, exceeding 70 percent in some studies (Miller 1989, pp. 32-41). Known or suspected causes of mortality during dispersal include starvation, predation, and accidents (Miller 1989, pp. 41-44; Forsman et al. 2002, pp. 18-19). Parasitic infection may contribute to these causes of mortality, but the relationship between parasite loads and survival is poorly understood (Hoberg et al. 1989, pp. 247; Gutiérrez 1989, pp. 616-617, Forsman et al. 2002, pp. 18-19). 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, pp. 697-698).

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, pp. 22). 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, pp. 22). 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, pp. 35).

Breeding dispersal occurs among a small proportion of adult spotted owls; these movements were more frequent among females and unmated individuals (Forsman et al. 2002, pp. 20-21). Breeding dispersal distances were shorter than natal dispersal distances and also are apparently random in direction (Forsman et al. 2002, pp. 21-22).

2.2.8 Food Habits

Spotted owls are mostly nocturnal, although they also forage opportunistically during the day (Forsman et al. 1984, pp. 51; 2004, pp. 222-223; Sovern et al. 1994, pp. 202). 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, pp. 40-41) in Washington (Hamer et al. 2001, pp. 224) and Oregon, while dusky-footed wood rats (*Neotoma fuscipes*) are a major part of the diet in the Oregon Klamath, California Klamath, and California Coastal provinces (Forsman et al. 1984, pp. 40-42; 2004, pp. 218; Ward et al. 1998, pp. 84). 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, pp. 40-43; 2004, pp. 218; Ward et al. 1998; pp. 84; Hamer et al. 2001, pp.224).
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, pp. 4-27). For example, Rosenberg et al. (2003, pp. 1720) 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, pp. 1723). Ward (1990, pp. 55) also noted that mice were more abundant in areas selected for foraging by owls. Nonetheless, spotted owls deliver larger prey to the nest and eat smaller food items to reduce foraging energy costs; therefore, the importance of smaller prey items, like *Peromyscus*, in the spotted owl diet should not be underestimated (Forsman et al. 2001, pp. 148; 2004, pp. 218-219).

2.2.9 Population Dynamics

The spotted owl is relatively long-lived, has a long reproductive life span, invests significantly in parental care, and exhibits high adult survivorship relative to other North American owls (Gutiérrez 1996, pp. 5). 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, pp. 576).

Annual variation in population parameters for spotted owls has been linked to environmental influences at various life history stages (Franklin et al. 2000, pp. 581). 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, pp. 805), 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, pp. 1). Annual variation in breeding may be related to weather (i.e., temperature and precipitation) (Wagner et al. 1996, pp. 74 and Zabel et al. 1996, pp.81 *In*: Forsman et al. 1996) and fluctuation in prey abundance (Zabel et al. 1996, pp.437-438).

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, pp. 581-582). Specifically, weather could have increased negative effects on spotted owl fitness for those owls occurring in relatively lower quality habitat (Franklin et al. 2000, pp. 581-582). 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, pp. 583). Olson et al. (2005, pp. 930-931) used open population modeling of site occupancy that incorporated imperfect and variable detectability of spotted owls and allowed modeling of temporal variation in site occupancy, extinction, and colonization probabilities (at the site scale). The authors found that visit

detection probabilities average less than 0.70 and were highly variable among study years and among their three study areas in Oregon. Pair site occupancy probabilities declined greatly on one study area and slightly on the other two areas. However, for all owls, including singles and pairs, site occupancy was mostly stable through time. Barred owl presence had a negative effect on these parameters (see barred owl discussion in the New Threats section below). However, there was enough temporal and spatial variability in detection rates to indicate that more visits would be needed in some years and in some areas, especially if establishing pair occupancy was the primary goal.

2.3 Threats

2.3.1 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 1990a, pp. 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 1992a, pp. 33-41). These threats were characterized for each province as severe, moderate, low or unknown (USDI 1992a, pp. 33-41) (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 rangewide 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, pp 11-8 to 11-9). However, great horned owls (*Bubo virginianus*), an effective predator on spotted owls, are closely associated with fragmented forests, openings, and clearcuts (Johnson 1992, pp. 84; Laidig and Dobkin 1995, pp. 155). As mature forests are harvested, great horned owls may colonize fragmented forests, thereby increasing spotted owl vulnerability to predation.

2.3.2 New Threats

The Service conducted a 5-year review of the spotted owl in 1994 (USDI 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, pp. 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 rangewide habitat base over a 10-year period)." (Courtney and Gutiérrez 2004, pp. 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, pp. 11-8).

2.3.2.1 Barred Owls (Strix varia). With its recent expansion to as far south as Marin County, California (Gutiérrez et al. 2004, pp. 7-12-7-13), the barred owl's range now completely overlaps that of the northern spotted owl. Barred owls may be competing with spotted owls for prey (Hamer et al. 2001, pp.226) or habitat (Hamer et al. 1989, pp.55; Dunbar et al. 1991, pp. 467; Herter and Hicks 2000, pp. 285; Pearson and Livezey 2003, pp. 274). In addition, barred owls physically attack spotted owls (Pearson and Livezey 2003, pp. 274), and circumstantial evidence strongly indicated that a barred owl killed a spotted owl (Leskiw and Gutiérrez 1998, pp. 226). 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, pp. 46; Pearson and Livezey 2003, pp. 267; Olson et al. 2005, pp. 921). It is widely believed, but not conclusively confirmed, that the two species of owls are competing for resources. However, given that the presence of barred owls has been identified as a negative effect while using methods designed to detect a different species (spotted owls), it seems safe to presume that the effects are stronger than estimated. Because there has been no research to quantitatively evaluate the strength of different types of competitive interactions, such as resource partitioning and competitive interference, the particular mechanism by which the two owl species may be competing is unknown.

Barred owls were initially thought to be more closely associated with early successional forests than spotted owls, based on studies conducted on the west slope of the Cascades in Washington (Hamer et al 1989, pp. 34; Iverson 1993, pp.39). However, recent studies conducted in the Pacific Northwest show that barred owls frequently use mature and old-growth forests (Pearson and Livezey 2003, pp. 270; Schmidt 2006, pp. 13). 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, pp. 1).

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, pp. 226). 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, pp. 225-226).

The presence of barred owls has been reported to reduce spotted owl detectability, site occupancy, reproduction, and survival. Olson et al. (2005, pp. 924) 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, pp. 51). Pearson and Livezey (2003, pp. 271) 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, p. 11) 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, pp. 928) found that the annual probability that a spotted owl territory would be occupied by a pair of spotted owls after barred owls were detected at the site declined by 5 percent in the HJ Andrews study area, 12 percent in the Coast Range study area, and 15 percent in the Tyee study area.

Olson et al. (2004, pp. 1048) 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, pp. 89) was unfounded because of small sample sizes (Livezey 2005, pp. 102). It is likely that all of the above analyses underestimated the effects of barred owls on the reproduction of spotted owls because spotted owls often cannot be relocated after they are displaced by barred owls (E. Forsman, pers. comm., cited in USDI 2008a, pp. 65). Anthony et al. (2006, pp. 32) 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, pp. 807). 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, pp. 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, pp. 739-740; Olson et al. 2005, pp. 930-931). There is no

evidence that the increasing trend in barred owls has stabilized in any portion of the spotted owl's range in the western United States, and "there are no grounds for optimistic views suggesting that barred owl impacts on northern spotted owls have been already fully realized" (Gutiérrez et al. 2004, pp. 7-38).

2.3.2.2 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, pp. 1025) 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, pp. 1026). In a preliminary study conducted by Anthony and Andrews (2004, pp. 8) in the Oregon Klamath Province, their sample of spotted owls appeared to be using a variety of habitats within the area of the Timbered Rock fire, including areas where burning had been moderate.

In 1994, the Hatchery Complex fire burned 17,603 hectares in the Wenatchee National Forest in Washington's eastern Cascades, affecting six spotted owl activity centers (Gaines et al. 1997, pp. 125). Spotted owl habitat within a 2.9-kilometer (1.8-mile) radius of the activity centers was reduced by 8 to 45 percent (mean = 31 percent) as a result of the direct effects of the fire and by 10 to 85 percent (mean = 55 percent) as a result of delayed mortality of fire-damaged trees and insects. Direct mortality of spotted owls was assumed to have occurred at one site, and spotted owls were present at only one of the six sites 1 year after the fire (Gaines et al. 1997, pp. 126). In 1994, two wildfires burned in the Yakama Indian Reservation in Washington's eastern Cascades, affecting the home ranges of two radio-tagged spotted owls (King et al. 1998, pp. 2-3). 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 1990a, pp. 26183). New information suggests fire may be more of a threat than previously thought. In particular, the rate of habitat loss due to fire has been expected with over 102,000 acres of late-successional forest lost on Federal lands from 1993-2004 (Moeur et al 2005, pp. 110). Currently, the overall total amount of habitat loss from wildfires has been relatively small, estimated at approximately 1.2 percent on federal lands (Lint 2005, pp. v). 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, pp. 12-11). 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, pp. 77).

2.3.2.3 West Nile Virus. WNV has killed millions of wild birds in North America since it arrived in 1999 (Caffrey 2003, pp. 12; Marra et al. 2004, pp. 393). 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, pp. 3111). One captive spotted owl in Ontario, Canada, is known to have contracted WNV and died (Gancz et al 2004, pp. 2137), but there are no documented cases of the virus in wild spotted owls.

Health officials expect that WNV eventually will spread throughout the range of the spotted owl (Blakesley *et al.* 2004, pp. 8-31), but it is unknown how the virus will ultimately affect spotted owl populations. Susceptibility to infection and the mortality rates of infected individuals vary among bird species (Blakesley *et al.* 2004, pp. 8-33), but most owls appear to be quite susceptible. For example, eastern screech-owls breeding in Ohio that were exposed to WNV experienced 100 percent mortality (T. Grubb pers. comm. in Blakesley *et al.* 2004, pp. 8-33). Barred owls, in contrast, showed lower susceptibility (B. Hunter pers. comm. in Blakesley *et al.* 2004, pp. 8-34).

Blakesley et al. (2004, pp. 8-35) offer two possible scenarios for the likely outcome of spotted owl populations being infected by WNV. One scenario is that a rangewide reduction in spotted owl population viability is unlikely because the risk of contracting WNV varies between regions. An alternative scenario is that WNV will cause unsustainable mortality, due to the frequency and/or magnitude of infection, thereby resulting in long-term population declines and extirpation from parts of the spotted owl's current range. WNV remains a potential threat of uncertain magnitude and effect (Blakesley et al. 2004, pp. 8-34).

2.3.2.4 Sudden Oak Death. Sudden oak death was recently identified as a potential threat to the spotted owl (Courtney and Guttierez. 2004, pp. 11-8). 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, pp. 733). 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, pp. 441). It has been found in several different forest types and at elevations from sea level to over 800 m. Sudden oak death poses a threat of uncertain proportion because of its potential impact on forest dynamics and alteration of key prey and spotted owl habitat components (e.g., hardwood trees - canopy closure and nest tree mortality); especially in the southern portion of the spotted owl's range (Courtney and Guttierez. 2004, pp. 11-8).

2.3.2.5 Inbreeding Depression, Genetic Isolation, and Reduced Genetic Diversity. Inbreeding and other genetic problems due to small population sizes were not considered an imminent threat

to the spotted owl at the time of listing. Recent studies show no indication of significantly reduced genetic variation in Washington, Oregon, or California (Barrowclough et al. 1999, pp. 922; Haig et al. 2001, pp. 36). 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, pp. 13). 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, pp. 11-9). 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.

2.3.2.6 Climate change. Climate change, a potential additional threat to northern spotted owl populations, is not explicitly addressed in the NWFP. Climate change could have direct and indirect impacts on spotted owls and their prey. However, the emphasis on maintenance of seral stage complexity and related organismal diversity in the Matrix under the NWFP should contribute to the resiliency of the Federal forest landscape to the impacts of climate change (Courtney et al. 2004, pp. 9-15). 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, pp. 37-42) 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, pp. 685), subtle changes in climate have the potential to affect this. However, the specific impacts to the species are unknown.

2.3.2.7 Disturbance-Related Effects. The effects of noise on spotted owls are largely unknown, and whether noise is a concern has been a controversial issue. The effect of noise on birds is extremely difficult to determine due to the inability of most studies to quantify one or more of the following variables: 1) timing of the disturbance in relation to nesting chronology; 2) type, frequency, and proximity of human disturbance; 3) clutch size; 4) health of individual birds; 5) food supply; and 6) outcome of previous interactions between birds and humans (Knight and Skagan 1988, pp. 355-358). 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 close proximity to recreational hikers can cause Mexican spotted owls (*S. o. lucida*) to flush from their roosts (Swarthout and Steidl 2001, pp. 314) and helicopter overflights can reduce prey delivery rates to nests (Delaney et al. 1999, pp. 70). 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, pp. 14; Andersen et al. 1989, pp. 296; McGarigal et al. 1991, pp. 5).

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, pp. 925). 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, pp.517-518; Saplosky et al. 2000, pp. 1). In avian species, the secretion of corticosterone is the primary non-specific stress response (Carsia and Harvey 2000, p. 517). The quantity of this hormone in feces can be used as a measure of physiological stress (Wasser et al.1997, pp. 1019). Recent studies of fecal corticosterone levels of spotted owls indicate that low intensity noise of short duration and minimal repetition does not elicit a physiological stress response (Tempel & Gutiérrez 2003, pp. 698; Tempel & Gutiérrez 2004, pp. 538). However, prolonged activities, such as those associated with timber harvest, may increase fecal corticosterone levels depending on their proximity to spotted owl core areas (Wasser et al. 1997, pp.1021; Tempel & Gutiérrez 2004, pp. 544).

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

2.4 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:

2.4.1 Habitat-specific Needs

1. Large blocks of suitable habitat to support clusters or local population centers of spotted owls (e.g., 15 to 20 breeding pairs) throughout the owl's range;

2. Suitable habitat conditions and spacing between local spotted owl populations throughout its range to facilitate survival and movement;

3. Suitable habitat distributed across a variety of ecological conditions within the spotted owl's range to reduce risk of local or widespread extirpation;

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

5. In areas of significant population decline, sustain the full range of survival and recovery options for this species in light of significant uncertainty.

2.4.2 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.

2.4.3 Conservation Strategy

Since 1990, various efforts have addressed the conservation needs of the spotted owl and attempted to formulate conservation strategies based upon these needs. These efforts began with the ISC's Conservation Strategy (Thomas et al. 1990); they continued with the designation of critical habitat (USDI 1992a), the Draft Recovery Plan (USDI 1992b), and the Scientific Analysis Team report (Thomas et al. 1993), report of the Forest Ecosystem Management Assessment Team (Thomas and Raphael 1993); and they culminated with the NWFP (USDA and USDI 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.

2.4.4 Federal Contribution to Recovery

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

The NWFP with its rangewide system of LSRs was based on work completed by three previous studies (Thomas et. al. 2006, pp. 279-280): the 1990 Interagency Scientific Committee (ISC) Report (Thomas et. al. 1990), the 1991 report for the Conservation of Late-successional Forests and Aquatic Ecosystems (Johnson et. al. 1991), and the 1993 report of the Scientific Assessment Team (Thomas et. al. 1993). In addition, the 1992 Draft Recovery Plan for the Northern Spotted Owl (USDI FWS 1992b) was based on the ISC report.

The Forest Ecosystem Management Assessment Team predicted, based on expert opinion, the spotted owl population would decline in the Matrix land use allocation over time, while the

population would stabilize and eventually increase within LSRs as habitat conditions improved over the next 50 to 100 years (Thomas and Raphael 1993, pp. II-31, USDA and USDI 1994b, pp. 3&4-229). Based on the results of the first decade of monitoring, Lint (2005, pp. 18) 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, pp. 18; Noon and Blakesley 2006, pp. 288). Bigley and Franklin (2004, pp. 6-34) suggested that more fuels treatments are needed in east-side forests to preclude large-scale losses of habitat to stand-replacing wildfires. Other stressors that occur in suitable habitat, such as the range expansion of the barred owl (already in action) and infection with WNV (which may or may not occur) may complicate the conservation of the spotted owl. Recent reports about the status of the spotted owl offer few management recommendations to deal with these emerging threats. The arrangement, distribution, and resilience of the NWFP land use allocation system may prove to be the most appropriate strategy in responding to these unexpected challenges (Bigley and Franklin 2004, pp. 6-34).

Under the NWFP, the agencies anticipated a decline of spotted owl populations during the first decade of implementation. Recent reports (Anthony et al. 2006, pp. 33-34) 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, 9-12, Lint 2005, pp. 87). Even with the population decline, Courtney et al (2004, pp. 9-15) noted that there is little reason to doubt the effectiveness of the core principles underpinning the NWFP conservation strategy.

The current scientific information, including information showing northern spotted owl population declines, indicates that the spotted owl continues to meet the definition of a threatened species (USDI 2004, pp. 54). That is, populations are still relatively numerous over most of its historic range, which suggests that the threat of extinction is not imminent, and that the subspecies is not endangered; even though, in the northern part of its range population trend estimates are showing a decline.

In May, 2008, the Service published the 2008 Final Recovery Plan for the Northern Spotted Owl (USDI 2008a). The recovery plan identifies that competition with barred owls, ongoing loss of suitable habitat as a result of timber harvest and catastrophic fire, and loss of amount and distribution of suitable habitat as a result of past activities and disturbances are the most important rangewide threats to the spotted owl (USDI 2008a, pp. 57-67). To address these threats, the present recovery strategy has the following three essential elements: barred owl control, dry-forest landscape management strategy, and managed owl conservation areas (MOCAs) (USDI 2008a, pp. 12-15). The recovery plan lists recovery actions that address research of the competition between spotted and barred owls, experimental control of barred owls to better understand the impact the species is having on spotted owls, and, if recommended

by research, management of barred owls (USDI 2008a, pp. 15). The foundation of the plan for managing forest habitat in the non-fire-prone western Provinces of Washington and Oregon is the MOCA network on Federal lands, which are intended to support stable and well-distributed populations of spotted owls over time and allow for movement of spotted owls across the network (USDI 2008a, pp. 13). On the fire-dominated east side of the Cascade Mountains in Washington and Oregon, and the California Cascades, the dry-forest habitat management strategy is intended to maintain spotted owl habitat in an environment of frequent natural disturbances (USDI 2008a, pp. 14). Additionally, the recovery plan identifies Conservation Support Areas (CSAs) in Washington, the west side of the Cascades in Oregon, and in California. These CSAs are located on private, State, and Federal lands and are expected to support the MOCA network and the dry-forest landscape management approach (USDI 2008a, pp. 14). In addition, the recovery plan recommends a research and monitoring program be implemented to track progress toward recovery, inform changes in recovery strategy by a process of adaptive management, and ultimately determine when delisting is appropriate (USDI 2008a, pp. 15). The three primary elements of this program include 1) the monitoring of spotted owl population trends, 2) an inventory of spotted owl distribution, and 3) a comprehensive program of barred owl research and monitoring (USDI 2008a, pp. 15). The recovery plan estimates that recovery of the spotted owl could be achieved in approximately 30 years (USDI 2008a, pp. VIII).

2.4.5 Conservation Efforts on Non-Federal Lands

In the report from the Interagency Scientific Committee (Thomas et al. 1990, pp. 3), the draft recovery plan (USDI 1992b, pp. 272), and the report from the Forest Ecosystem Management Assessment Team (Thomas and Raphael 1993, pp. IV-189), 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 rangewide goal of achieving conservation and recovery of the spotted owl. The U.S. Fish and Wildlife 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. In addition, timber harvest within each state is governed by rules that provide protection of spotted owls or their habitat to varying degrees.

There are 17 current or completed Habitat Conservation Plans (HCPs) that have incidental take permits issued for spotted owls—eight in Washington, three in Oregon, and four in California (USDI 2008a, pp. 55). 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, pp. 11-15; Buchanan et al. 1994, pp. ii). 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, pp. 9). Spotted owl-related HCPs in Washington generally were intended to provide demographic or connectivity support (USDI 1992b, pp. 272).

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, pp. 64). In general, no large-scale spotted owl habitat protection strategy or mechanism currently exists for non-Federal lands in Oregon. The three spotted owl-related HCPs currently in effect cover more than 300,000 acres of non-Federal lands. These HCPs are intended to provide some nesting habitat and connectivity over the next few decades (USDI 2008, pp. 56).

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, pp. 85-87). 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, pp. 85-87). The California Department of Fish and Game initially reviewed all timber harvest plans to ensure that take was not likely to occur; the U.S. Fish and Wildlife Service took over that review function in 2000. Several large industrial owners operate under spotted owl management plans that have been reviewed by the U.S. Fish and Wildlife Service and that specify basic measures for spotted owl protection. Four HCPs authorizing take of spotted owls have been approved; these HCPs cover more than 669,000 acres of non-Federal lands. Implementation of these plans is intended to provide for spotted owl demographic and connectivity support to NWFP lands (USDI 2008a, pp. 56).

2.5 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 and USDC 1998, pp. 4-19).

2.5.1 Rangewide Habitat and Population Trends

2.5.1.1 Habitat Baseline. The 1992 Draft Spotted Owl Recovery Plan estimated approximately 8.3 million acres of spotted owl habitat remained rangewide (USDI 1992b, pp. 37). However, reliable habitat baseline information for non-Federal lands is not available (Courtney et al. 2004, pp. 6-5). The Service has used information provided by the Forest Service, Bureau of Land Management, and National Park Service to update the habitat baseline conditions on Federal lands for spotted owls on several occasions since the spotted owl was listed in 1990. The estimate of 7.4 million acres used for the NWFP in 1994 (USDA and USDI 1994b, pp. G-34)

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, pp. 21-82). 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.

2.5.1.2 NWFP Lands Analysis 1994 – 2001. In 2001, the Service conducted an assessment of habitat baseline conditions, the first since implementation of the NWFP (USDI 2001, pp. 1). This rangewide evaluation of habitat, compared to the 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 and USDI 1994a, pp. 6), 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 2001, pp. 32).

2.5.1.3 Rangewide Analysis 1994 – April 8, 2009. This section updates the information considered in USDI (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, wind storms, insect and disease outbreaks). 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 several 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 northern spotted owl habitat were estimated to exist on Federal lands managed under the NWFP. As of April 8, 2009, the Service had consulted on the proposed removal of approximately 213,187 acres (Table 2) or 2.9 percent of 7.4 million acres of northern spotted owl suitable habitat on Federal lands. Of the total Federal acres consulted on for removal, approximately 188,928 acres, or 2.6 percent of 7.4 million acres of northern 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 and USDI 1994a,). The Service is currently consulting with the BLM about large proposed timber sales in southwestern Oregon that would remove approximately 6,800 acres of habitat, resulting in the potential for incidental take of about 280 spotted owl activity centers. If

implemented as proposed, these projects could substantially impact the baseline condition of the spotted owl rangewide.

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.

Due to ongoing technical difficulties with the Service's Consultation Effects Tracking system, the rangewide summary of acres of federal NWFP lands that were consulted on and removed and downgraded presented in Table 2 does not match the province-specific summary of acres of habitat on federal NWFP lands that were consulted on and removed and downgraded in reserves and non-reserves (Table 3). Table 3 reports approximately 11,500 acres less of total habitat removal. Despite this discrepancy, we include Table 3 because it is useful for providing an approximate breakdown of habitat impacts by physiographic province and state. We are currently re-programming our Consultation Effects Tracking system, with support from the U.S. Geological Survey, and we expect to resolve this technical problem during this process.

Habitat removal from Federal lands due to management activities has varied among the individual provinces with most of the impacts concentrated within the Non-Reserve land-use allocations (about 91% of total removal) (Table 3). When habitat removal is evaluated as a proportion of the affected acres rangewide, the most pronounced losses have occurred within Oregon (82%), especially within its Klamath Mountains (48%) and Cascades (East and West) (35%) Provinces (Table 3), followed by much smaller habitat losses in Washington (8 %) and California (9%) (Table 3). When habitat loss is evaluated as a proportion of provincial baselines, the Oregon Klamath Mountains (22%), Cascades East (8%), and the California Cascades (5.45%) all have proportional losses greater than the rangewide mean (5%) (Table 3).

Table 2. Changes to NRF[1] habitat acres from activities addressed in section 7 consultations (both formal and informal) and other causes rangewide from 1994 to April 8, 2009.

Northwest Forest Plan (NWFP) Group / Ownership		Consulted On Habitat Changes[2]		Other Habitat Changes[3]	
		Removed/ Downgraded	Degraded	Removed/ Downgraded	Degraded
Federal - Northwest Forest Plan	Bureau of Land Management	89745	46166	760	0
	Forest Service	104256	460722	34234	5481
	National Park Service	3866	4855	3	0
	Multi-agency[4]	15320	23314	132897	0
	NWFP Subtotal	213187	535057	167894	5481
Other Management and Conservation Plans (OMCP)	Bureau of Indian Affairs and Tribes	109370	28349	2398	0
	Habitat Conservation Plans	295889	14430	0	0
	OMCP Subtotal	405259	42779	2398	0
Other Federal Agencies & Lands[5]		241	466	28	70
Other Public & Private Lands[6]		14173	880	30240	20949
TOTAL Changes		632860	579182	200560	26500

[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 the acres of habitat loss to natural events that can not be split out by administrative unit.

[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 FS lands are included here.

Table 3: Acres of suitable (NRF[1]) habitat loss on Federal lands from 1994 to April 8, 2009 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]				% of 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	548483	11734	560217	867	24	299	1190	0.21	0.32
	Eastern Cascades	506340	200509	706849	3910	5747	5754	15411	2.18	4.17
	Western Cascades	864683	247797	1112480	1681	10804	0	12485	1.12	3.38
	Western Lowlands	0	0	0	0	0	0	0	0	0.00
OR	Coast Range	422387	94190	516577	394	3769	66	4229	0.82	1.14
	Klamath Mountains	448509	337789	786298	3322	71479	101676[8]	176477	22.44	47.75
	Cascades East	247624	196035	443659	2343	12758	19547[9]	34648	7.81	9.37
	Cascades West	1012426	1033337	2015763	4020	64683	24583	93286	4.63	25.24
	Willamette Valley	593	5065	5658	0	0	0	0	0.00	0.00
CA	Coast	47566	3928	51494	405	69	100	574	1.11	0.16
	Cascades	61852	26385	88237	0	4808	0	4808	5.45	1.3
	Klamath	734103	345763	1079866	1492	9115	15869	26476	2.45	7.16
Total		4894566	2502532	7397098	18434	183256	167894	369584	5	99.99

[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 NSO 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 Cascades East, are from the Scientific Evaluation of the Status of the Spotted owl (Courtney et al. 2004)

[8] Acres are from the biological assessment entitled: Fiscal year 2006-2008 programmatic consultation: re-initiation on activities that may affect listed species in the Rogue-River/South Coast Basin, Medford BLM, and Rogue-Siskiyou National Forest.

[9] Acres are from the Scientific Evaluation of the Status of the Spotted owl (Courtney et al. 2004) and data in the NSO Consultation Effects Tracking Database. NSO Consultation Effects Tracking Database

From 1994 through April 8, 2009, habitat lost due to natural events was estimated at approximately 167,894 acres rangewide (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 (Table 3 – footnote 8). Approximately 18,630 acres of spotted owl habitat were lost due to the B&B Complex and Davis Fires in the East Cascades Province of Oregon (Table 3– footnote 9).

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 419,432 (Table 2) acres of habitat on non-Federal lands. Most of these losses have yet to be realized because they are part of large-scale, long-term HCPs. Combining effects on Federal and non-Federal lands, the Service had consulted on the proposed removal of approximately 632,860 acres of spotted owl habitat rangewide, resulting from all management activities, as of April 8, 2008 (Table 2).

2.5.1.4 Other Habitat Trend Assessments. In 2005, the Washington Department of Wildlife released the report, "An Assessment of Spotted Owl Habitat on Non-Federal Lands in Washington between 1996 and 2004" (Pierce et al. 2005). This study estimates the amount of spotted owl habitat in 2004 on lands affected by state and private forest practices. The study area is a subset of the total Washington forest practice lands, and statistically-based estimates of existing habitat and habitat loss due to fire and timber harvest are provided. In the 3.2-million acre study area, Pierce et al. (2005, pp. 88) estimated there was 816,000 acres of suitable spotted owl habitat in 2004, or about 25 percent of their study area. Based on their results, Pierce and others (2005, pp. 98) 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, pp. 91). Approximately 77 percent of the harvested habitat occurred on private lands and about 15 percent occurred on State lands. Pierce and others (2005, pp. 80) also evaluated suitable habitat levels in 450 spotted owl management circles (based on the provincial annual median spotted owl home range). Across their study area, they found that owl circles averaged about 26 percent suitable habitat in the circle across all landscapes. Values in the study ranged from an average of 7 percent in southwest Washington to an average of 31 percent in the east Cascades, suggesting that many owl territories in Washington are significantly below the 40 percent suitable habitat threshold used by the State as a viability indicator for spotted owl territories (Pierce et al. 2005, pp. 90).

Moeur et al. 2005 (pp. 110) 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 Northwest Forest Plan area between 1994 and 2003. The increase occurred primarily in the lower end of the diameter range for older forest. The net area in the greater than

30 inch dbh size class increased by only an estimated 102,000 to 127,000 acres (Moeur et al. 2005, pp. 100). The estimates were based on change-detection layers for losses due to harvest and fire and remeasured inventory plot data for increases due to ingrowth. Transition into and out of medium and large older forest over the 10-year period was extrapolated from inventory plot data on a subpopulation of Forest Service land types and applied to all Federal lands. Because size class and general canopy layer descriptions do not necessarily account for the complex forest structure often associated with northern spotted owl habitat, the significance of these acres to northern spotted owl conservation remains unknown.

2.5.1.5 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 1989, pp. 2-17). According to the final rule listing the spotted owl as threatened (USDI 1990a, pp. 26118), approximately 90 percent of the roughly 2,000 known spotted owl breeding pairs were located on Federally managed lands, 1.4 percent on State lands, and 6.2 percent on private lands; the percent of spotted owls on private lands in northern California was slightly higher (USDI 1989, pp. 4-11; Thomas et al. 1990, pp.64).

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 1990a, pp. 26115). The range of the spotted owl is partitioned into 12 physiographic provinces (Figure 1) based on recognized landscape subdivisions exhibiting different physical and environmental features (USDI 1992b, pp. 31). 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 1995, pp. 9495). By June 2004, the number of territorial spotted owl sites in Washington recognized by the Washington Department of Fish and Wildlife was 1,044 (Buchanan and Swedeen 2005, pp. 37). The actual number of currently occupied spotted owl locations across the range is unknown because many areas remain unsurveyed (USDI 2008a, pp. 44). In addition, many historical sites are no longer occupied because spotted owls have been displaced by barred owls, timber harvest, or severe fires, and it is possible that some new sites have been established due to reduced timber harvest on Federal lands since 1994. The totals in USDI (1995, pp. 9495) 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 rangewide 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. 2006) 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 (Table 4), while the other modeled the eight study areas that are part of the effectiveness monitoring program of the NWFP (Anthony et al. 2006, pp. 2). Data were analyzed separately for individual study areas, as well as across all study areas in a meta-analysis.

Table 4. Spotted owl demographic study areas (adapted from Anthony *et al*. 2006, pp. 29).

Area	Fecundity	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

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. 2006, pp. 29). 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 HJ 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*. (2006, pp. 31) 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 mean λ_{RJS} for the eight demographic monitoring areas that are part of the effectiveness monitoring program of the NWFP was 0.976 (SE = 0.007, 95 percent CI = 0.962 to 0.990), and the mean λ_{RJS} for the other five study areas was 0.942 (SE = 0.016, 95 percent CI = 0.910 to 0.974), yielding average declines of 2.4 and 5.8 percent per year, respectively. These data suggest that demographic rates for spotted owl populations on Federal lands were better than elsewhere; however, both the interspersion of non-Federal land in study areas, and the likelihood that spotted owls use habitat on multiple ownerships in some demography study landscapes, confound this comparison.

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. 2006, pp. 31). 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. 2006, pp. 30). 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. 2006, pp. 30). 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, pp. *v*) suggested immediate action was required to improve the likelihood of recovering the spotted owl population in British Columbia. So, in 2007, personnel in British Columbia captured and brought into captivity the remaining 16 known wild spotted owls (USDI FWS 2008, pp. 48). Prior to initiating the captive-breeding program, the population of spotted owls in Canada was declining by as much as 10.4 percent per year (Chutter et al. 2004, pp. *v*). The amount of previous interaction between spotted owls in Canada and the United States is unknown.

3.0 STATUS OF SPOTTED OWL CRITICAL HABITAT

This section provides a rangewide overview of the current condition of spotted owl revised critical habitat. Subsequent sections of the BO will zoom-in to the scale of the physiographic province, watershed, and the Project's action area to describe the status of critical habitat and owl populations at these hierarchical scales. These descriptions of baseline conditions provide the context within which the Service evaluates the effects of the Project.

3.1 Legal Status

On January 15, 1992, the Service designated spotted owl critical habitat within 190 CHUs which encompassed nearly 6.9 million acres of Federal lands in California, Oregon, and Washington (USDI 1992a). In 2008 the Service revised spotted owl critical habitat into 29 units, comprised of 174 sub-units, on approximately 5,312,300 acres of Federal lands in California, Oregon, and Washington (USDI 2008b) in a geographic manner designed to protect clusters of reproducing spotted owls and facilitate demographic interchange.

Designation of critical habitat serves to identify those lands that are necessary for the recovery of the listed species. The Service's primary objective in designating critical habitat was to identify capable and existing spotted owl habitat and highlight specific areas where management of the spotted owl and its habitat should be given highest priority.

3.2 Primary Constituent Elements

Primary constituent elements (PCEs) are the physical and biological features of critical habitat essential to a species' conservation. PCEs identified in the spotted owl critical habitat final rule include forest types that support the spotted owl across its geographic range when they occur in concert with a) nesting, roosting, foraging, and/or dispersal habitat or b) lands capable of developing one or more of these habitats in the future (USDI 2008b, pages 47347-47348).

3.3 Conservation Role of Critical Habitat

The conservation role of spotted owl critical habitat is to support a viable spotted owl population at the rangewide scale by providing a network of functional units within each physiographic province, excluding the Willamette and Western Washington Lowland Provinces. The size and distribution of these CHUs are based on "Managed Owl Conservation Areas (MOCAs) (USDI 2008a)" in the western portion of the range and proposed MOCAs (USDI 2007) in the eastern portion of the range. Proposed MOCAs were the basis of critical habitat in the eastern, dry-forest provinces because the final recovery plan for the spotted owl adopted a landscape management approach without MOCAs in those areas, while critical habitat requires specific, mappable boundaries.

MOCAs and proposed MOCAs comprise a network of both large habitat blocks (capable of supporting 20 or more breeding pairs of owls (MOCA 1s)), and small habitat blocks (capable of supporting up to 19 breeding pairs of owls (MOCA 2s)) intended to support stable and well-distributed populations of spotted owls over time and allow for movement of owls across the landscape (USDI 2007; 2008a). However, the Federal lands comprising the MOCA and proposed MOCA network includes areas of congressionally-reserved lands, such as designated wilderness areas and National Parks, which were included in the recovery plan's assessment that the MOCA network is sufficient to achieve the recovery of the spotted owl. Congressionally-reserved lands are not included within the boundaries of spotted owl critical habitat since, based on their designation, no special management is needed in these areas to conserve the area for spotted owl use. Therefore, the contribution of these congressionally-reserved areas must be

considered in any evaluation of the sufficiency of the overall conservation habitat network recommended for the recovery of the spotted owl.

3.4 Current Condition of Critical Habitat

The current condition of critical habitat incorporates the effects of all past human activities and natural events that led to the present-day status of the habitat (USDI and USDC 1998, pg. 4-19). With the revision of spotted owl critical habitat, the rangewide condition has been "reset" as of September 12, 2008.

3.4.1 Rangewide Condition

As of February 25, 2009, rangewide effects to NRF habitat within critical habitat units included removal of 877 acres, mostly from the Oregon Cascades East Province (Table 5). Effects to dispersal habitat consisted of 28 acres of dispersal habitat degraded in the Oregon Coast Range province (Table 5). Given the recent revision, these minor effects do not change the functional capacity of any critical habitat unit or sub-unit.

Table 5. Change in spotted owl suitable habitat within critical habitat from September 12, 2008 to February 25, 2009, resulting from Federal management actions and natural events by physiographic province.

Physiographic Province[4]		Evaluation Baseline[1]	Suitable[2] Critical Habitat Removed/Downgraded[3]			Percent Provincial Baseline Affected	Percent of Total Effects
		Total	Habitat loss to management activities	Habitat loss to natural events[5]	Total		
WA	Olympic Peninsula	149,090	0	0	0	0.0	0.0
	Eastern Cascades	188,720	0	0	0	0.0	0.0
	Western Cascades	415,620	0	0	0	0.0	0.0
	Western Lowlands	0	0	0	0	0	0.0
OR	Coast Range	303,680	0	0	0	0.0	0.0
	Klamath Mountains	210,430	0	0	0	0.0	0.0
	Cascades East	109,140	873	0	873	0.8	99.54
	Cascades West	498,020	4	0	4	0.0	0.46
	Willamette Valley	0	0	0	0	0	0.0
CA	Coast	53,480	0	0	0	0.0	0.0
	Cascades	137,010	0	0	0	0.0	0.0
	Klamath	583,690	0	0	0	0.0	0.0
Total		2,648,880	877	0	877	0.03	

1. 2008 Revised Critical Habitat baseline.
2. Nesting, roosting, foraging (NRF) habitat.
3. Includes effects reported by each field office.
4. Defined by the Northwest Forest Plan as the twelve physiographic provinces, as presented in Figure 3&4-1 on page 3&4-16 of USDA and USDI 1994.
5. Acres for all physiographic provinces, except the Oregon Klamath Mountains and Oregon Cascades East, are from the Scientific Evaluation of the Status of the Spotted owl.

Revised critical habitat overlaps to a high degree with the original critical habitat designation, with the new designation generally including less area. Thus, impacts to original critical habitat provide some insights into the baseline condition of the revised designation. Across the range of the spotted owl between 1994 and June 26, 2007, the Service consulted on the removal and/or downgrading of about 50,500 acres (1.61 percent of the rangewide evaluation baseline) of critical habitat due to management-related activities. The majority of these effects, 31,878 acres, have been concentrated in the Oregon Cascades West and Oregon Klamath Mountains Provinces. In addition, natural events (including fire and insect outbreaks) have resulted in the removal or downgrading of approximately 39,078 acres (1.24 percent) of critical habitat extant in 1994. The Service believes that combined effects occurring on less than 3 percent of critical habitat rangewide were unlikely to have changed the overall functionality of the rangewide critical habitat network.

3.4.2 Provincial Condition

3.4.2.1 Olympic Peninsula. This province provides the westerly extension of spotted owls in Washington. Habitat within this province is highly fragmented and approximately 60 miles separate spotted owl subpopulations within this province and the neighboring Western Cascades province. There is one CHU in this province [CHU 1 (Olympic Peninsula)] which contains three subunits.

3.4.2.2 Washington West Cascades. This province contains the most acres of critical habitat among the Washington provinces. It is located west of the Cascades Crest and is characterized by significant differences in topography and distribution of habitat between its northern and southern portions. There are two CHUs [CHU 2 (Northwest Washington Cascades) and CHU 5 (Southwest Washington Cascades)] in this province which contain 15 and six subunits, respectively. Subunit 8 of CHU 2 and subunit 1 of CHU 5 overlap with the Washington East Cascades province.

3.4.2.3 Washington East Cascades. The Washington East Cascades province is located east of the Cascade Crest and provides the easterly extension of spotted owls in Washington. Similar to the Washington West Cascades province there are significant differences in topography and distribution of habitat between its northern and southern portions. There are three CHUs in this province. CHU 3 (Okanogan) is located the northern portion of the province and contains eight subunits while CHU 6 (Southeast WA Cascades) is the most southerly unit and contains six subunits. CHU 4 (Entiat) is situated between CHUs 3 and 6 and is comprised of seven subunits. A small portion of subunit 1 of CHU 5 (Southwest Washington Cascades) also occurs in the southern edge of this province. See the Environmental Baseline section below for more details about this province.

3.4.2.4 Oregon Coast Range. This province is important in maintaining the distribution of spotted owls in western Oregon. In general, habitat within this province is not widely distributed and intra- and inter-provincial connectivity is limited. There are three CHUs that occur entirely or partially within this province. CHU 7 (Northern Oregon Coast Ranges) and CHU 8 (Southern Oregon Coast Ranges) occur entirely within the Oregon Coast Range province and contain nine and four subunits, respectively. CHU 13 (Willamette/North Umpqua) has three subunits, two of which (subunits 32 and 34) are located within the Oregon Coast Range province.

3.4.2.5 Oregon Klamath Mountains. The Oregon Klamath Mountains province provides the link between the Oregon Cascades West and Oregon Coast Range provinces and south to the California provinces. There are four CHUs that occur entirely or partially within this province. CHU 14 (Rogue-Umpqua), which contains four subunits, is the northern most unit in this province and occurs entirely within the Oregon Klamath Mountains province. The remaining CHUs in this province [CHU 15 (Oregon Klamath Mountains), CHU 16 (Klamath Intra-province), and CHU 25 (Scott and Salmon Mountains)] overlap with California provinces. CHU 15 contains five subunits, four of which occur in the Oregon Klamath Mountains province. Similarly, CHU 16 contains three subunits, two of which occur in this province. The Oregon Klamath Mountains province also contains one small subunit (subunit 20) of CHU 25.

3.4.2.6 Oregon Cascades East. This province is located east of the crest of the Cascade Mountains and encompasses the easterly extension of spotted owl range in Oregon. Habitat in this province is naturally fragmented and limited. There are two CHUs [Unit 10 (Hood River) and Unit 11 (Eastern Oregon Cascades)] that occur entirely within the Oregon Cascades East province. CHU 10 is a single unit and is located in the northern portion of this province while CHU 11 has seven subunits and is located in the center of this province. The northern border of this province also contains a portion of subunit 1 of CHU 9 (Western Oregon Cascades North). Subunit 53, the eastern portion of subunit 17 and a very small portion of the eastern edge of Subunit 18 of CHU 17 (Southern Cascades) also occur in the southern portion of this province.

3.4.2.7 Oregon Cascades West. This province is located in the geographic center of spotted owl range and contains more critical habitat than any other province. It provides links with the Washington Cascades, Oregon Coast Range, and Klamath Mountains provinces. There are four CHUs that occur entirely or partially in this province. CHU 9 (Western Oregon Cascades North) is located in the northern portion of this province and contains six subunits. The eastern portion of subunit 1 overlaps with the Oregon Cascades East province. CHU 12 (Western Oregon Cascades South), which is located in the center of the province is comprised of eight subunits and occurs entirely within the Oregon Cascades West province. CHU 17 (Southern Cascades) contains five subunits, of which subunits 16 and 18 and the western portion of subunit 17 occur in this province. This province also contains subunit 11 of CHU 13 (Willamette/North Umpqua).

3.4.2.8 California Coast Range. The California Coast Range province provides the westerly extension of spotted owl in California. Much of the land base within this province is privately owned. Two CHUs [Unit 19 (Coastal Humboldt) and Unit 20 (King Range)] occur entirely within this province. CHU 19 contains ten relatively small subunits distributed across the southern half of the province while CHU 20 is the most westerly unit in the province and is composed of a single unit. This province also contains individual subunits or portions of subunits from five additional CHUs [Unit 15 (Oregon Klamath Mountains), Unit 18 (Coastal Redwoods), Unit 21 (South Fork Mountain Divide), Unit 22 (Eel-Russian River), and Unit 23 (Mendocino Coast Range)].

3.4.2.9 California Klamath. This province contains the majority of critical habitat in California and provides the main link north to the Oregon provinces. There are nine CHUs that occur within or partially within the California Klamath province. Two CHUs [Unit 24 (Western

Klamath Siskiyou Mountains) and Unit 26 (Trinity Divide) contain eight and five subunits, respectively, and occur entirely within this province. Additionally, the vast majority of CHU 21 (South Fork Mountain Divide), CHU 23 (Mendocino Coast Range), CHU 25 (Scott and Salmon Mountains), and CHU 27 (Shasta-Trinity Lakes) occur in the California Klamath Province but all these CHUs have subunits that overlap with or occur in adjacent provinces. This province also contains small subunits or portions of subunits of CHU 16 (Klamath Intra-Province), CHU 18 (Coastal Redwoods), and CHU 22 (Eel-Russian River).

3.4.2.10 California Cascades. The California Cascades province constitutes the southeastern portion of spotted owl range. Habitat within this province is naturally fragmented and much of the land base is privately owned. There are four CHUs that occur entirely or partially within this province. CHU 28 (Eastern Klamath Mountains) and CHU 29 (Shasta/McCloud) occur entirely within the California Cascades province and constitute the majority of the critical habitat in this province. These CHUs contain six and eight subunits, respectively. This province also contains one subunit (61) of CHU 17 (Southern Cascades) and a portion of subunit 48 of CHU 27 (Shasta/Trinity Lakes).

4.0 ENVIRONMENTAL BASELINE (Spotted Owls and Spotted Owl Critical Habitat)

4.1 Introduction

The environmental baseline is an account of the effects of past and ongoing human actions and natural factors leading to the current status of the species, its habitat, and ecosystem at the scale of the action area (USDI and USDC 1998 p. 4-22). The environmental baseline represents the current condition of species and designated critical habitat, and provides the context for the analysis of potential effects of the proposed action.

For wide-ranging, highly mobile species like the spotted owl, the action-area scale is not the only scale relevant to the evaluation of how baseline conditions might influence the consequences of project effects. Baseline conditions at larger scales, particularly the watershed and physiographic province, provide important information about trends in habitat quantity, quality, and distribution, as well as non-habitat factors that may be influencing spotted owl numbers, reproduction, and distribution across the landscape. The watershed baseline provides insights about the condition of the local population of spotted owls affected in the action area. The physiographic province scale describes the condition of the broader metapopulation with which the affected local population interacts. Baseline conditions of the spotted owl metapopulation presumably influence the numbers, distribution, and reproduction of the local population in the action area.

Functionality across multiple scales was also an important consideration in critical habitat designation. Critical habitat units were intended to identify a network of habitats that provided the functions considered important to maintaining stable, self-sustaining, and interconnected populations over the range of the spotted owl, with each CHU having a local, provincial, and rangewide role in spotted owl conservation.

The following sub-sections present baseline information starting at the broad scale of the physiographic provinces affected and zooming in to the watershed and action area scales. In

conjunction with the Status of the Species, this nested hierarchy of baseline conditions provides the context for subsequent analysis of Project effects at multiple scales en route to determining the potential for the Project to jeopardize the continued existence of the spotted owl or to destroy or adversely modify critical habitat.

4.2 Washington Eastern Cascades Province Baseline

This section describes the implementation of the conservation strategy for the spotted owl at the scale of the Washington Eastern Cascades province (WECP). The Service uses this background to determine how representative baseline conditions in the action area are relative to baseline conditions at the broader provincial scale, and how the action area is currently contributing to the provincial conservation strategy. This background also provides insights about how resilient the broader metapopulation of spotted owls may be to adverse effects to the local population in the action area.

The 5.7 million acre WECP is located along the eastern edge of the Cascade Mountains in Washington, spanning the entire state from Canada south to the Columbia River and the border with Oregon. The range of the spotted owl within the WECP has a mixture of federal, state, tribal, and private ownership. The Forest Service, Yakama Indian Nation, and State of Washington are owners and managers of most of the spotted owl suitable habitat and known activity centers within the province. The province is generally characterized by high topographic relief compared to other provinces, especially the extensively glaciated northern portion. The province is dominated by mixed-conifer and ponderosa pine forests in the low- to mid-elevation areas, and true fir/hemlock forests at higher elevations.

The Service's current recovery strategy includes two primary components; (1) maintain large clusters of spotted owl pairs, with smaller clusters supporting these large clusters, and (2) maintain dispersal habitat between clusters by limiting the distance between clusters and providing "stepping stones" and corridors of suitable habitat linking larger habitat blocks (Thomas et al. 1990, USDI 1990a, FEMAT 1993). These strategic objectives guided the final recovery plan for the spotted owl, revision of spotted owl critical habitat (based on the recovery plan), and the design of the reserve network in the NWFP. In the WECP, four large clusters (i.e., groups of at least 20 pairs) have been identified. Populations of this size have a high probability of being self-sustaining for 100 years, and are expected to produce "extra" owls that can disperse into other smaller reserves where populations are less stable. Other smaller clusters (i.e., numbering less than 20 pair) exist to support these four large clusters. These clusters are located within three large Late-successional Reserves on federal lands managed under the NWFP (Chiwawa, Swauk, and Manastash LSRs) and on Yakama Nation Lands.

The original designation of critical habitat in the province was designed to provide for intra-provincial connectivity and inter-provincial connectivity with Washington Western Cascades to the west, the Yakama Indian Nation to the south, and Canadian populations of spotted owls to the north (Tehan 1991). Within the province, the three largest CHU's were anticipated to support three large clusters of spotted owls on federal lands described above. Smaller units had other roles such as supporting smaller clusters of owls, acting as "stepping stones" to support dispersal, or providing roosting/foraging opportunities.

The revised critical habitat designation follows the same conceptual model. The new sub-units that overlap the large owl clusters are WA-38, WA-43, and WA-45. Sub-unit WA-45 is much reduced in size compared to the original unit at this location and no longer encompasses sufficient area to support a large cluster of spotted owls. In general the revised designation has resulted in smaller sub-units that are also less contiguous in their spatial distribution.

Effects to spotted owl habitat in the province result primarily from natural disturbance and forest management projects. The primary agents of natural disturbance in forested areas of the province are fires, insect outbreaks, and tree diseases. Preliminary data suggest that over 36,000 acres of suitable habitat for the spotted owl have been removed due to wildfire since 1994 (Appendix A). During the same period, about 8,900 acres have been removed or downgraded due to management actions (through February 2009; USFWS effects tracking data). Information about effects to spotted owl habitat from insect and disease is limited. The risk of these disturbances has recently been assessed by the OWNF in their forest health assessment (USDA 2004). In general, insect and disease disturbances exist across the OWNF. Some loss of suitable habitat and the PCEs of designated critical habitat are occurring on the Naches, Wenatchee River, and Methow Valley Ranger Districts. Patchy mortality is a natural process and can increase stand heterogeneity, which may benefit the spotted owl in some cases by producing the snags and large woody debris required by prey species (see Lehmkuhl et al. 2006a and b).

Regarding effects to original critical habitat, the Services best estimate is that about 12,000 acres of critical habitat, or 3.8 percent of the provincial baseline, were removed or downgraded from 1994 to September 2008. The majority of effects were concentrated in the northern half of the province and resulted primarily from the Tyee, Needles, North 25 Mile, and Maple fires. The largest of these fires, the Tyee, removed or downgraded approximately 3,600 acres of suitable habitat. The Maple Fire removed or downgraded an additional 300 acres of suitable habitat. The Needles and North 25 Mile Fires removed or downgraded approximately 2,974 acres of suitable habitat from two different units (see Appendix A). Collectively, the units impacted by these fires are important for the rangewide distribution of the spotted owl, because they are located on the eastern and northeastern edge of the species range (Tehan 1991). Although some units in the original critical habitat network sustained substantive effects, the Service believed the province-wide network continued to fulfill the conservation functions for which it was designated.

These estimates of natural disturbance effects represent the best available information, but they remain preliminary. These estimates cannot be finalized and entered into the Service's rangewide effects-tracking database until they have been reviewed and agreed upon by the NWFP Level 1 team. Many factors, especially lack of comprehensive surveys of spotted owl presence across the province, also complicate estimation of the effects of wildfire and fire suppression activities on spotted owls. The summary provided in Appendix A gives our best estimates for effects to spotted owls and their habitat in the vicinity of known activity centers detected using protocol surveys.

Since 1994, authorized removal of suitable habitat from NWFP reserves in the WECP was less than 1 percent of the starting habitat total. Wildfires, especially during the summer of 1994, removed large areas of habitat from a subset of reserves, including the Chiwawa. Up to 20

known spotted owl activity centers may have been removed due to fire and fire-suppression effects since 1994. Despite these losses, the large-cluster LSRs continue to have relatively high proportions of suitable habitat, particularly in the Manastash, which has 65 percent of its area in suitable habitat (USDA 1997).

Given the relatively modest scale of disturbance and management effects to spotted owl habitat, it is surprising that from1996 through 2006, the number of spotted owls in the four large clusters declined between 32 and 62 percent, and only 1 cluster currently has more than 20 pairs. All four demography study areas in Washington (Wenatchee [WEN], Cle Elum [CLE], Rainier [RAI], and Olympic [OLY]) and the Warm Springs Reservation study site in the northeast Oregon Cascades, are all locations where precipitous declines in spotted owl populations have been observed (4.4 to 10.4 percent per year). Spotted owl population trends in the WECP are declining at about 6.2 percent annually (Anthony et al. 2006). Consequently, formerly large clusters in the province may no longer be fulfilling their expected roles of ensuring long-term persistence of spotted owls and providing recruits to other areas.

Connectivity among clusters may still be adequate, based on the distribution of habitat. Although suitable spotted owl habitat in the Matrix has been reduced by over 10 percent, again primarily due to wildfire effects, the distribution of suitable and dispersal habitat across all land allocations does not exceed typical dispersal distances and does not contain conspicuous gaps. The concentration of spotted owl habitat removal in fire areas suggests reduced local connectivity, but dispersal opportunities remain either through unburned patches of habitat or outside fire perimeters.

One reason that spotted owl demographic performance in the WECP may not be matching expectations based on habitat condition is the presence of barred owls. Barred owls first arrived in the WECP over 25 years ago. Barred owls are potential competitors with spotted owls for prey and nest sites. The barred owl has rapidly expanded its distribution within the range of the spotted owl and negative inter-specific interactions with the spotted owl have been documented (reviewed in Courtney et al. 2004). However, competitive interactions between barred and spotted owls are not well studied (Courtney et al. 2004). Most published studies about barred owls in the Pacific Northwest have been ancillary to studies being conducted on spotted owls. This has led to a great deal of uncertainty about the barred owl's pattern of range expansion, its interaction and the consequences of those interactions with spotted owls, and the contribution of barred owls to the decline of spotted owls both in terms of direct effects (e.g., competition, predation, social harassment, hybridization) or interactions among barred owl effects and the effects of other factors (e.g., ongoing habitat loss, lag effects associated with previous habitat loss, or weather).

Preliminary results from one study of barred owl habitat selection and use in the WECP have provided insights into some aspects of the interspecific interaction. Along a moisture gradient extending from mesic to dry forests, barred owls prefer the more mesic end of the gradient, and in more mesic forests have established adjoining territories that nearly saturate suitable spotted owl habitat (Peter Singleton, USFS, pers. comm. 2008). Barred owl territories are only about 200 to 300 ha in size, roughly one-tenth the size of spotted owl territories in the WECP, and barred owls appear to defend these territories vigorously (Singleton, pers. comm. 2008). Barred

owls appear to prefer flat or gentle slopes (broad valley bottoms) with mature, closed canopy forests that include a deciduous component. Toward the drier end of the moisture gradient, barred owls appear to prefer the moistest inclusions within a matrix of dry forest types. Existing and historic spotted owl sites in this study area were associated with closed canopy, mature ponderosa pine or Douglas fir forest on steeper slopes at mid-slope locations (Singleton, pers. comm. 2008). Though these results are preliminary, they suggest that barred owl competition with spotted owls may be more intense in more mesic forests, and that some opportunities for niche partitioning may be present in drier forest types.

Experimental studies that will clarify the nature of competitive interactions between these species are currently underway or are being designed. Results of these experiments should help to predict the likely consequences of interactions between these species. Pending the outcome of these studies, the best available science indicates the presence of barred owls has a negative effect on spotted owl numbers, distribution, and reproduction in the WECP, but the magnitude of this negative effect is unknown.

Overall, the Service is concerned about the long-term persistence of spotted owls within the province. Continuing population declines suggest the combined effects of historic and ongoing habitat removal due to human activities, habitat removal by wildfire and other natural disturbances, changes in habitat suitability due to fire suppression (e.g., Irwin et al. 2004), and interactions with barred owls are reducing survival and reproduction, and may be contributing to range contraction in the province. The final recovery plan proposes a new conservation strategy for the province based on managing the entire landscape to meet spotted owl conservation objectives. This strategy acknowledges that in fire-prone landscapes, spotted owl habitat is likely to be spatially dynamic, and recommends a three-part landscape management strategy: (1) identify existing high-quality spotted owl habitat, (2) strategically place fuel-reduction treatments, and (3) manage for sustainable ecosystem processes and functions (USDI 2008a). Most of the important decisions about how to implement this strategy remain to be made. During the transition period, the Service believes all remaining spotted owls within the WECP are vital to the conservation of the species until populations stabilize and recover to abundance levels with a higher likelihood of long-term persistence.

4.3 Environmental Baseline at the Watershed Scale

We consider this scale to be roughly equivalent to the population of spotted owls likely to be affected by the proposed Project. In some locations, this scale will be comparable to critical habitat units. This Project, however, is near the boundary between units and we consider the condition of sub-units from all adjoining units.

The action area is located within the Teanaway watershed in the central portion of WECP. The Teanaway River watershed analysis (USDA 1998) provided an overview of the watershed and is incorporated by reference. Elevations in the Teanaway River watershed range from 5,361 feet at the peak of Red Top Mountain located on the southeastern divide of the watershed, to 1,800 feet at the confluence with the Yakima River. In 1998, the watershed had about 70,000 acres of private or state land (52 percent), and the remainder was managed by the U.S. Forest Service, under several NWFP land allocations.

Average annual precipitation ranges from about 70 inches in the headwaters to 35 inches at the Yakima River confluence. Snow is the predominant form of precipitation, falling mostly from October to March. Mature forested habitat covers about 78 percent of the watershed, with lower elevations dominated by Douglas-fir and ponderosa pine. Grand fir, which is more prevalent at higher elevations, is becoming more predominant throughout the watershed due to fire suppression.

Portions of National Forest land within the Teanaway River watershed have had varying degrees of timber harvest over the past 80 years. The majority however, 85 percent, has had no timber harvest (USDA 1998). Harvest has occurred on intermingled and adjacent private forest lands, resulting in fragmented forested habitats and high road densities. In addition to timber harvest, other features that contribute to forest fragmentation in the watershed are railroad lines, electric transmission lines and recreational facilities, including one developed campground, dispersed camping areas, and a network of trails that are used for summer and winter recreation (USDA 1998).

Spruce budworm (*Choristoneura occidentalis*) is a widespread defoliator and has been active in the Teanaway River watershed since 2001. The insect species is a foliage feeder with a one year life cycle. Species affected are grand fir, Douglas-fir, and subalpine fir. The activity has spread from the northwest to the southeast across the watershed with heaviest defoliation in the northwest. Defoliation has occurred on approximately 85% of the forested project area, with an average defoliation percent of 20%. Actual stand to stand defoliation ranges from 5% to 70%. This defoliator has affected large areas due to the multi-layered nature of the forests in the project area and abundant food source. Since much of the project area is located in moist grand fir plant associations and multi-layered forest, the forage for the spruce budworm is abundant and of high quality. In the project area, defoliation percentages run a gradient, from 70% defoliated, down to 10-15%. Defoliation is less severe in the Jungle Creek drainage with grand fir generally < 15% defoliated. Lower Jungle Creek has been lightly defoliated to date, but defoliation could be severe in the area due to deep stand layering and a high percentage of grand fir/ Douglas-fir (80%). Defoliation is also correlated with slope position, valley bottoms with higher site soils offer better budworm habitat due to stand layering. Crown fire risk from budworm attack is elevated due to the low moisture content of dead and dying foliage, suspended dead branches, and connected crowns. A biological evaluation of western spruce budworm potential impacts was prepared for the Teanaway area for 2004, 2005, and 2006. In 2003, 2,000 acres were identified as affected by budworm; in 2005 16,580 acres were affected.

Bark beetles present in the watershed include the fir engraver beetle, (*Scolytus ventralis*), the Douglas-fir beetle, (*Dendroctonus psuedotsugae*), Western pine beetle; (*Dendroctonus Brevicomis*), and mountain pine beetle, (*Dendroctonus ponderosae*). Bark beetle populations trail behind and peak after defoliator populations. Defoliators weaken trees and set the stage for bark beetles. Peak bark beetle attacks occur three years after initial defoliator attacks. Because of the density of defoliated trees in some areas (up to 40% defoliated) it is expected that a 13 fold increase in post first year defoliation bark beetle populations is possible for grand fir from fir engraver outbreaks. For the Douglas-fir beetle in the same defoliated stands, a 6.5%, increase in post first year defoliation bark beetle density is possible. In the moderately defoliated stands

(>25%), the current annual bark beetle mortality rates are 15 trees per acre for grand fir by the fir engraver beetle, and 6 trees per acre for Douglas-fir by the Douglas fir beetle. Using the above documented multipliers, it is expected that up to 195 trees per acre of grand fir will be successfully attacked and killed, and about 40 trees per acre of Douglas-fir will be attacked and killed by year 2008 in heavily defoliated and moderately defoliated areas.

The Service's revised critical habitat designation includes 4 sub-units near the Teanaway River watershed (Table 6). These sub-units largely overlap original critical habitat units that were in the area, but they are smaller and less contiguous. All of these sub-units have above 97 percent of their total area modeled to be capable of producing suitable spotted owl habitat (Table 6). However, all of these sub-units have less than 40 percent of their total area modeled as currently supporting suitable habitat. In terms of functionality, this pattern suggests that the baseline habitat condition of critical habitat units in the watershed makes these units only marginallycapable of fulfilling their conservation role in the survival and recovery of the spotted owl. Current information about the actual status of spotted owl pairs within these sub-units is not available, but we expect that owl abundance levels are also less than 40 percent of the estimated potential (Table 6).

The Manastash Ridge LSR (RW-125) to the south and the Swauk LSR (RW-129) to the north are large NWFP reserves expected to support large clusters of owls near the Teanaway River watershed. These NWFP reserves formerly overlapped to a large degree with the original designation of critical habitat. Revised critical habitat retains most of the overlap with the Swauk LSR (subunit WA-43), but overlaps only a small portion of the Manastash LSR (subunit WA-45). Revised critical habitat also made small changes to subunit (WA-44) that overlaps the Snoqualmie Pass Adaptive Management Area (SPAMA). The Teanaway LSR (RW130) is expected to provide east-west connectivity from the Cascade crest and the SPAMA to the Manastash Ridge and Swauk LSRs. As described above, these NWFP LSRs and corresponding critical habitat subunits may no longer have sufficient habitat or pairs of owls to fulfill their expected roles in the conservation of spotted owls at the watershed scale (see Table 7).

Table 6. Baseline condition of critical habitat sub-units surrounding the proposed project.

		Habitat Capable Area[2]		Suitable Habitat (NRF) Area[3]		
Sub-unit	Total acres[1]	Acres	Proportion	Acres	Proportion	Potential NSO Pairs[4]
WA - 42	8440	8295	98	2036	25	2
WA - 43	83820	83274	99	29760	36	17
WA - 44	68303	66980	98	21527	32	14
WA - 45	43724	43390	99	15293	35	9

[1] Calculated from GIS layer of final revised Critical Habitat (FWS, 2008).

[2] Calculated from GIS layers of habitat capable lands generated by R. Davis & J. Lint for the NWFP 10-year Monitoring Report (Lint 2005).

[3] Calculated from GIS layers of existing suitable habitat (NRF) generated by R. Davis & J. Lint using BioMapper for the NWFP 10-year Monitoring Report (Lint 2005).

[4] This value is the acres of capable habitat within each subunit, divided by 75% of the provincial home range acreage (USFWS 2008a, p. 73).

Table 7. Habitat Acreage and Spotted Owl Activity Centers within Late-Successional Reserves located near the Project Area

LSR Name	Total Acres	Suitable Habitat (NRF)	Spotted Owl Activity Centers (1997 surveys)	Estimated Current Activity Centers** (2007)
Teanaway (RW130)	34,043	16,352	4 (goal* 5)	2
Manastash Ridge (RW125)	104,661	68,147	33 (goal 20+)	13
Swauk (RW129)	107,962	45,675	24 (goal 20+)	13

* Goals from LSRA (USDA 1997).
** Derived from personal communications and survey information with OWNF staff.

Available information indicates the functional status of WECP LSRs in the Project vicinity has declined since the Late Successional Reserve Assessment was completed in 1997 (Table 7). Although habitat changes due to both projects and natural disturbance have been negligible in these LSRs since the assessment, the best available information about the current numbers of activity centers indicates substantial declines. These results are consistent with estimated rates of population decline from demography studies. The troubling aspect of these changes is the large source clusters in the Swauk and Manastash LSRs appear to no longer have population sizes that provide a high likelihood of long-term persistence. No information is available about the degree to which these areas are currently providing recruits to nearby smaller LSRs and other land allocations.

4.3.1 Spotted owl Demographics at the Watershed Scale

The Project is located within the Cle Elum demography study area (CLE). Within the CLE, known spotted owl locations have been monitored annually since 1989, providing detailed information about distribution, abundance, fecundity, survival, and other population parameters. Occupancy of some sites has been monitored since 1976. The potential for undetected spotted owl pairs in the action area is low, given the intensity and duration of the monitoring efforts.

Anthony et al. (2006) reported an annual 6.2 percent decline in spotted owls in the Cle Elum demography study area from 1989 to 2003. The realized population change across this time interval suggests the current population may be less than half the size of the population on the study area when surveys began (Anthony et al. 2006). In recent years, greater numbers of floater or transient male owls have been detected during surveys in the Swauk Density Study Area (an intensively surveyed sub-area within the Cle Elum study) (Forsman and Sovern 2006). These individuals may eventually colonize territories and contribute to stabilizing the population.

In 2008, studies confirmed the bands of 24 owls and detected another 12 owls on 26 occupied territories. This compares to a high of 120 owls on 64 territories in the same area in 1992 (Forsman et

al. 2008, pg. 3). Six territories showed increases in occupancy between 2007 and 2008: 5 vacant territories became occupied by single owls, and 1 territory occupied by a single owl became occupied by a pair of owls. However, 8 of 17 (47%) territories occupied by pairs in 2007 held only single male owls (5), single female owls (1), or were vacant (2) in 2008 (Forsman et al. 2008, pg. 4).

From 1989 to 1999 spotted owls on the Cle Elum study area showed a pronounced pattern in which higher rates of nesting and fecundity occurred in even-number years than in odd-number years (Forsman and Sovern 2006, pg. 9). This pattern was common across many demography study areas throughout the range of the owl (Anthony et al. 2006, pg. 28). This pattern has waned in the past decade (Forsman and Sovern 2006, pg. 9), with reproduction becoming more consistent across years and potentially showing a stabilizing trend.

Between 3 and 13 barred owls have been detected on the density study area during surveys from 1991 to 2008 (Forsman et al. 2008, pg. 8). During surveys for spotted owls in 2008, responses from 24 barred owls were detected. These responses may represent 17 barred owl territories based on their spatial distribution.

4.4 Environmental Baseline at the Action Area Scale

In this sub-section, we focus on the specific critical habitat subunits and spotted owl activity centers that may be affected by the Project. The Project area overlaps part of the *CLE,* where all known spotted owl locations are monitored annually, all known spotted owls are banded, and all spotted owl habitat is surveyed annually.

Almost all NRF habitat in or near this Project area has been surveyed, with the exception of upper Beverly Cr, upper Miller Cr, and upper Stafford Creek. A spotted owl of unknown status was detected in upper Stafford Creek in late summer 2007, and the spacing of known owls and distribution of habitat indicate a potential for an undetected pair to occur somewhere in this unsurveyed habitat. If so, proposed treatments would most likely be located in the outer home range area of this undetected pair.

Treatments will occur within 1.8 miles of 8 known spotted owl activity centers located in the Teanaway and Swauk LSRs, Matrix, and on private land outside the National Forest boundary. Five of the 8 potentially affected sites are active (2 in Teanaway LSR, 2 in Swauk LSR, and 1 in Matrix). Three of the 8 (319 and 306 in Teanaway LSR and pair 360 on private land) are considered historic, with no detections for 18, 10, and 16 consecutive years, respectively.

Extensive timber harvest outside the National Forest boundary is a likely cause of site abandonment by pairs 306 and 360. Removal of habitat outside the National Forest boundary, and barred owl activity may both have contributed to abandonment of site 319. The majority of habitat within the breeding radius of site 319 remains intact, however, and spotted owl reoccupation of long-abandoned sites has been observed elsewhere on the Cle Elum Ranger District (USFS 2009).

Treatments will also occur within the breeding radii (i.e., the 0.7 mile radius core area) of 6 known sites, including all 4 known owl pairs in Teanaway LSR, 1 owl pair in

Swauk LSR, and the Matrix owl. Two of the 4 affected owl sites in the Teanaway LSR , however, are considered historic. Therefore, treatments will occur within the breeding areas of 4 active sites (2 in Teanaway LSR, 1 in Swauk LSR, and 1 in Matrix).

Desired levels of NRF habitat within owl home ranges are specified in LSRA (USDA 1997): at least 60% of the home range area (3994 acres within 1.8 miles) should occur as NRF habitat in both the Teanaway and Swauk LSRs. Therefore, available NRF habitat is currently below desired levels for all potentially affected owl pairs (Table 8). Available NRF habitat within home range areas is also currently below the threshold for incidental take, for 5 of the 8 owl home ranges within the action area (Table 8).

Table 8. Available NRF habitat within the 1.8 mile home range (hr) areas of known spotted owl pairs.

Owl No.	Nest Location*	Current Mgt Status	Site Status	Baseline** Condition (available NRF habitat)	
				acres	*% of hr*
306	*T*	Historic	Vacant since 1991	*2297*	*35*
319	*T*	Historic	Vacant since 1999	*1946*	*30*
323	*S*	Occupied	Active (nesting pair)	3451	*53*
342	*M*	Occupied	Active (nesting pair)	*2449*	*38*
346	*S*	Occupied	Active (nesting pair)	3115	*48*
356	*T*	Occupied	Active (nesting pair)	3081	*47*
360	*P*	Historic	Vacant since 1992	*1201*	*18*
398	*T*	Occupied	Active (nesting pair)	*2165*	*33*

* T = Teanaway LSR, S = Swauk LSR, M = Matrix, P = private land outside NF boundary.
**Acreages shown in red (italics) are currently below incidental take thresholds.

For spotted owls in LSR, at least 50% of the breeding radius (or 500 acres within 0.7 miles) should also occur as NRF habitat. Of the 6 breeding areas potentially affected by the Project, only site 346 in Swauk LSR and site 356 in Teanaway LSR currently exceed this threshold (Table 9).

Table 9. Available NRF habitat within the 0.7 mile breeding areas of known spotted owl pairs.

Owl No.	Nest Location *	Current Mgt Status	Baseline Condition** (available NRF habitat, in acres)
306	T	Historic	*493*
319	T	Historic	*337*
342	M	Occupied	*362*
346	S	Occupied	534
356	T	Occupied	595
398	T	Occupied	*424*

* T = Teanaway LSR, S = Swauk LSR, M = Matrix, P = private land outside NF boundary.
**Acreages shown in red (italics) are currently below incidental take thresholds.

4.4.1 Individual Site Histories for All Owl Pairs in the Action Area

4.4.1.1 Activity Centers in Teanaway LSR

Historic Sites:

Site 306 (Jungle Creek South): There have been no spotted owl detections here for 18 consecutive years. Owls last nested in 1989 and 1990 (total of 3 young fledged during those years). Approximately 36% of the home range area is located outside the National Forest boundary on private industrial forest land, and 20% is located on private land within the National Forest boundary. National Forest lands comprise about half of the home range area. Private lands outside the National Forest boundary were heavily logged during the 1980s, and now provide little if any NRF habitat for owls.

Site 319 (Teanaway North Fork): There have been no spotted owl detections here for 8 consecutive years. A pair of barred owls has been detected in the core nesting area. Prior to becoming inactive, spotted owls nested here in 9 out 11 survey years (from 1990 through 2000) and fledged 17 young total. Approximately 14% of home range area is located outside the National Forest boundary, and 30% is located on private land within the National Forest boundary. A high percentage of the home range area for this owl is on private industrial forestlands, but National Forest lands comprise most of the breeding area.

Active or "Occupied" Sites:

Site 356 (Jungle Creek North): A "new" non-nesting pair was detected here in 2007 approximately 0.6 mi west of historic nest trees. The male was unbanded; the female had nested previously in the adjacent watershed (SPAMA). This new pair location is considered to be using the same activity centers as previous nesting pairs. The designated core area has been enlarged to encompass the 2007 pair location and previous nest trees, until a clear pattern of spotted owl use emerges. The site was unoccupied in 2004-2006, 1997-2002, 1994-1995. Single spotted owls were detected in 2003, 1996, and 1991. Nesting pairs were detected in 1990, 1992, and 1993 (4 young fledged during all survey years). Approximately 13% of the home range area is located

outside the National Forest boundary, and 5% is located on private land within the National Forest boundary.

Site 398 (Johnson Creek) : Resident Single in 2007 and 2008. Vacant in 2006. Nested annually from 2000 to 2005, and in 1996 (total of 11 young fledged in all survey years). This is the only known spotted owl site in the Teanaway watershed whose entire home range is comprised of National Forest System lands.

4.4.1.2 Activity Centers in Swauk LSR

Active or "Occupied" Sites:

Site 323 (Jack Creek): Resident single detected in 2008. Nesting pair detected in 2007 (nest failed). Pair nested from 2000-2004, and in 1998, 1996, 1994, 1992, and 1990 (total of 22 young fledged in all survey years). Approximately 23% of the home range area is private land within the National Forest boundary, and the remainder is on National Forest land.

Site 346 (Bear Creek): Nesting pair detected from 2003 through 2006 (3 young fledged). No spotted owls detected in 2 surveys conducted in 2008. Vacant in 2007. All but 6% of the home range area is located on National Forest land.

4.4.1.3 Activity Centers in Matrix

Active or "Occupied" Site:

Site 342 (Stand Up Creek): A non-nesting pair is present this year (2008). Spotted owls last nested in 2007 (2 young fledged), also nested in 2003, 2001, 2000, 1992-1998 (total of 19 young fledged in all nesting years). Non-nesting pairs were detected from 1989 to 1991. Approximately 16% of the home range area is located on private land within the National Forest boundary and 1% is outside the National Forest boundary. The remaining 83% of the home range acreage is National Forest land, comprised of 4 different allocations (Teanaway and Swauk LSRs, Matrix, and Administratively Withdrawn areas).

4.4.1.4 Activity Centers Outside the National Forest Boundary

Historic Site:

Site 360 (Rye Creek): There have been no spotted owl detections here since 1993. Nesting pairs were detected in 1992 and 1990 (4 young fledged). Approximately 71% of the home range area (and all of the breeding area) is located outside the National Forest boundary, on heavily logged private industrial forest lands. A portion of this owl's home range also burned during the Lick Creek Fire of 2003. The site is considered historic, and very unlikely to support spotted owls for 50 or more years.

4.4.2 Current Level of LSR Function

Teanaway LSR: At the time it was established, Teanaway LSR encompassed 4 known spotted owl activity centers (306, 319, 356, and 398). The desired number of pairs for this LSR is 5. Other activity centers adjacent to the LSR (sites 342 in Matrix, site 344 in SPAMA, and site 381 in Administratively Withdrawn lands around Yellow Hill) were identified in the LSRA (USDA 1997) as sites that may need to be protected if the

number of nesting pairs fell short in this LSR. They have in fact, fallen short as the Teanaway LSR appears to support only 2 active sites at this time. The LSR is not functioning as intended, in terms of the number of breeding pairs needed to support spotted owl recovery efforts.

Site 344 last nested in 2007. Site 381 has been inactive for 7 consecutive years, and is now considered historic. Since the LSRA (USDA 1997) was completed, one new activity center (374) has also been located on private land outside the LSR but it is too far removed from the LSR to substitute for sites that have become historic.

Given the historic status of sites 306 and 319, it appears that both sites 344 and 342 (adjacent to the LSR) and the 2 remaining active owl sites within the LSR (356 and 398) need to be protected to maintain the original level of LSR function, and additional habitat and owls must be recruited to meet the desired level of LSR function.

Swauk LSR: Occupied owl sites have also declined in Swauk LSR, from 15 in 2004, to approximately 13 in 2007. At least one highly productive pair (310) appears to have abandoned the area, along with one other marginally productive site. Recent and ongoing timber harvest on both National Forest and private land and barred owl encroachment are affecting owls in Swauk LSR

4.4.3 Current Critical Habitat Function

Subunit 43 of the Entiat critical habitat unit has a total area of 83,820 acres. Of this total, nearly 83,274 acres (99 percent) are believed to be capable of supporting suitable spotted owl habitat. However, suitable spotted owl habitat is currently modeled as occurring on 29,760 acres within the subunit (36 percent). Dispersal habitat is present on about 19,947 acres (24 percent of the total). The large difference between "capable" and "currently suitable" acreages is primarily due to extensive timber harvest in the area. The relatively small proportion of suitable habitat in the unit and the high level of existing fragmentation of this habitat compromises the potential for this subunit to support nesting spotted owls and successful dispersal (i.e., minimize mortality of transient owls due to starvation and predation).

4.5 Factors Affecting the Species Environment in the Action Area

This section describes all federal, state, tribal, local, and private actions already affecting the species and/or critical habitat or that will occur contemporaneously with the proposed action. It also includes a discussion of the effects of natural disturbances and interactions with barred owls on the condition of spotted owls and their habitats at the action-area scale.

4.5.1 Consulted-Upon Effects

Several federal projects implemented in the action area since 1994 had the potential to affect the environmental baseline for spotted owls in the Teanaway River Watershed (Appendix B). Among these, none of the activities resulted in the removal of suitable habitat. The precommercial thinning project listed in Appendix B may have degraded some dispersal habitat, but the thinning treatments were designed to accelerate the development of late-successional habitat. On some sites, forest maturation modeling suggests that old-growth structure may be

attained twice as quickly in treated stands compared to untreated stands. This thinning project did not result in a loss of habitat function. All remaining projects had effects the Service found to be discountable and insignificant to the spotted owl and the PCEs of designated critical habitat. Effects from projects listed in Appendix B have been incorporated into the rangewide NWFP and Section 7 Consultation Effects Tracker database (as applicable) and are reflected in the rangewide status of the species.

Several projects were conducted under the OWNF programmatic for minor forest activities (1-9-2003-I-W0329, 1-9-2003-I-W0355, 1-9-2004-I-W0468, and 13260-2006-I-0109), as renewed and updated. These projects resulted in various treatments and activities, but effects to suitable habitat, the PCEs of spotted owl critical habitat, and individual spotted owls were discountable and insignificant due to implementation of the design criteria and conservation measures included in the programmatic consultation.

None of the projects in the area resulted in substantive habitat removal in critical habitat subunit WA-43. No recent or ongoing projects will affect the functional suitability of this subunit. Regarding the baseline condition of the action area in terms of suitability for spotted owls, the Service's opinion is that the collective habitat effects of known projects are relatively minor and have not substantively changed the actions area's capacity to support spotted owls.

4.5.2 Natural Disturbances

A variety of fire, insect, and disease disturbances have occurred in the Teanaway River watershed (USDA 1998). The Malcolm Creek fire, about 11 miles north of Cle Elum, Kittitas County, Washington, burned an area of approximately 14 acres in 2002. The amount of dispersal and suitable habitat affected by this fire are unknown. Insect and disease are at higher levels than historic condition. In 2004, the OWNF conducted a forestwide forest health assessment (USDA 2004) and key conclusions are summarized below. In this analysis, forest pathologists have suggested that conditions in the "central zone," which includes the action area at a coarse scale, include some of the greatest increases in root disease infection and resultant tree mortality. Although they suggested the "central zone" had experienced only low levels of bark beetle mortality, this was anticipated to increase. Silvicultural exams conducted in 2007 showed spruce budworm activity had spread from the northwest to the southeast across the watershed with heaviest defoliation in the northwest. Defoliation has occurred on approximately 85% of the forested project area, with an average defoliation percent of 20%. Because of the density of defoliated trees in some areas it was expected that up to 195 trees per acre of grand fir would be successfully attacked and killed by bark beetles, and about 40 trees per acre of Douglas-fir would be attacked and killed by bark beetles by the year 2008 in heavily defoliated and moderately defoliated areas (USFS 2008, pg. 57).

4.5.3 Presence and Effect of Barred Owls

The barred owl is known to occur in the action area, but its distribution and abundance were recorded incidentally to spotted owl surveys, adding uncertainty in the use and quality of this information. Courtney *et al.* (2004) reported that the competitive interaction between barred owls and spotted owls is unclear and that relatively little data has been specifically collected regarding this issue. The opinion of the scientific panel convened for the 5-year review for the spotted owl was divided; while all panelists thought this was a major threat, some felt that the scientific case for the effects of barred owls remained inconclusive and others were more certain.

Because the information on detections of barred owls has been collected incidental to spotted owl surveys, the data are neither consistently collected nor consistently reported, and are usually reported in the literature either as a ratio of barred owls to spotted owls or as numbers of barred owls detected over time. Consequently, there is a great deal of uncertainty about the barred owl's pattern of range expansion, its interaction and the consequences of those interactions with spotted owls, and the contribution of barred owls to the decline of spotted owls both in terms of direct effects (e.g., competition, predation, social harassment, hybridization) or indirect contributing effects (e.g., additional pressure on spotted owls in combination with habitat loss and/or lag effects associated with previous habitat loss; weather; or other factors). However, it is apparent that barred owls have greatly and rapidly expanded their distribution within the range of the spotted owl and that they have demonstrated negative inter-specific interactions with the spotted owl (Courtney *et al.* 2004).

Given this uncertainty, Courtney *et al.* (2004) proposed nine hypotheses regarding the potential consequences of the barred owl invading the range of the spotted owl. They range from complete replacement of the spotted owl by barred owls across their range to varying degrees of range, habitat, or niche partitioning. Although these hypotheses were categorized as "clearly plausible," "plausible," or "not plausible or not clear," no management recommendations were provided.

4.5.4 Summary

The Service concludes that although only recent, minor consulted-upon effects and natural disturbances have occurred in or near the action area, historic timber harvest has been extensive and current LSR and CHU function has been marginalized. At the watershed and WECP scales, moderate degrees of effect have occurred. While historic timber harvest has occurred across the entire WECP, habitat removal from wildland fire in the central and northern sub-provinces has been extensive. Habitat degradation from insect and disease mortality appears to be increasing across the WECP, and "outbreak" levels exist most notably in the northern and southern sub-provinces. Spotted owl populations in the northern part of their range are in precipitous decline, and non-habitat factors may be significant. The barred owl may be a greater threat than previously thought, but the potential effects are poorly understood and may be confounded by lag effects of habitat removal and other factors. Due to the documented decline in spotted owl populations and the uncertainty in identifying the effects of the proximate cause, a conservative approach is taken in analyzing the proposed action.

5.0 EFFECTS OF THE ACTION

The Service regulations for implementing the Act define "effects of the action" as "the direct and indirect effects of an action on the species together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline" (50 C.F.R. §402.02). "Indirect effects" are those that are caused by the proposed action and are later in time, but are still reasonably certain to occur. Any adverse effect requires the Service to conduct a jeopardy/adverse modification analysis (Section 7[a][2] of the Act).

5.1 Factors to be Considered

The Service evaluates the degree of effect resulting from the proposed action by considering the proximity, distribution, timing, type, duration, frequency, intensity, and severity of the action (USDI and USDC 1998; pages 4-23, 24). The standards to be analyzed are whether the proposed action will "jeopardize the continued existence" of the spotted owl or will result in the "destruction or adverse modification" of critical habitat of the northern spotted owl. "Jeopardy" is defined as an appreciable reduction in the likelihood of survival and recovery by reducing its reproduction, numbers, or distribution. "Destruction or adverse modification" of critical habitat is defined as an appreciable reduction of the value of constituent elements essential to the species conservation (USDI and USDC 1998; page xvi).

5.2 Analyses for Effects of the Action

The Service has identified all Project elements as having the potential to affect suitable and dispersal habitat. These effects are anticipated to occur primarily through the removal of existing structural characteristics through (1) commercial and non-commercial thinning; (2) partial overstory removal; (3) prescribed burning; (4) ladder and surface fuel removal; (5) construction, reconstruction, and closure of roads, landings, and skidding/ yarding trails; (6) noxious weed treatments; and (7) hand piling and burning. Areas that are capable of developing into, but are not currently, suitable habitat may be precluded from future development, or have their development delayed, by the same means. Noxious weed treatments, thinning of small-diameter overstocked stands, and road closures (including obliteration and decommissioning) are anticipated to have short-term effects to suitable habitat, and may have long-term benefits by accelerating the development of late-successional habitats. The Service assumes that once treated, most of these areas will be maintained such that dense fuels, and spotted owl habitat, will not be allowed to develop in order to meet the long-term Project objectives.

5.2.1 Direct and Indirect Effects

Based on the information provided in the BA and as described in the Introduction section, the proposed action is comprised of various, overlapping treatments over 3,176 acres. With few exceptions, any removal or downgrade of suitable habitat is an adverse affect. A variety of actions can also create disturbance which can also be an adverse affect. Examples of activities that create disturbance include loud noises, production of smoke, and use of aircraft within prescribed distances from listed species that result in a significant impairment of normal behavior.

Effects on Habitat: As described in the Status of the Species (section 2.0), effects of habitat modification can disrupt normal behavior patterns including feeding, breeding, and sheltering. Potential effects include (1) reductions in canopy closure that can increase susceptibility to predators and competitors ill-suited for movements within a closed canopy; (2) a reduction of branches low on the bole of trees (often pruned as part of ladder fuel reduction) can reduce climbing and perching opportunities for low-mobility owlets and reduce the availability of hunting perches for more mobile owls; and (3) reductions in stand complexity (e.g., density and/or multi-layered canopy), snags, and coarse woody debris that can influence prey populations.

The proposed action will reduce suitable and dispersal habitat in LSR, Matrix and Administratively Withdrawn land allocations by using various "thinning from below" and prescribed fire treatments to return the area closer to ecological conditions within the natural range of variability, decreasing the likelihood of insect and disease epidemics or uncharacteristic, stand-replacing fire. Treated acres will create fuel breaks by breaking up, or compartmentalizing, the remaining late-successional spotted owl habitat susceptible to stand-replacement fire, increasing the likelihood of efficient fire suppression efforts that will minimize the amount of late-successional habitat lost to high severity fire.

Silvicultural treatments will affect 368 ac of NRF habitat and 2181 ac of dispersal habitat for spotted owls, in the project area (Table 10). Planned removal of overstory and understory trees in thinning and shelterwood areas and in upland burn areas will reduce overstory canopy closures to the 30-60% range and would reduce logs, snags, and intermediate tree structure that provide cover for spotted owl prey. These actions will remove 123 ac of NRF habitat and 735 ac of dispersal habitat, downgrade 217 ac of NRF habitat to a dispersal condition, and degrade 1445 ac of dispersal habitat for spotted owls. Planned retention of 60% canopy closure and higher densities of snags and logs within Riparian Reserves would preserve habitat suitability and are expected to degrade but not remove approximately 28 ac of NRF habitat.

Table 10. Effects of planned treatments on NRF habitat for spotted owls, within treatment areas and within estimated home range areas of known spotted owls (R=1.8 mi buffer around nests) Figures in red (italics) are below the incidental take threshold.

	ACRES IN UNITS	ACRES IN AFFECTED HOME RANGES							
		306	319	323	342	346	356	360	398
BASELINE NRF HABITAT	368	*2297*	*1946*	3451	*2449*	3115	3081	*1201*	*2165*
BASELINE DISPERSAL HABITAT	2181	1473	2469	1663	1952	1546	2051	555	2196
EFFECTS FROM TREATMENTS									
NRF Removed	123	0	68	0	68	0	48	0	53
NRF Downgraded to Dispersal	217	3	114	0	103	0	60	0	130
NRF Degraded	28	16	16	2	17	2	16	3	15
Dispersal Removed	735	146	389	63	250	63	417	8	247
Dispersal Degraded	1445	9	346	148	469	138	189	2	1077
POST-PROJECT NRF	***28***	*2294*	*1764*	*3451*	*2278*	*3115*	*2973*	*1201*	*1982*
TREATMENTS RESULT IN INCIDENTAL TAKE		***no***	***no***	***no***	***yes***	***no***	***no***	***no***	***yes***
POST-PROJECT DISPERSAL	1662	1330	2195	1598	1806	1392	1694	547	2080

Most of the areas targeted for natural fuels underburning are currently either unsuitable for spotted owls, due to open canopy structure, or provide dispersal habitat. Mosaic, low-to-moderate intensity underburning in dispersal habitat will thin out understory trees but is not expected to significantly reduce overstory canopy. These areas will continue to function as dispersal habitat for spotted owls, albeit it degraded by reduced understory cover and structure for prey.

Most of the NRF habitat in treatment areas occurs as narrow riparian stringers or as small inclusions on moist microsites that stand a reasonable chance of being protected from high intensity fire. However, one nearly pure stand of large old grand fir trees is perched on a moist bench above the North Fork Teanaway River, at the toe of a south-facing slope (still within Riparian Reserve). Planned thinning and subsequent underburning in this area is likely to kill most if not all grand fir trees, removing NRF habitat for spotted owls at this location.

In underburn areas, plans to exclude high intensity fire from Riparian Reserves, and to exclude all fire from inner gorge areas, will help protect small inclusions of NRF habitat. With landscape level burns, however, it may not be possible to guarantee the success of all planned fire exclusions, and even low intensity burning may kill grand fir trees within Riparian Reserves. Another pure stand of grand fir located along an unnamed tributary of Beverly Creek may be particularly at risk, in spite of its riparian setting. This area currently provides NRF habitat for spotted owls, and all or a portion of this habitat may be removed if planned riparian exclusions fail.

All temporary roads are located within commercial thinning areas which will be thinned to less than 40% canopy closure in most areas, and to the 40-50% range within selected dry draws and swales. The planned 20ft-clearing width for these roads is less than the crown diameter of most overstory trees, and tree removal in such a narrow linear configuration will not result in significant fragmentation or removal of habitat. It will, however, reduce cover and structure for prey species. Therefore, planned temporary road construction will contribute to degradation of dispersal and foraging habitats, without changing the overall acres affected. Areas thinned to less than 40% will be unsuitable for owls, regardless of temporary roads, with the exception of opportunistic foraging attempts. Planned obliteration and reseeding of these roads upon completion of the project will help restore affected dispersal habitat to full function, within 1 or 2 decades of road closure.

Planned treatments will reduce the availability of NRF habitat within the home range areas of 7 known owl pairs, and may result in incidental take of 2 active nesting pairs (342 in Matrix and pair 398 in the Teanaway LSR) (Table 10). Available habitat for both of these pairs (and for 2 other historic sites) is currently below the threshold for incidental take.

Treatments will also increase, remove, and/or degrade dispersal habitat within the home range areas of all 8 known pairs (Table 10), and potentially a 9th undetected pair located in unsurveyed habitat in upper Stafford or Miller Creek. Most of the NRF habitat that

will be treated under this project is located more than 1.8 mi from any unsurveyed habitat, therefore potential habitat effects on undetected spotted owls would stem only from treatment of dispersal habitat.

Planned logging and underburning within the breeding areas (0.7-mile radius) of known spotted owls will:

- Degrade from 2 to 10 ac of NRF habitat for 3 occupied spotted owl sites (342, 356, and 398), and from 4 to 5 ac of NRF habitat for 2 historic sites (306 and 319) (Table 11).
- Downgrade 2 ac of NRF habitat for pair 356, which is currently above threshold and will remain so after planned treatments.
- Downgrade 7 ac of NRF habitat to a dispersal condition for site 319, an historic site. This site is currently below threshold, but because the site is considered historic and is unlikely to be occupied, no significant disruption or impairment of behavior would result.
- Remove from 1 to 67 ac of dispersal habitat for 4 occupied spotted owl sites (342, 346, 356, and 398).
- Degrade from 37 to 255 ac of dispersal habitat for 4 occupied sites (342, 346, 356, and 398).

Table 11. Effects of planned treatments on habitats for spotted owls, within breeding areas of known spotted owls (0.7-mile radius). Units are in *acres*.

	AFFECTED OWL SITE NUMBER					
	306	**319**	**342**	**346**	**356**	**398**
BASELINE NRF HABITAT	*493*	*337*	*362*	534	595	*424*
BASELINE DISPERSAL HABITAT	92	493	332	256	307	424
EFFECTS from TREATMENTS						
NRF Removed	0	0	0	0	0	0
NRF Downgraded to Dispersal	0	38	0	0	2	0
NRF Degraded	5	4	7	2	6	10
Dispersal Removed	*2*	*227*	*6*	*5*	*1*	*67*
Dispersal Degraded	3	38	80	37	78	255
POST-PROJECT NRF	*493*	*299*	*362*	534	593	*424*
TREATMENTS SIGNIFICANTLY DISRUPT OR IMPAIR BEHAVIOR	***no***	***no****	***no***	***no***	***no***	***no***
POST-PROJECT DISPERSAL	90	303	326	251	308	367

** Habitat removal will not significantly disrupt or impair behaviors due to historic status.*

Removal of suitable and dispersal habitat in a marginalized action area, whether within or outside occupied spotted owl home ranges, will likely negatively impact the long-term conservation of the species (i.e., current and future nesting, roosting, foraging, or dispersal opportunities). However, the proposed action changes the distribution and abundance of fuels and increases the likelihood of maintaining late-successional habitat through time. Considering that more spotted owl habitat is removed by wildfire than timber harvest in the WECP (see Section 4.2), the OWNF has made a reasonable attempt at balancing strategic treatments in terms of the conservation of the owl with the risk of large stand-replacing fires.

No silvicultural treatments and road construction will occur within designated core areas (i.e., the 0.7 mile radius area around the nest tree) for any occupied spotted owl activity centers. Because all planned temporary roads are also within treatment areas, there will be no additional impacts to any known spotted owls resulting from temporary road construction.

Proposed burning in open forest and dispersal habitat would have no direct effect on resident spotted owls, with the possible exception of pair 398 (see following discussion). It may indirectly affect spotted owls, however, by creating edge conditions that expose spotted owls to higher levels of predation by great horned owls and goshawks. Both of these avian predators/competitors are known to use the project area. In addition, effects to prey can also occur.

Timber harvest, including prescribed fire, can also impact foraging habitat and prey species. Richards (1989) and Forsman et al. (2001) studied the local food habits of spotted owls. The primary prey species that were identified in these studies include the northern flying squirrel, bushy-tailed woodrat, deer mouse, and voles. Woodrat and flying squirrel densities in dry and mesic forests on the OWNF are among the highest measured within the range of the northern spotted owl (Lehmkuhl et al. 2006a and 2006b). These medium-sized prey are key to the reproductive success of the young, and decreased prey availability could lead to reduced recruitment (Barrows 1985, Zabel *et al.* 1995). This is especially important from April through July, prior to juvenile dispersal from natal areas in August and September. Other prey species can also be seasonally important, and their abundance can be profoundly impacted by use of fire (which alters the amount and arrangement of surface fuels). Wirtz et al. (1988), in their 4-year study on post-fire rodent succession, found that while species richness did not change, abundance did. Populations of woodrats lagged, with significant increases taking as much as 30 months, and did not return to pre-fire densities over the 4 years of study. These data suggest recovery of the rodent community to prefire condition may take more than 4 years.

In contrast, spotted owls may indirectly benefit from restoration of fire climax communities on south slopes, due to the reduced risk of uncharacteristically large and severe wildfire that they would provide. Among other things, open south slopes may function as fuel breaks, creating or improving anchor points for fire suppression, and improving the chances for successful wildfire suppression. The presence of open forest areas may also contribute to a more diverse post-fire landscape that may still support spotted owls. When wildfire burns through a diverse landscape, some patches of dense late-successional habitat that are leeward

to open forest areas may not burn or may burn at lower intensity. These remnant patches of unburned or lightly burned forest would provide seed sources for recovery of vegetation, shortening the post-fire recovery period for forest vegetation. They may also enable spotted owls to persist in burned areas.

Potential Effect on Pair 398: One active spotted owl site in Teanaway LSR (pair 398) is atypical. About $^{1}/_{3}$ of their home range area and ½ of the breeding area currently provides NRF habitat, but a substantial portion of the home range area also overlaps 2 other occupied spotted owl circles, therefore some of the available habitat may not be used by pair 398. If their habitat base is limited by proximity to other spotted owls, then this pair may already be persisting under somewhat marginal conditions. Pair 398 has also nested for 5 years in a stand that would normally be characterized as dispersal habitat, albeit dense and trending toward NRF condition. This nest stand is located on a south aspect and is single-layered with 50-60% canopy closure with mid-seral Douglas-fir and ponderosa pine as dominant trees--the type of stand structure that is targeted for treatment under this project.

For most spotted owl pairs, treatments in dispersal habitat would have relatively little direct effect on habitat use, but that may not be the case for pair 398. Approximately half of the breeding area for pair 398 is located in dense dispersal habitat growing on a southerly aspect, and targeted for treatment. Planned harvest and underburning will remove or degrade a substantial amount of the dense dispersal habitat within the breeding and home range areas for this pair (322 and 1322 ac, respectively) and may further restrict their habitat base. Removal and degradation of NRF habitat within the estimated home range, but entirely outside the breeding area, will reduce habitat for this pair below the incidental take threshold. Treatment of dense dispersal habitat within the breeding area may pose an additional impact to this pair and lead to possible abandonment of this site.

Effects from Disturbance: Disturbance effects can cause an adverse affect if they disrupt normal behavior patterns to such an extent that "injury" is reasonably certain to occur. However, disturbance effects can be managed through the application of seasonal timing restrictions to minimize effects during critical periods (e.g., the nesting season). The proposed action will implement seasonal restrictions to minimize effects during the nesting season for the spotted owl (March 1 through August 31). This includes all activities that create noise or smoke within 0.25 mile of nest sites or activity centers, or further depending on the type of activity involved. Many activities that generate noise and smoke, including the use of heavy machinery and helicopters, chainsaws, and pile burning, were recently analyzed in the OWNF forestwide programmatic (USFWS reference 113260-2008-B-0014). The programmatic described the likely effects of these disturbances and measures to minimize these effects. The OWNF has adopted these standards as typical conservation measures to minimize effects to listed species.

Commercial thinning will entail use of chainsaws and heavy equipment. Planned prescribed burns may entail use of heavy equipment, pumps, chainsaws, and helicopters. All of these activities will result in intermittent noise above ambient conditions lasting

hours, days, or weeks. Within 0.25 miles of active spotted owl nests, or in the case of helicopter use within1 km of active nests, such noise may pose a disturbance to nesting pairs and may result in displacement of adult spotted owls, increased exposure of eggs or young to predators, and/or nest abandonment. Persistent smoke may also be damaging to the lungs of nestlings, and poses a different form of disturbance and injury.

For this Project, there is a potential for noise and smoke disturbance resulting from harvest and spring burns, affecting 4 active owl sites (346, 356, 342, and 398). Although fall burning is preferred, it may be more difficult in fall to protect spotted owl core areas adjacent to burns, and to exclude fire from inner gorge and riparian areas within burn units. Therefore the Project reserves the option to burn in spring. Risks to spotted owls from burning piles or underburning in fall are minimal. Risks from spring burning are also reduced by plans to conduct spring burns in manner that would minimize smoke around active spotted owl nests, to use drip torches rather than helicopters to ignite spring burns within 1 km of active nests, and to avoid all burning within 0.7 miles of active nests. If spring burning is implemented near active nests, research personnel will monitor effects on nesting spotted owls, during and after treatment.

Risk of disturbance to spotted owls from non-winter harvest activities will be substantially reduced by planned seasonal operating restrictions for use of chainsaws and heavy equipment within 0.25 miles of active spotted owl nests. Around active nests, these activities would be conducted outside the breeding period for spotted owls (March 1 through August 31).

Effects from Chemical Applications: Application of chemical treatments are anticipated to have little to no direct effects to the spotted owl, and only minor indirect effects to their habitat and prey. The formulations of herbicides and the manner in which they will be used were previously analyzed in the programmatic consultation for the USFS Pacific Northwest Region Invasive Species Program (USFWS reference: 1-7-05-7-0653). In this analysis, they found little habitat-based risk to listed species and low potential for bio-accumulation. Based on the design criteria and conservation measures in the BA, tiering to the aforementioned programmatic analysis, the Service believes the Project effects of noxious weed treatment to the spotted owl are discountable and insignificant. As a result, this action will not be analyzed further in this BO.

Overall, the Service anticipates adverse effects within the home range of 3 occupied activity centers (SO 342, 356, and 398), and habitat within 2 of these activity centers (SO 342 and 398) will be further reduced below the incidental take "threshold" (see Section 2.2.5.1). Removal of suitable and dispersal habitat is anticipated to negatively impact current and future nesting, roosting, foraging, or dispersal opportunities. While silvicultural impacts are expected to be permanent, prescribed fire effects to non-arboreal prey may last at least 4 to 6 years until their populations recover to pre-treatment conditions. The Service expects the short-term consequence of the proposed action to be decreased foraging, roosting, and dispersal opportunities, and potentially decreased fecundity of 2 of 5 active nests in the action area. Of particular concern is the potential for site abandonment of SO 398, which is already below threshold and appears to be using dense dispersal habitat (some of which is proposed for removal) as suitable habitat.

The removal of suitable habitat within the action area will further limit current and future nesting, roosting, foraging, and dispersal opportunities. In particular, impacts to the Teanaway LSR are of concern. While only a small percentage of its total area will be impacted, only 48% is currently comprised of suitable habitat, and its ability to function as anticipated is questionable. But the most imminent risk, based on recent fire history (see Section 4.2 and Appendix A), suggests the greatest risk of removal of habitat in the WECP is from large, stand-replacing fire. The proposed action appears to have minimized habitat removal, especially within the 0.7 mile core area, while reducing the fire risk (i.e., strategic treatments that increase the likelihood of fire containment at a smaller size).

5.2.2 Interrelated and Interdependent Actions

"Interrelated and Interdependent Actions" are defined in the Service's consultation handbook (USDI and USDC 1998; page xv). In brief, they are actions that would not occur but for the proposed Project and are a connected action and effect.

Interrelated and interdependent actions are not anticipated. The Service is aware of other efforts near the action area that also have fuel reductions as a primary purpose. However, they either appear to be a future federal action (i.e., which would require separate section 7 analysis), or are future non-federal actions that are addressed below in Cumulative Effects (section 5.0).

5.2.3 Effects to Designated Critical Habitat

The PCEs essential to the conservation of the spotted owl are (1) forest types that support the spotted owl across its geographic range, (2) nesting, roosting, foraging habitat and (3) dispersal habitat (USDI 2008b). The east side of the Project area overlaps a small portion of designated spotted owl critical habitat sub-unit WA-43. Proposed treatments will affect 475 total acres: 42 acres of NRF and 433 acres of dispersal.

Planned commercial thinning and associated fuel treatments within NRF habitat in critical habitat would reduce overstory canopy closures to the 30-60% range and would reduce logs, snags, and intermediate tree structure that provide cover for spotted owl prey. These actions will downgrade NRF habitat to a dispersal condition (38 acres) (Table 12). Planned retention of 60% canopy closure and higher densities of snags and logs in Riparian Reserves would preserve suitability for owls in these moister microsites—this action would degrade but not remove NRF habitat (4 acres) (Table 12). Overstory removal associated with treatments will reduce canopy closure to less than 30 percent, removing 207 acres of dispersal habitat from critical habitat. Canopy cover in the remaining 226 acres of dispersal habitat affected by the project will not be reduced below 30% as a result of the treatments and will therefore continue to function as dispersal habitat albeit in a degraded capacity (Table 12). These treatments in critical habitat constitute an "adverse effect" to the PCEs in the action area and to sub-unit WA-43. However, the capacity of sub-unit WA-43 to provide the functions for which it was designated will not be appreciably altered from its baseline condition.

Table 12. Effects of treatments on designated critical habitat for spotted owls in sub-unit WA-43.

	Habitat Type	Acres
Baseline Conditions	NRF	31917
	Dispersal	19947
	Unsuitable	5633
Effects from Treatments	NRF degraded	4
	NRF Downgraded	38
	NRF Removed	0
	Dispersal Degraded	226
	Dispersal Removed	207
Post-Treatment Conditions	NRF	31879
	Dispersal	19778
	Unsuitable	5840

About 4 acres (0.005 percent of the sub-unit total) of NRF habitat will be degraded, meaning these areas retain their habitat function, but with reduced overall quality. Approximately 38 acres (0.05 percent of the sub-unit total) of NRF will be downgraded to dispersal habitat and will not retain their current habitat function. However, the current condition of critical habitat sub-unit WA-43 is marginal. Only about 36% of WA-43 is currently comprised of suitable habitat, which suggests its ability to function in the manner for which it was designated is questionable. But the most imminent risk, based on recent fire history (see Section 4.2 and Appendix A), suggests the greatest risk of removal of habitat in the WECP is from large, stand-replacing fire. The proposed action appears to have minimized habitat removal, especially within the 0.7-mile core area, while reducing the fire risk (i.e., strategic treatments that increase the likelihood of fire containment at a smaller size).

Removal and degradation of 433 acres (0.5 percent of the sub-unit total) of dispersal habitat will result in a localized reduction in opportunities for successful dispersal of spotted owls within sub-unit WA-43. The Project is unlikely to influence spotted owl dispersal patterns at any scale larger than that of the action area. The size and distribution of effects to dispersal habitat from the Project is unlikely to alter the overall level of connectivity among sub-units WA-43, 42, 44, and 45. Telemetry studies indicate that dispersing spotted owls regularly traverse areas of unsuitable habitat, and only broad expanses of unsuitable habitat (e.g., Willamette Valley, OR) block dispersal (e.g., Forsman *et al*. 2002). Unfortunately, we lack the information needed to determine the relationship between levels of habitat fragmentation and survival to reproduction of dispersing spotted owls. Nonetheless, we believe the limited scope of Project effects on the dispersal habitat PCE are unlikely to prevent sub-unit WA-43 from contributing to successful dispersal of spotted owls across the WECP, and between the WECP and the Washington Western Cascades Province, despite its degraded baseline condition.

The overall effects of the Project will lead to reductions in the functionality of PCEs of 475 acres of critical habitat. The extent and severity of these effects are unlikely to be detectable at any larger scale than the action area. With implementation of the proposed Federal action, critical habitat would remain marginally functional (or retain the current ability for the PCEs to be

functionally established) to serve the intended conservation role for the species from the sub-unit to the rangewide scale.

6.0 CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this BO. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to Section 7 of the Act. All future permitted actions (e.g., through a USFS special use permit) would require consultation following the implementing regulations of Section 7 of the Act.

Climate change, and the related warming of global climate, has been well documented in the scientific literature. The abundance and distribution of species, including the spotted owl, are dynamic relative to a variety of factors including climate. As climate changes, the abundance and distribution of species are expected to change. Many of the current future climate predictions for the Pacific Northwest suggest the spotted owl and its habitat will be affected by climate change through several pathways, including but not limited to changes in fire regime; patterns of rain and snowfall; wildlife diseases; and abundance and distribution of native and nonnative species of fish, wildlife, and plants.

As the human population in Washington continues to grow, residential growth and demand for dispersed and developed recreation, especially near lakes and streams, is likely to occur. This trend may result in increasing terrestrial and aquatic habitat degradation on private and public lands alike. These activities may include the removal and trampling of riparian vegetation, falling of trees and collection of downed wood for campfires, construction of user-built roads and trails, degraded hydrologic function, and impaired water quality. In particular, thinning can open up formerly dense stands of trees such that off-highway vehicles, including snowmobiles, may have increased overland access. This can increase the intensity and extent of the zone of influence of habitat and disturbance effects above current levels.

The Service is also aware of multiple community-based wildfire protection plans in and around the action area. Actions anticipated to occur as a result of the implementation of these plans include the thinning of small trees and surface fuel reductions, potentially within the home range of spotted owls. These impacts are speculative, however, because a formal proposal has not yet been developed. However, the Service acknowledges that some level of fuel reductions on private lands is likely to occur independent of the proposed action, and that Project implementation may influence private landowner's decisions about the manner and extent of their treatments. In cases where a particular spotted owl activity center is near threshold and depends on suitable habitat on private lands, incidental take may occur. Each subsequent action by itself may have only a small incremental effect, but taken together they may have a substantive effect that would further degrade the environmental baseline and undermine the habitat conditions necessary for the conservation of listed species.

7.0 CONCLUSION

The Service has reviewed the status of the species/status of designated critical habitat for the spotted owl, the environmental baseline, the effects of the proposed action, and the cumulative effects. Based on this review, it is the Service's biological opinion that these actions are not likely to jeopardize the continued existence of the spotted owl and are not likely to destroy or adversely modify designated critical habitat. The bases for these conclusions are summarized as follows:

1. The change in the rangewide status of the spotted owl and its designated critical habitat due to consulted-upon effects is within expectations of the overall conservation strategy. Approximately 96 percent of effects have occurred outside of LSR and other NWFP reserve allocations (Table 4), and only about 1.5 percent of the amount of extant critical habitat has been consulted-upon for removal or downgrading since the 1994 FSEIS baseline (Table 5) was established.

2. Natural events (e.g., wildland fire, insect and disease disturbances) have impacted some spotted owl suitable habitat and individual CHU's, but rangewide the conservation framework (LSR/MLSA and CHU networks) continues to function as designated. To date, wildland fires have resulted in more rangewide effects to suitable habitat than management; the proposed action would result in short-term adverse effects but in the long-term may protect more habitat than it treats, minimizing the risk of catastrophic loss of habitat due to wildland fire.

3. Consulted-upon effects in the Washington Eastern Cascades physiographic province have been minor, but wildland fires since 1994 have been extensive. Although the provincial CHU and LSR/MLSA networks have been degraded, primarily by wildland fire and historic timber harvest, they remain intact although the resiliency of some areas has been reduced. However, the action area has experienced few consulted-upon effects and natural disturbances.

4. The rangewide baseline status of critical habitat was "reset" as of September 12, 2008, when revision of spotted owl critical habitat became effective. Since that reset, documented rangewide effects to NRF habitat within critical habitat units consist of removal of 877 acres, mostly from the Oregon Cascades East Province. Effects to dispersal habitat consist of reduction in quality of 28 acres of dispersal habitat in the Oregon Coast Range province. At this early point post-revision of critical habitat, these minor effects do not change the functional capacity of any critical habitat unit or sub-unit. Before the reset, less than 1.6 percent of the total area of the original critical habitat designation had been affected by projects since the 1994 baseline was established. This limited amount of effects to critical habitat rangewide, combined with all provinces having less than 5 percent of critical habitat affected by management, led the Service to conclude that the original critical habitat network had not been substantively degraded by management activities before revision occurred.

5. At the watershed scale, no adverse effects to revised critical habitat have occurred. Previous timber management in the area has diminished the amount, quality, and distribution of habitat within critical habitat sub-units in the area. The baseline functionality of these sub-units is marginal in terms of both habitat condition and demographic performance of remaining spotted owls.

6. The action area is centrally located between large population clusters important to the conservation of the spotted owl in the province, making this area critical to connectivity. The proposed action would degrade about 4 acres of suitable habitat within critical habitat. Effects to dispersal habitat are more extensive (about 207 acres removed and 226 acres degraded). These effects are very small proportionally, representing far less than 1 percent of NRF habitat in critical habitat sub-unit WA-43 and about 2.2 percent of known dispersal habitat in the sub-unit. The limited amount of dispersal habitat removal proposed is too small to influence functional connectivity among spotted owl populations. Project effects are more likely to be entirely local in scale. For transient spotted owls, changes in the dispersal PCE associated with habitat modification may cause small changes in dispersal paths. The Service believes that Project implementation is unlikely reduce the overall functionality of critical habitat.

7. Habitat-based incidental take will occur to two pairs of spotted owls (SO-342 and SO-398) as a result of Project implementation. Treatments within the 1.8 mile estimated home range of these spotted owl pairs will further reduce suitable habitat below 2,663 acres in these home ranges. The Service believes that this may significantly impair essential breeding, feeding and sheltering behaviors for these owl pairs. This will result from the indirect effects of the proposed treatments and the removal of stand structural complexity which reduces the abundance and composition of spotted owl prey. These changes could result in a decrease in spotted owl numbers and distribution within the action area as a result of activity center abandonment by SO-398. The Service does not anticipate changes in spotted owl numbers, reproduction or distribution at the provincial or rangewide scale.

8. The consequences of the proposed action are not expected to directly reduce the number of spotted owls currently residing in the action area. Although treatments are proposed to occur in two active spotted owl home ranges and in adjacent habitat, recent surveys by the USFS resulted in no additional nesting sites detected beyond those identified previously. Thus, we do not expect treatments to result in lethal effects because no treatments will occur within 0.7 miles of any known spotted owl activity center during the breeding period of March 1 through August 31.

9. The proposed action will likely modify the normal behavioral patterns of spotted owls that may attempt to disperse into the action area, and may increase their susceptibility to predation and competition. The severity of these effects is difficult to quantify.

10. The cumulative effects of fuel reduction projects reasonably certain to occur on private lands may incrementally remove, downgrade, or degrade suitable and dispersal habitats into the long-term future. However, relatively little conservation benefit is anticipated from private lands.

Based on the analysis presented in this BO, habitat removal that will result from the Project will affect two occupied spotted owl pairs. Since effects at the Project scale appear to be relatively minor, effects at the provincial or rangewide scales may not be measurable. The proposed action will not cause an appreciable reduction in the numbers, distribution, or reproduction of spotted owls, or compromise the functional suitability of the LSR network. As a result, the Service does not believe that the proposed action will jeopardize the continued existence of the spotted owl.

The relatively minor adverse effects of the Project on spotted owl critical habitat is unlikely to change the existing ability of critical habitat sub-unit WA-43 to support its intended conservation role in the survival and recovery of the spotted owl. Small negative effects on NRF and dispersal habitat at the action area (sub-unit) scale are unlikely to influence functionality of critical habitat at the watershed (unit), provincial or rangewide scales. Given that critical habitat will remain functional across scales from sub-unit to rangewide, and retain the current ability for PCEs to become functionally established, we conclude that the action, as proposed, will not destroy or adversely modify designated critical habitat for the spotted owl.

7.1 REASONABLE AND PRUDENT ALTERNATIVES

Regulations implementing Section 7 of the Act (50 C.F.R. §402.02 *et seq.*) define reasonable and prudent alternatives as alternative actions, identified during formal consultation, that: (1) can be implemented in a manner consistent with the intended purpose of the action; (2) can be implemented consistent with the scope of the action agency's legal authority and jurisdiction; (3) are economically and technologically feasible; and (4) would, the Service believes, avoid the likelihood of jeopardizing the continued existence of listed species or resulting in the destruction or adverse modification of critical habitat.

Because the proposed action is not likely to jeopardize the continued existence of the spotted owl, no reasonable and prudent alternatives are required.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act, and Federal regulations pursuant to Section 4(d) of the Act, prohibit the take of endangered and threatened species, respectively without special exemption. Take is defined as 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 behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions or omissions that create the likelihood of injury to listed species by annoying it 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 this Incidental Take Statement.

The measures described below are non-discretionary, and must be undertaken by the USFS so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, for the exemption in section 7(o)(2) to apply. The USFS has a continuing duty to regulate the activity covered by this incidental take statement. If the USFS fails to assume and implement 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 USFS must report the progress of the action and its impact on the species to the Service as specified in this Incidental Take Statement [(50 C.F.R. §402.14(i)(3)].

Treatments within the 1.8 mile estimated home ranges of spotted owl pairs SO-342 and SO-398 will further reduce suitable habitat below 2,663 acres in these home ranges. The Service believes that this may significantly impair essential breeding, feeding and sheltering behaviors for these owl pairs. This will result from the indirect effects of the proposed treatments and the removal of stand structural complexity which reduces the abundance and composition of spotted owl prey. These changes may result in a decrease in spotted owl numbers and distribution within the action area as a result of activity center abandonment by SO-398.

AMOUNT OR EXTENT OF TAKE

Based on the best information available on spotted owl use of the action area, significant habitat modification or degradation will occur, resulting in harm to two spotted owl pairs (SO-342 and SO-398). Harm will occur through impairment of essential behavioral patterns including breeding, feeding, or sheltering. In addition, normal spotted owl nesting, roosting, foraging, and dispersal patterns will be significantly disrupted by the removal of suitable and dispersal habitat within and outside of active territories over the 3,176 acres of treatment areas. The Service is exempting incidental take in the form of harm, up to, but not including, lethal take of two spotted owl pairs. The current rate of decline of the spotted owl in the northern portion of its range suggests authorizing lethal take would not be prudent. Therefore, if any spotted owls associated

with this Project are observed or suspected to be killed, reinitiation of consultation on the proposed action is required pursuant to the Act.

EFFECT OF THE TAKE

In the accompanying BO, the Service determined this level of anticipated incidental take is not likely to result in jeopardy to the spotted owl.

REASONABLE AND PRUDENT MEASURES

Reasonable and prudent measures are non-discretionary measures designed to minimize impacts on specific individuals or habitats affected by the proposed action, and involve only minor changes to the project. Pursuant to 50 CFR §402.14 (I) (ii), reasonable and prudent measures are those measures the Service considers necessary to minimize incidental take. The Service believes the following reasonable and prudent measure is necessary and appropriate to minimize the incidental take of spotted owls:

> **RPM1.** Minimize the adverse habitat and disturbance effects of the proposed activities within the estimated home range of spotted owl pair SO-398 to reduce the possibility of site abandonment.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Act, the USFS must comply with the following terms and conditions, which implement the reasonable and prudent measure, described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary.

Implement the following Term and Condition to fulfill Reasonable and Prudent Measure #1:

> **T&C1.** Alter treatments in Unit A-15 (see Project BA for descriptions of treatment units) to ensure the retention of dispersal habitat within the estimated home range of SO-398. Suggested methods for maintaining dispersal habitat within this 21-acre treatment unit include:
>
> - Mark more overstory trees for retention.
> - Reduce or eliminate machine-piling and underburning.
> - Implement alternatives to machine piling, such as mastication or other mechanical methods for reducing activity fuels, where feasible.
> - Retain larger amounts of down wood (large logs or unburned piles) to improve foraging opportunities for spotted owls.

REPORTING REQUIREMENTS

In order to monitor the impacts of implementation of the reasonable and prudent measure, the USFS shall prepare a report describing the progress of the proposed Project, including implementation of the associated terms and conditions, and impacts to the spotted owl (50 CFR 402.14(I)(3)). The report, which shall be submitted to the Central Washington Field Office on or before January 31, annually until project completion, shall list and describe:

1. Adverse effects to spotted owl resulting from Project activities including number and life stages of individuals affected.
2. Deviations from proposed treatments and procedures.

Upon locating a dead, injured, or sick specimen of an endangered or threatened species, initial notification must be made to the nearest Service Law Enforcement Office (Richland, Washington; telephone 509-546-8344). Care should be taken in handling sick or injured specimens to ensure effective treatment and care or the handling of dead specimens to preserve biological material in the best possible state for later analysis of cause of death. In conjunction with the care of sick or injured endangered species or preservation of biological materials from a dead animal, the finder has the responsibility to carry out instructions provided by Law Enforcement to ensure that evidence intrinsic to the specimen is not unnecessarily disturbed.

The reasonable and prudent measure, with its implementing terms and condition, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. If, during the course of the action, this level of incidental take is exceeded, such incidental take represents new information requiring reinitiating of consultation and review of the reasonable and prudent measures provided. The USFS must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures. Because incidental take for this Project is difficult to detect, the Service recommends contacting us if Project plans change from those described in this BO.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act requires 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. In order to promote the conservation of the spotted owl and a healthy late-successional ecosystem, the Service makes the following recommendations:

1. The USFS should diligently monitor road obliterations and closures throughout the action area. If any of these closures are not effective, the Service recommends immediate corrective action including additional physical closures, interpretive signing, and law enforcement, be implemented. Conservation benefits to listed species may not be realized if these closures are not effective.

2. The USFS should monitor the frequency, type, and extent of off-highway vehicle use, including snowmobiles, and activities that occur due to the proposed action reducing stand density. Opening up forested stands increases sight distances, may provide opportunities for off-highway vehicle use, and can lead to increased amounts of user-built roads, trails, and dispersed recreation sites. Lower stand densities may also allow for additional firewood cutting further from the road's edge. The aggregation of these effects may result in the degradation of suitable and dispersal habitat for the spotted owl.

3. The USFS should continue to conduct inventories for spotted owls in and adjacent to the action area using the USFS Region 6 protocol. Information gathered during these inventories may provide valuable information regarding the interactions between spotted owls, barred owls, and great-horned owls.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, we request notification of the implementation of any conservation recommendations.

REINITIATION-CLOSING STATEMENT

This concludes formal consultation pursuant to the regulations implementing the Act, 50 C.F.R. §402.16. Reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this BO; (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 BO; 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 reinitiation.

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PERSONAL COMMUNICATIONS

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APPENDIX A: Summary of Estimated Wildfire Effects on Spotted Owl Habitat in the Washington Eastern Cascades Physiographic Province, 1994 to Present

Year	#	Fire	Unit	Total Acres	NRF Rmvd	CHU Rmvd	CHU	AC Rmvd	READ	Comments
1994	1	Tyee/Rat/Rd. Mtn	WNF	186800	9512	6080	6, 9, 11	17	0	jb analysis
1998	2	North 25	Chelan	8845	3500	1260	4	1	0	jb
			TOTAL	**195645**	**13012**	**7340**		**18**	**0**	
2001	3	Icicle Complex	Leav	7850	1569	41	10	0	1	jk
2001	4	Rex Creek	Chelan	56000	1873	0	n/a	0	1	cm
2001	5	South Libby	MVRD	3800	380	0	n/a	0	0	jk: assumed 10% of area is NRF
2001	6	Tommy Creek	Entiat	640	100	30	5	0	0	jk
2001	7	Rattlesnake	Naches	20	2	0	n/a	0	0	jk: assumed 10% of area is NRF
2001	8	Spruce-Dome	Naches	2600	260	130	17	0	0	jk: assumed 10% of area is NRF; about half in CHU
2001	9	Merritt Lake	Lake	20	2	0	n/a	0	0	jk: assumed 10% of area is NRF
2001	10	Dog Creek	Naches	450	45	0	n/a	0	0	jk: assumed 10% of area is NRF
			TOTAL	**71380**	**4231**	**201**		**0**	**2**	
2002	11	Deer Point	Chelan	43000	2098	0	n/a	0	1	cm
2002	12	Power Creek	Leav	10	0	0	n/a	0	0	jk
2002	13	Deer Mountain	Chelan	1500	0	0	n/a	0	0	jk
2002	14	Malcom	Cle Elum	10	2	2	13	0	0	jk: assumed 20% of area is NRF
2002	15	Cat Face	Lake	10	0	0	n/a	0	0	jk
			TOTAL	**44530**	**2100**	**2**		**0**	**1**	
2003	16	Crystal Creek	Leav	1284	195	0	n/a	0	1	jk
2003	17	Square Lake	Leav	1097	607	0	n/a	0	0	jk
2003	18	Farewell	MVRD	81400	1343	0	n/a	0	1	jk: about 1/3 of area is w/in NWFP; assumed 5% of area was NRF
2003	19	Needles	MVRD	21300	6500	2500	2	1	0	cm: much of home range of Driveway Butte STOC burned
2003	20	Maple	Lake	2409	1385	630	6	0	1	cm
			TOTAL	**107490**	**10030**	**3130**		**1**	**3**	
2004	21	Pot Peak Complex	Chelan	46000	4600	1150	4	1	1	jk: assumed 10% of area is NRF; about 1/2 of CHU was burned, much of 25-mile STOC home range burned

Year	#	Fire	Unit	Total Acres	NRF Rmvd	CHU Rmvd	CHU	AC Rmvd	READ	Comments
2004	22	Rattlesnake	Naches	600	30	0	n/a	0	0	jk: assumed 5% of area is NRF
2004	23	Icicle	Leav	778	416	355	10	0	1	jk
2004	24	Trinity	Lake	45	0	0	6	0	0	jk
2004	25	Dirtyface	Lake	295	50	0	n/a	0	0	jk
2004	26	Sunshine	MVRD	50	5	0	n/a	0	0	assumed 10% of area is NRF
2004	27	Reecer	Cle	100	18	0	n/a	0	0	jk
2004	28	Fisher	Leav	16500	1314	0	n/a	0	1	jk
			TOTAL	**64368**	**6433**	**1505**		**1**	**3**	
2005	29	Pearrygin Lake	MVRD	550		0	n/a	0	0	jk
2005	30	Dirtyface	Lake	1150	303	5	6	0	1	jk: BA coming over winter; weed issues
2005	31	Squaw Creek	MVRD	1200		0	n/a	0	0	
			TOTAL	**2900**	**303**	**5**		**0**	**1**	
2006	32	Tripod Complex	MVRD	175000			n/a		1	outside NWFP area
2006	33	Tatoosh Complex	MVRD	2550			n/a		0	
2006	34	Flick Creek	Chelan	5160					0	
2006	35	Tinpan	Entiat	5750					0	
2006	36	Cedar Creek	MVRD	1661					0	
2006	37	Polallie Ridge	Cle	500					0	
				190621	**0**	**0**		**0**	**1**	
2007		Easton Ridge	Cle	400	4				0	40 acres on USFS; assumed 10% was NRF
		Grand Totals		**676934**	**36109**	**12183**		**20**	**11**	

NRF and CHU removed is a combination of fire and fire-suppression effects

NRF and CHU acres overlap unless otherwise stated; CHU acres = NRF only
READ = Service resource advisors/BAER/monitoring (1=present, 0=absent)

APPENDIX B: Projects Subject to Prior Section 7 Consultation.

Projects subject to prior section 7 consultation that may have had effects on bull trout and spotted owl in the Teanaway River watershed.*

Project	**USFWS Reference**	**Effects to Bull Trout**	**Effects to Spotted owl Habitat**
Cle Elum Ranger District 5-year Precommercial Thinning Program	13260-2008-I-0061	May Affect, Not Likely to Adversely Affect bull trout	None; some noise disturbance of spotted owls possible
Monroe Pump Screen	13260-2007-I-0069	May Affect, Not Likely to Adversely Affect bull trout	None
Fulks/Morris Bulkhead Replacement Project	13260-2006-I-0133	May Affect, Not Likely to Adversely Affect bull trout.	None; some noise disturbance of spotted owls possible
Way Creek Trail Improvements	13260-2006-I-120	May Affect, Not Likely to Adversely Affect bull trout	None; some noise disturbance of spotted owls possible
Sasse Corral Trail Improvements	1-9-2005-I-W0266	None	Degradation of 0.1 acres of NRF in CHU WA-13

* This list does not include projects that were determined to have "no effect" on bull trout or spotted owls or their habitat or projects that were covered under the Programmatic for Selected Forest Management Activities (USFWS ref. 13260-2008-I-0076). This programmatic covers only activities that result in "not likely to adversely affect" determinations, based on conformance with specific design criteria.