United States Department of the Interior

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In Reply Refer To: 01EOFW00-2014-F-0161
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June 25, 2014

Memorandum

To: District Manager, Medford District
Bureau of Land Management
Medford, Oregon

From: Field Supervisor, Roseburg Fish and Wildlife Office
Roseburg, Oregon

Subject: Formal consultation on the Medford Douglas Post-Fire Salvage Project (Reference Number 01EOFW00-2014-F-0161)

This document transmits the U.S. Fish and Wildlife Service's (Service) Biological Opinion (Opinion) addressing the Medford Douglas Post-Fire Salvage Project proposed by the Medford District (District) of the Bureau of Land Management (BLM). At issue are the effects of the proposed action (or Project) on the threatened northern spotted owl (*Strix occidentalis caurina*) (spotted owl) and spotted owl critical habitat. The attached Opinion was prepared in accordance with the requirements of section 7 of the Endangered Species Act (ESA) of 1973 as amended (16U.S.C. 1531 et seq.).

The Opinion is based on information provided in the District's Biological Assessment (USDI BLM 2014; Assessment), dated April 28, 2014 and received in our office on April 30, 2014, along with other sources of information cited herein. A complete decision record for this consultation is on file at the Service's Roseburg Field Office. The Opinion includes a finding by the Service that the District's proposed action is not likely to jeopardize the spotted owl or adversely modify spotted owl critical habitat.

The Assessment includes a finding that it may take several years to fully complete the proposed action. On that basis, the Opinion is valid for the term of the proposed action as discussed and analyzed herein. In accordance with the implementing regulations for section 7 at 50 CFR 402.16, re-initiation of consultation is required where discretionary Federal agency involvement or control over the action has been maintained (or is authorized by law) and if: (1) the amount or extent of exempted incidental take is exceeded; (2) new information reveals effects of the agencies' action that may affect listed species or critical habitat in a manner or to an extent not considered in the Opinion; (3) the agency action is

subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the Opinion; or (4) a new species is listed or critical habitat designated that may be affected by one or both of these actions. When consultation is reinitiated, the provisions of section 7 (d) of the ESA apply.

If you have any questions regarding the attached Opinion, please contact Cindy Donegan of the Service's Roseburg Field Office at 541-618-2374.

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Biological Opinion
Addressing
The Medford Douglas Post-Fire Salvage Project
Proposed by
The Medford District of the Bureau of Land Management

(FWS Reference Number 01EOFW00-2014-F-0161)

U.S. Department of the Interior
U.S. Fish and Wildlife Service
Roseburg Field Office
June 25, 2014

Signature: _____

Jim Thrailkill
Field Supervisor

Date Signed: 6/25/2014

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

This document transmits the U.S. Fish and Wildlife Service's (Service) Biological Opinion (Opinion) addressing the Medford Douglas Post-Fire Salvage Project proposed by the Medford District (District) of the Bureau of Land Management (BLM). At issue are the effects of the proposed action (or Project) on the threatened northern spotted owl (*Strix occidentalis caurina*) (spotted owl) and spotted owl critical habitat (USDI FWS 2012). The District planned the proposed salvage harvest of 1,612 acres in response to several wildfires (the Dad's Creek, Farmer Gulch, and Rabbit Mountain fires) also known as the Douglas Complex fire that began on July 26, 2013. These fires were ignited by an early morning lightning storm and burned a total of 48,671 acres across all land ownerships. Just over half of the burned acres (25,348 acres) occur on Federal land managed by the Medford and Roseburg BLM Districts; this consultation however is specific to the proposed action on the Medford District. The primary purpose of the proposed Project is economic recovery, roadside safety and fire planning. A portion of the Medford Douglas Post-Fire Salvage Project is located within critical habitat for the spotted owl that was designated by the Service in 2012 (77 Federal Register 233:71876-72068).

This Opinion is based on information provided in the District's Biological Assessment (USDI BLM 2014; Assessment), dated April 28, 2014 and received in our office on April 30, 2014, along with other sources of information cited herein. A complete decision record for this consultation is on file at the Service's Roseburg Field Office.

Please note that this 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.

Please also note that the analysis and findings presented in this Opinion do not rely on the Spotted Owl Estimation Methodology (OEM) (USDI/USDA 2008) pursuant to the court order issued by the District Court for the District of Columbia in the *Swanson v Salazar* case on June 26, 2013. The analysis and findings presented herein regarding the effects of the Project on the spotted owl rely on the best available science as discussed in the *Spotted Owl Resource Use* section as provided below, along with the Service's professional judgment on the Project's potential effects to spotted owls.

CONSULTATION HISTORY

The Medford Douglas Post-Fire Salvage Project generally represents a new project. However, part of this proposed action includes 123 acres of the Wolf Pup Timber Sale that was previously analyzed and subject to a Service concurrence determination in 2009 (Service consultation # 13420-2009-I-0159). The District now proposes to harvest the 123 acres because they burned in the Douglas Complex fire. This harvest is likely to cause adverse effects to the spotted owl not previously analyzed in the 2009 informal consultation cited above.

As the proposed Project was developed, it was the subject of multiple presentations to the Rogue Basin Level 1 Team, which is comprised of the Rogue River-Siskiyou National Forest Biologist, the Medford BLM District Biologist, and a Service Roseburg Fish and Wildlife Office Biologist. This Team was established in accordance with the interagency consultation streamlining process (USDI BLM, USDI FWS, USDA FS, and USDC NMFS 1999). Level 1 meetings and field trips (sometimes including Line

Officers) occurred on December 19, 2013, and January 28 and 31, 2014, and March 5, 2014. Comments and suggestions provided during these meetings by the Rogue Basin Level 1 Team were incorporated, to the extent practical, into the final proposed action. The combined Umpqua and Rogue Basin Level 1 Teams also held meetings on December 5 and 16, 2013 and on January 8 and 10, 2014 to discuss fire-related consultation and analysis because the Douglas Complex fire spanned two BLM Districts. As noted below, a summary overview of burn size and stand mortality for both the Roseburg and Medford BLM Districts is provided herein. However, this consultation is specific to the Medford District's proposed action. A separate consultation on proposed fire salvage activities on the Roseburg District of the BLM that are specific to affected lands designated as a Late-successional Reserve is being planned and will incorporate an environmental baseline that accounts for the Medford District's proposed Project as analyzed herein. The Medford District's proposed Project is located on lands designated as Matrix under the Northwest Forest Plan (NWFP) (USDA FS and USDI BLM 1994).

Overall, the proposed Project was refined in both scale and magnitude based on input from the Level 1 Team. Early Level 1 Team discussions considered up to 3,000 acres for potential timber salvage. Subsequently through Level 1 and the District's internal discussions, the proposed action eventually was modified to address timber salvage on approximately 1,600 acres as described in the Description of the Proposed Action section below.

DESCRIPTION OF THE PROPOSED ACTION

Project Location

The proposed Project encompasses 1,612 acres located west of Interstate 5 and north of the Rogue River in the Cow Upper and Rogue Middle section 7 watersheds, in Douglas and Josephine Counties, Oregon. The proposed action is planned within the Matrix land use allocation (LUA) of the NWFP. This LUA is designated for timber production and available for salvage harvest per the District's Resource Management Plan (USDI BLM Medford 1995).

Project Description

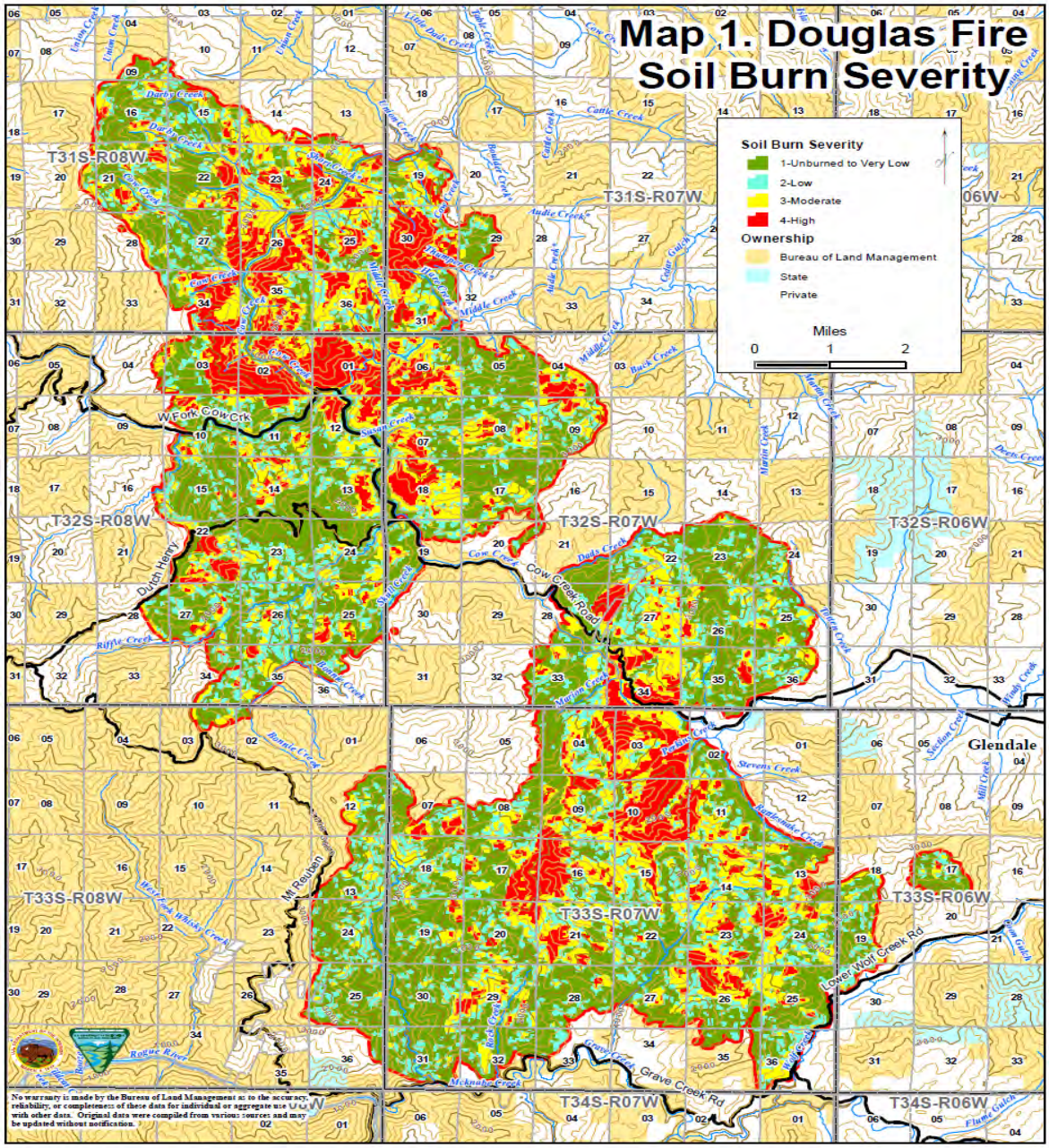
As noted above, the District's Assessment is incorporated herein by reference and the following discussion represents project description summaries. Please see the Assessment and/or Appendix A herein for full descriptions of proposed Project activities.

The Douglas Complex fires burned up to 48,671 acres across the checkerboard of Federal and non-Federal lands in this portion of southwest Oregon (Table 1 and Map 1). These fires burned with mixed severity, with most conifer mortality occurring on the mid-to- upper elevation of ridges, whereas the cooler lower elevations experienced lower burn severity. The areas of highest burn severity occurred within the Perkins Creek and Poorman Creek drainages on the Medford District of the BLM during the first four days of the fire. Approximately eight spotted owl sites are located in these drainages, and large reductions of spotted owl nesting, roosting, and foraging (NRF) habitat occurred within these home ranges as a result of the high severity burn.

Table 1. Burn severity acres for the 2013 Douglas Complex Fire across the Medford and Roseburg Districts of the BLM (FWS reference #01EOFW00-2014-F-0161) (portions of table are excerpted from the Assessment).

Douglas Fire Complex	High	Moderate	Low	Unburned to Very Low	Total
Total	7,483	10,060	9,668	21,460	48,671

Figure 1. Burn severity across the area likely to be affected by the proposed Medford Douglas Project. This figure is excerpted from the Assessment.



The Douglas Complex fire burned approximately 19,082 acres of the Medford District of the BLM, including lands designated under the NWFP as Matrix, Riparian Reserves and Known Spotted Owl Activity Center (KSOAC) LUAs. Over 70 percent of the burned area experienced low severity fire, resulting in more of a patchwork of green trees intermingled with single or group tree mortality and no salvage is planned on these lands on the District. Approximately 4,783 acres burned at moderate to high severity levels of intensity that resulted in the near total mortality of affected trees; these acres are the primary focus for the proposed salvage harvest. Of these acres, the District has identified up to 1,612 acres, or eight percent, of the burned area on the District for timber salvage to address economic recovery, roadside safety and fire planning objectives (Table 2). The proposed Project may decrease in size when further assessments are conducted for red tree voles, for botanical reasons, and to assess cultural sites and logging feasibility.

Table 2. Overview of salvage treatment acres within the proposed Medford Douglas Project (FWS reference #01EOFW00-2014-F-0161).

Assessment Category	Acres subtracted from treatment	Total acres
Total acres in the Douglas Complex Fire on the Medford and Roseburg Districts of the BLM		48,671
Total Medford BLM acres within the area of the Douglas Complex Fire		19,082
Total burned acres within the Matrix LUA on the Medford District		19,069
Low severity burned acres (not salvaged)	14,286	
Initial field reconnaissance estimate of high and moderate burned acres		4,783
Burned acres excluded due to low timber volume	681	
Burned acres excluded within high priority 0.5 mile spotted owl core areas	1,115	
Burned acres excluded from KSOAC	346	
Acres of Administratively Withdrawn lands	93	
Riparian Reserve Acres[2]	879	
Net Matrix acres available for salvage		**1,669**
Additional adjustments to Project Units Layer	57	
Final acres proposed for salvage		**1,612[1]**

[1]Includes approximately 26 acres proposed for landings and road/route construction.
2 Riparian acres are from the analysis of the District's Environmental Assessment, which is on file with the District.

District staff utilized aerial photo interpretation, crown scorch information and Burned Area Reflectance Classification (BARC) data to determine the preliminary Soil Burn Severity. Crown scorch is a measure of the proportion of foliage that has been killed by the fire, relative to the entire amount of foliage present before the burn (SWOFIDSC 2001). Using crown scorch alone (excluding cambium inspections) represents a conservative measure for determining post-fire mortality in trees with a high probability of dying within the next four years (SWOFIDSC 2001, SWOFIDSC 2014, Fowler and Seig 2004, Filip et al. 2007). BARC data rate fire impacts on soil productivity and erosion rate, and the potential for vegetation recovery. Burn severity maps display polygons representing four classes of burn severity: (1) high; (2) moderate; (3) low; and (4) unburned to very low. While the BARC data are not an exact match for vegetation mortality, high and moderate burn severity categories can be used to estimate the amount of vegetation mortality caused by a fire.

The District also conducted a cursory analysis of burn data using the Rapid Assessment of Vegetation Condition after Wildfire (RAVG), another common estimator of burn severity. In this case, the District found both higher and lower estimates for the various burn severities as compared to the BARC values and overall found RAVG to have fewer acres in the high and moderate burn classes. The District's use of a combination of evaluation methods, in particular the use of aerial photos, likely provides a reasonable estimation of burn severity (Assessment). The proposed salvage units are scattered across Medford District-managed lands within the fire perimeter. However, a relatively higher concentration of salvage is proposed within the Perkins and Poorman Creek drainages, where large areas of high severity burned acres are located (Figure 2).

As part of process of identifying potential Project units, the District, to the extent practicable, used the principles discussed in Recovery Action 10 of the Northern Spotted Owl Recovery Plan to further refine the placement of timber salvage units (USDI FWS 2011 and USDA FS/USDI BLM/USDI FWS 2013) and to minimize potential adverse impacts to spotted owls. Because the Douglas Complex fire overlaps a long-term spotted owl demographic study area (the Klamath Demography Study Area – KDSA), the District used spotted owl survey data to prioritize sites for protection based on known spotted owl occupancy and reproductive history. While this prioritization effort was conducted, unfortunately, some of the longest occupied and highest reproductive spotted owl sites were subject to high severity fire impacts. For that reason, some of the proposed timber salvage is located within these home ranges and analyzed herein.

Under the proposed Project, the District has identified up to 1,612 acres of timber harvest of which 638 acres are for economic recovery, 874 acres for both economic recovery and roadside safety planning, and 100 acres for roadside safety and fire planning. Each of these Project elements is further discussed below. Similar silvicultural prescriptions will be used for all of the proposed timber harvest activities, regardless of the different objectives. As described in the Project Design Criteria section below, the District's Resource Management Plan (RMP) (USDI BLM 1995) standards and guidelines for levels of coarse woody material and standing snags will be followed. Another District-stated goal of the proposed Project is to reduce the risk of stand mortality from insects and disease. Fire-injured trees are at a greater risk of damage or mortality from bark beetles or borers because these trees lack the ability or have a reduced ability to produce defensive compounds to resist attack. Insect populations are expected to increase in areas where salvage is not proposed, which could affect healthy green trees at sites adjacent to burned areas.

Salvage harvesting for economic recovery, roadside safety and fire planning is not planned within Riparian Reserves, mapped Late Successional Reserves, or KSOACs. Post-harvest, the District plans to replant forest stands with species suited to the natural plant communities, including drought resistant tree species.

Salvage for Economic Recovery

Economic recovery is the salvage (see Salvage Prescription below) of dead or dying trees on Matrix lands for economic value. This project is designed to meet BLM's Matrix/salvage direction to provide forest commodities and jobs to the local community (USDI BLM 1995). Fire-killed and damaged trees have reduced lumber quality and merchantable value. The District considers timely salvage crucial to capture remaining merchantable timber values before further deterioration occurs (see SWOFIDSC 2014). To facilitate removal of dead and dying trees, some incidental live trees may be felled and removed through yarding corridors, landings, and road/route construction and these activities are

accounted for in this Opinion. Under the proposed action, green tree removal would be minimized through PDC and the sale administrator approval process.

Salvage for Road Safety and Fire Planning

Roadside safety and fire planning objectives include the salvage (see Salvage Prescription below) of burned trees that compromise the safety of roads used by the BLM, the public, and forest workers. This safety concern has been raised by the Occupational Safety and Health Administration (Oregon OSHA) as a requirement that needs to be addressed as well as an issue that has been raised by other governmental organizations and private industrial timber companies, in particular with reciprocal rights-of-way. Fire-planning objectives include areas along approximately 14 miles of mainline roads and one mile of a key ridge within the fire perimeter that would be utilized for future fire suppression operational needs.

Hazard trees with likely failure potential within 1-10 years, based on a rating assigned by District staff (using guidance found in Toupin et al. 2008) would be targeted for potential removal under the proposed action.

Under the proposed action, the majority of the Roadside Safety/Fire Planning units overlap as much as 86 percent of the acres identified for economic recovery objectives (Assessment). The primary mainline roads and one key ridgeline are located in moderate and high severity burn areas that were selected to meet these objectives. Roadside salvage is planned in the following locations: within 1.5 times the existing tree height (as opposed to site potential tree height) below the road; within 2.5 times the existing tree height above roads on slopes greater than 35 percent; and within 1.5 times the existing tree height above roads on slopes less than 35 percent. As a result, these impacts are planned to be mostly confined in a linear and narrow fashion along the targeted roads and ridgeline; although, there will be cases where treatments will occur on both sides of switchback roads where the result will be more of a block configuration.

Salvage Prescription

Under the proposed action, the silvicultural prescriptions will be the same, regardless of the different objectives discussed above and will follow the Medford District's RMP Management Direction for Salvage in Matrix (USDI BLM 1995). Dead and dying trees to be harvested would be determined by analyzing the amount of crown scorch relative to the entire amount of foliage present before the burn (SWOFIDSC 2001) (see above). Only tree mortality above the level needed to meet snag retention and other habitat goals and provide desired levels of coarse woody debris would be harvested (see below).

Within stands that burned at moderate to high severity, fire-killed and fire-injured trees 8 inches DBH and greater that exhibit a high probability of mortality will be targeted for salvage. Targeted trees would be based on species-specific crown scorch amounts which would result in a 75 percent probability of mortality. Fire-killed hardwoods 8-16 inches DBH may be cut and removed for reforestation site preparation. Live or dead standing material (hardwoods and conifers) less than 8 inches DBH would be slashed and/or hand-pile burned where they impede establishment of conifers. Some slash piles will be retained for spotted owl prey species habitat. Generally, live trees > 8 inches dbh without a high probability of mortality would be retained. However, some live trees would need to be felled and extracted for landing construction, road/route construction, and road widening for suitable haul widths. Yarding-corridors will be sited to minimize impacts to unburned patches of live trees to

reduce the effects to unburned forest stands. All potential yarding corridors and green tree removal are factored into the effects to habitat for each unit as discussed below.

Post-fire stand-retained legacy structure, such as live green trees, standing dead and course woody debris, would generally be retained as aggregated residuals. Overstory fire-killed trees (as defined above) would be retained at a salvage unit average of two snags per acre of the largest available diameters within salvage units, which range from 1 to approximately 80 acres in size, with nearly half of the post-fire foraging (see below) units less than five acres. Large "wolf" trees (i.e., deformed trees with large diameters) or trees with heavy branching or poor form would be retained because they provide habitat for numerous wildlife species. Snags that exhibit a greater chance of remaining on the landscape and surviving future windstorms would also be targeted for retention, if safety considerations allow. Leave trees/snags are planned to be clustered in groups of three or more and these un-harvested clusters will occur within the unit to avoid felling of salvaged trees to meet federal and state safety laws.

Where naturally-occurring merchantable coarse woody debris exceeds 120 linear feet per acre, additional merchantable coarse woody debris may be removed as a commercial product, provided that a minimum of 280 linear feet of non-merchantable down woody debris would be retained per acre; where present, the total retention per unit would be 400 linear feet per acre on average. When stands are deficient in coarse woody debris (less than 120 feet of logs per acre that are greater than or equal to 16 inches in diameter and 16 feet long), merchantable material would be used to make up the deficit (USDI BLM 1995). This merchantable material would generally be left standing unless it needs to be felled for safety considerations.

Access Route and Landing Construction

The proposed action includes landing and road/route construction that would remove up to 26 acres of spotted owl habitat. Up to 10 of these acres are due to road and landing construction. This component of the Project is accounted for in the Project overview presented in Table 2.

Implementation Methods

The District proposes to use ground, cable, and/or helicopter-based extraction to harvest trees for salvage purposes. These inter-related activities are accounted for in this analysis.

Project Design Criteria

Project Design Criteria (PDC) associated with the proposed Project are defined as measures incorporated into the proposed action to minimize potential adverse effects to the spotted owl and its habitat (Assessment, Appendix A). The District uses PDC to the extent practicable in keeping with BLM policy and regulation. The Effects of the Action analysis in this Opinion relies on the full implementation of the PDC described below.
No treatments are proposed within any KSOACs.

No treatments are proposed in NWFP Riparian Reserves (USDA FS USDI BLM 1994) because spotted owls are likely to select habitats in areas of lower elevation and/or closer to perennial streams (Clark 2007).

If spotted owls are located during surveys at sites not included in this analysis, the District will review PDC and affirm (or not) that the effects analysis in this Opinion remains valid (see Project Monitoring below). If new information on spotted owl site occupancy becomes available, the District will affirm consistency of the new information with this Opinion and will reinitiate consultation or make modifications to the proposed action, as appropriate.

All existing coarse woody debris will be retained in proposed salvage units within 0.5 miles of high priority spotted owl core-use areas (see below), within spotted owl critical habitat, and within known Del Norte salamander-occupied areas. This PDC includes retention, where available, of a minimum of 4 dead/dying trees (snags) per acre for snags over 16 inches DBH that reflect the species mix of the original stand and emphasize retention of the largest snags available (USDI 1995). Large wolf trees or trees with heavy branching or poor form would also be retained. When stands are deficient in coarse woody debris (less than 120 feet of logs per acre for logs greater than or equal to 16 inches in diameter and 16 feet long), merchantable material would be used to make up the deficit (USDI 1995). Best available information indicates a positive relationship between spotted owl prey abundance and increases in the density of snags and downwood material (Courtney et al. 2004, Prey Section).

The proposed action will be restricted to outside of the spotted owl critical breeding season (March 1 – June 30) and/or occur beyond recommended disturbance distance thresholds (Assessment, Appendix A). Nesting spotted owls usually confine their activity to an area close to the nest, but once the young fledge, they move away from noise and activities that might cause adverse effects. Limiting activities associated with the proposed action until after the critical breeding period reduces potential adverse impacts to spotted owls from disturbance.

It is recommended that no NRF habitat removal will occur within 0.25 miles of any spotted owl site from March 1 through September 30, or until two (2) weeks after the fledging period, unless protocol surveys have determined spotted owls are not present, are non-nesting, or nesting has failed.

Project Monitoring

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

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

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

Consideration of the Revised Recovery Plan for the Northern Spotted Owl

Under the *Revised Recovery Plan for the Spotted Owl*, the conservation of occupied and high value spotted owl habitat is expected to be accomplished through implementation of Recovery Actions 10 and 32 on all lands containing such habitat (USDI FWS 2011, p. III-41). Recovery Action 12 is also applicable to this Project. The following description of these specific recovery actions is excerpted from the recovery plan.

Recovery Action 10:

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

The District used the concepts underpinning Recovery Action 10 (USDI FWS 2011 and USDA FS/USDI BLM 2013) to prioritize known spotted owl sites with relatively long-term continuous occupancy and high reproduction to inform project planning so as to minimize to the extent practicable, potential adverse effects to spotted owls from the proposed action. This resulted in the identification of up to 12 spotted owl sites as warranted for additional consideration for conservation measures (Assessment, Appendix C).

Recovery Action 12

"On lands where management is focused on the development of spotted owl habitat, post-fire activities should focus on the conservation and restoration of habitat elements that take a long time to develop (e.g., large trees, medium and large snags, downed wood). These areas should promote habitat elements to support spotted owls and their prey, including retention of large trees, snags, defective trees, and coarse woody debris."

The Project specifically identifies and retains habitat elements for spotted owls that persist for long periods on the landscape and take a long time to replace once removed. The largest snags and coarse woody debris will be targeted for retention and left in aggregates and are likely to provide both short and long-term benefits to spotted owl prey species and future benefits as spotted owl habitat.

Recovery Action 32:

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

The District has no salvage planned in stands that meet the characteristics of forest stands described under Recovery Action 32. Under the proposed Project, salvage is proposed in areas that burned at moderate to high severity and no longer have adequate numbers of habitat characteristics such as high canopy cover and multiple layers that are typically exhibited in Recovery Action 32-related stands. District staff will complete field evaluations to identify forest stands that meet the characteristics of Recovery Action 32-related stands (USDA/USDI 2010) in areas where green tree removal may occur. While attempts will be made to minimize potential yarding corridors and skid trails through Recovery Action 32 type of stands, the District estimates that up to two acres of this habitat may be affected.

DESCRIPTION OF THE ACTION AREA

The term "action area" is defined in the implementing regulations for section 7 at 50 CFR 402.02 as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action."

For the purposes of this analysis, the action area is defined as the Project site (i.e., salvage units defined under the Project) and adjacent lands that will be affected by project-generated, above ambient noise levels and the visual presence and noise generated by human use of the Project site and vehicular use of roads to and from the site. The boundaries of the action area cannot be precisely defined due to variation in the extent of noise and visual impacts beyond the Project site that are caused by the proposed action due to variation in topography, vegetation, and weather conditions. For the purposes of this analysis, spotted owl habitat composition and population distribution within 1.3 miles of the fire perimeter was used to characterize conditions in the action area. The 1.3-mile distance is based on the average home range size of spotted owls in the Oregon Klamath Province (see *Spotted Owl Resource Use and Selection*) and is a suitable scale to assess potential effects to known spotted owl activity centers from the proposed action. The District utilized multiple information sources and habitat data (Assessment, e.g., p. 21) to characterize spotted owl habitat within 1.3 miles of the Project site.

The action area is located within the Oregon Klamath Mountains Physiographic Province, an area characterized by Mediterranean climatic conditions and vegetative diversity resulting from steep gradients of elevation and dissected topography. These conditions support a highly diverse mix of forest communities such as Pacific Douglas-fir, Douglas-fir tanoak, and mixed evergreen forest interspersed with more xeric forest types. The prey base of spotted owls in the action area is diverse, but generally dominated by woodrats (*Neotoma sp.*) and northern flying squirrels (*Glaucomys sabirnus*) (Forsman et al. 2004). It is recognized that there is a high degree of variability in habitat used by spotted owls in the broader Klamath Province, including the Oregon portion of the province (see Courtney et al. 2004 and USDI FWS 2011).

District-managed lands with the Medford Douglas Post Fire action area occur in a checkerboard pattern of alternating one square mile sections of Federal (52 percent) and non-federal (48 percent) ownership. Adjacent private lands are generally managed for wood fiber production and relatively short harvest rotations of approximately 40 years. Atzet and Wheeler (1982) discuss fire as a key natural disturbance in the Klamath Province in southwestern Oregon and that decades of fire suppression have allowed natural stands to become overstocked, creating conditions that support large fire growth. Spotted owl habitat patterns in these drier portions of its range are not continuous, but occurred naturally in a mosaic pattern (USDI FWS 2011). Agee (1993, 2003) and Hessburg and Agee (2003) and Senseing et al. (2103) characterized the historical wildfire regime as low- to mixed-severity with fire return intervals of less than 10 to 50 or more years, depending on local conditions.

ANALYTICAL FRAMEWORK FOR THE JEOPARDY AND ADVERSE MODIFICATION DETERMINATIONS

Jeopardy Determination for the Spotted Owl

The analysis in the following sections relies on four components to support the jeopardy determination for the spotted owl: (1) the *Status of the Species*, which evaluates the spotted owl's range-wide condition, the factors responsible for that condition, and its survival and recovery needs; (2) the *Environmental Baseline*, which evaluates the condition of the spotted owl in the action area, the factors responsible for that condition, and the 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 the implementing regulations for section 7 and Service policy, the jeopardy determination is made in the following manner: the effects of the proposed Federal action are evaluated in the context of the aggregate effects of all factors that have contributed to the spotted owl's current status along with the effects of federal actions already consulted on, and, for non-Federal activities in the action area, those actions likely to affect the spotted owl in the future, 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 analysis in the following sections places an emphasis on consideration of the range-wide survival and recovery needs of the spotted owl and the relationship of the action area to the survival and recovery of the spotted owl at the range-wide and provincial scales 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 for Spotted Owl Critical Habitat

As noted above, this 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.

The following analysis relies on four components to support the adverse modification determination: (1) the *Status of Critical Habitat*, which evaluates the range-wide 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 range-wide 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 or retain the current ability for the PCEs to be functionally established in areas of currently unsuitable but capable habitat 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.

In accordance with Service policy and guidance, the adverse modification determination is made in the following manner: the effects of the proposed Federal action on spotted owl critical habitat are evaluated in the context of the aggregate effects of all factors that have contributed to the current status of the critical habitat at the provincial and range-wide scales and, for non-Federal activities in the action area, those actions likely to affect the critical habitat in the future, to determine if critical habitat at the range-wide scale would remain functional (or 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 with implementation of the proposed Federal action.

The following analysis places an emphasis on using the intended range-wide 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.

In the following sections the jeopardy analysis for the spotted owl is presented first, followed by the adverse modification analysis for spotted owl critical habitat. The CONCLUSION section is then presented that provides the section 7(a)(2) determinations based on each of these analyses.

RANGE-WIDE STATUS OF THE SPOTTED OWL

Because current range-wide survey data are insufficient to produce reliable range-wide estimates of the spotted owl's population size, demographic data are used to evaluate trends in 11 spotted owl study area populations, and these trends are used as a surrogate to inform a characterization of the range-wide status of the spotted owl. Analysis of demographic data can provide an estimate of the finite rate of population change [lamda] (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.

Two recent meta-analyses of spotted owl demographic data modeled rates of spotted owl population change for up to 24 years (Appendix B). One meta-analysis modeled demographic data for 11 long-term spotted owl study areas, while the other meta-analysis modeled eight study areas that are part of the effectiveness monitoring program of the NWFP (Forsman et al. 2011, pp. 65-67). Demographic data for seven of the eleven long-term study areas indicate strong evidence that spotted owl populations are declining; these seven study areas are the Rainier, Olympic, Cle Elum, Coast Range, HJ Andrews, Northwest California and Green Diamond (Forsman et al. 2011). Spotted owl populations were either stable or the precision of the demographic estimates was not sufficient to detect declines on the Tyee, Klamath, Southern Cascades, and Hoopa study areas. The Klamath study area overlaps the Medford Douglas action area.

In one of the meta-analyses, the weighted mean population change for all of the 11 spotted owl study areas indicates an average population decline of 2.9 percent per year from 1985 to 2006. This is a lower rate of decline than the 3.7 percent reported by Anthony et al. (2006, p. 23), but the rates are not directly comparable because Anthony et al. (2006) examined a different series of years and because two of the study areas in their analysis were discontinued and not included in Forsman et al. (2011, p. 65). Forsman et al. (2011, p. 65) explain that the indication that populations were declining was based on the fact that the 95 percent confidence intervals around the estimate of mean lambda for these 11 study area populations did not overlap 1.0 (stable) or barely included 1.0.

The result of the second meta-analysis, based on data reported for eight demographic monitoring areas (Cle Elum, Olympic, Coast Range, HJ Andrews, Tyee, Klamath, Southern Cascades and Northwest California), estimated a spotted owl population decline of 2.8 percent per year for (what period of time). Forsman et al. (2011) indicated that the number of declining spotted owl populations on study areas in Washington and northern Oregon, together with their rates of decline, are concerning for the long-term sustainability of northern spotted owl populations.

Range-wide habitat trends were reported by Davis et al. (2011), who estimated that spotted owl nesting and roosting habitat has declined by 3.4 percent (298,600 ac) range-wide on Federal lands since 1994. This rate is less than the anticipated rate of habitat loss under the NWFP of 5 percent per decade. Most of this habitat loss (79 percent) occurred within reserves and was the result of wildfires.

Threats to the Continued Existence of the Spotted Owl

The effects of extensive past habitat loss and degradation caused by timber harvest, past and ongoing effects of wildfires and the past and ongoing effects of barred owl competition are the primary factors influencing the current range-wide condition of the spotted owl. However, the recent best available information strongly indicates barred owls may be the most pressing threat (USDI FWS 2013).

Climate change is likely to further exacerbate some existing threats such as the effects of past habitat loss as a result of tree mortality caused by drought-related fires, insects and disease, and increases in extreme flooding, landslides and wind-throw events in the short-term (10 to 30 years). Although such effects appear to be likely, it is not yet possible to quantify how those environmental changes are likely to affect the spotted owl (USDI FWS 2011).

Survival and Recovery Needs of the Spotted Owl

The conservation of the spotted owl continues to depend on increasing the distribution and abundance of high quality nesting, roosting, and foraging habitat throughout its range and eliminating or reducing the adverse effects of the barred owl on the spotted owl.

Spotted Owl Revised Recovery Plan

The *Revised Recovery Plan for the Spotted Owl* identifies discrete recovery units throughout the entire range of the spotted owl. These recovery units are based on physiographic provinces defined by unique biological and physical factors that provide essential survival and recovery functions for the spotted owl. As discussed above, under Service national ESA section 7 policy, when a proposed Federal action is likely to impair or preclude the capacity of a recovery unit, defined in a final recovery plan, to provide for both the survival and recovery function assigned to that unit, that action may represent jeopardy to the species, provided the analysis describes not only how the action affects the recovery unit's conservation capability but also the relationship of the recovery unit to both the survival and recovery of the listed species as a whole (USDI FWS 2011, p. III-1). In this way, analysis of proposed project effects at the recovery unit scale helps inform the range-wide jeopardy analysis/determination at the range-wide scale for the listed species. The proposed Project is within the Oregon Klamath Mountains Province.

Recovery units are intended to assist land managers in re-establishing or maintaining: (1) historical or current genetic flow between spotted owl populations; (2) current and historic spotted owl population and habitat distribution; and (3) spotted owl meta-population dynamics. To accomplish this, the recovery plan recommends continued application of the reserve network established under the NWFP, and the restoration of more occupied and high-value spotted owl habitat, including increased conservation of habitat on some Federal "Matrix" lands (Service 2011, p. III-41). As noted above, under the *Revised Recovery Plan for the Spotted Owl*, the conservation of occupied and high value spotted owl habitat is expected to be accomplished through implementation of Recovery Actions 10 and 32 on all lands containing such habitat (USDI FWS 2011, p. III-41). These specific recovery actions were described above under the *Description of the Proposed Action* section.

Additional details on the range-wide status of the spotted owl, spotted owl population trends, and threats to the spotted owl's continued existence are provided in Appendix B and in the Service's *Revised Recovery Plan for the Spotted Owl*.

ENVIRONMENTAL BASELINE FOR THE SPOTTED OWL

The preamble to the implementing regulations for section 7 of the ESA provides good context for understanding the meaning of the term "Environmental Baseline." On page 19932 of the regulations (51 FR 19926), it states "In determining the "effects of the action," the Director first will evaluate the [rangewide] status of the species or critical habitat at issue. This will involve consideration of the present environment in which the species or critical habitat exists, as well as the environment that will exist when the action is completed, in terms of the totality of factors affecting the species or critical habitat. The evaluation will serve as the **baseline** [emphasis added] for determining the effects of the action on the species or critical habitat. The specific factors that form the environmental baseline are given in the definition of "effects of the action…"

Under the regulatory definition of "Effects of the action" at 50 CFR 402.02, it states: "…The environmental baseline **includes** [emphasis added] the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process." Use of the term "includes" referenced above acknowledges that the environmental baseline considers the present range-wide environment in which the species or critical habitat exists as well as the specific environmental conditions in the action area.

The discussion of Environmental Baseline below addresses the current condition of the spotted owl in the action area, the factors responsible for that condition, and the role of the action area in the survival and recovery of the spotted owl. The findings presented under the *Range-wide Status of the Spotted Owl* and the *Environmental Baseline for the Spotted Owl* sections of this Opinion provide essential context for interpreting the significance of any adverse or beneficial effects of the proposed action considered herein as well as for interpreting the significance of any adverse or beneficial cumulative effects reasonably certain to occur in the action area for this consultation.

Status of the Spotted Owl in the Oregon Klamath Mountains Province

The proposed Project is located within the Oregon Klamath Mountains physiographic province. Generally, the current conditions of forested stands in the province reflect past actions-both natural and anthropogenic disturbances and processes. The most influential of these actions include timber harvest and fire; the past century of fire suppression and previous forest management especially has shaped both landscape structure and condition. The Project area exhibits a broad spectrum of stand conditions including early seral plantations, dense young and mid-seral stands of advanced reproduction and natural stands of complex structure. These conditions support a highly diverse mix of forest communities such as Pacific Douglas-fir, Douglas-fir tanoak, and mixed evergreen forest interspersed with more xeric forest types. The prey base of spotted owls in the action area is diverse, but generally dominated by woodrats (*Neotoma sp.*) and northern flying squirrels (*Glaucomys sabirnus*) (Forsman et al. 2008). It is recognized that there is a high degree of variability in habitat used by spotted owls as described in research publications (see Courtney et al. 2004 and USDI FWS 2011) for the broader Klamath Province, including the Oregon portion of the province.

The Oregon Klamath Mountains Physiographic Province consists of approximately 884,300 acres of NRF habitat (Appendix B) (including the incorporation of the Douglas Complex fires), and extends from the southwest Oregon Coast east to the Cascade Range and south to the Oregon-California Border. Since 1994 there has been approximately 1.4 percent of the provincial NRF baseline affected by management and natural events associated with NWFP lands.

For purposes of this analysis, we are relying upon the results of demographic data analyses for the Klamath Demographic Study Area (KDSA) (Forsman et al. 2011, Davis et al. 2013 and Davis et al. 2014 Draft) to characterize the condition of the spotted owl population in the action area. We assume demographic data from the KDSA is likely representative of the spotted owl population condition because of its high overlap with the Medford Douglas action area. Those analyses show that in 2013, prior to the fire, that 48 of the 158 sites surveyed were occupied by spotted owl pairs. In recent years, there has been a steady decline in the number of non-juvenile spotted owls detected in the KDSA despite a relatively constant survey effort. The meta-analysis indicated that spotted owl survival was stable and the population trend was stationary with confidence intervals overlapping 1.0 on the KDSA

(Forsman et al. 2011).

In the LSRs that overlap the KDSA, spotted owl fecundity rates for LSR sites compared to non-LSR sites, both before and after the NWFP implementation, indicate similar trends (Davis et al. 2013). For example, there was a decrease in fecundity rates after NWFP implementation for both LSR (0.405 versus 0.292) and non-LSR (0.388 versus 0.304) sites. It is quite possible that any effect on the population due to habitat changes is masked by the presence of the barred owl.

Status of Spotted Owl Habitat within the Action Area

Douglas-fir (*Pseudotsuga menziesii*) is the primary over-story tree and represents the most common species throughout the action area inclusive of proposed harvest units. Like the Oregon Klamath Mountains Province in general, the project sites and adjacent lands in the action area are composed of a fragmented landscape of alternating sections of Federal and intensively managed private lands dominated by clearcuts and young, homogenous conifer plantations.

The action area is nearly an even mix of Federal Matrix lands and non-federal managed lands that occur in alternating sections. Pre-Douglas Complex fire, in general, spotted owl habitat in the action area consisted of a mosaic of late and mid-successional habitat on Federal lands interspersed with sections of early seral habitat on private lands.

According to the District's post-fire estimates, less than half of the action area is characterized as spotted owl NRF habitat with the majority of this habitat on Federal lands (Assessment) (Table 3). Total spotted owl habitat which includes both NRF and dispersal-only habitat accounts for approximately 47 percent of the action area. Evaluating dispersal habitat conditions for spotted owls is most meaningful at landscape scales, for example a township (Thomas et al. 1990) or fifth field or larger watershed scale, and this is further analyzed in the Effects section below. The 98,717-acre action area overlaps approximately 33,764 acres of spotted owl critical habitat of which 19,666 acres is considered NRF habitat, in subunits KLW 1 and KLW 2 (Table 3).

Under green tree conditions, radio-marked spotted owls selected old-growth and mature forests for foraging and roosting and used young forests less than predicted based on availability (Forsman et al. 1984, Carey et al. 1990, Thomas et al. 1990; Forsman et al. 2005, plus see *Spotted Owl Resource Selection* section herein). Landscape-level analyses suggest that a mosaic of late-successional habitat interspersed with other seral conditions may benefit spotted owls more than large, homogeneous expanses of older forests (Zabel et al. 2003, Franklin et al. 2000, Meyer et al. 1998, Olson et al. 2004). Glenn et al. (2004) studied spotted owls in young forests in western Oregon and while findings were variable across their two study areas, the authors found overall, spotted owls were closely associated with mature and old growth forests and the ecotones of broadleaf forests and other cover types.

Most spotted owls that inhabit the action area nest in drainages and on northerly aspects where it is likely that prior to fire suppression, these areas acted as refugia from frequent fire and may have been in a condition similar to today. While elevation and watershed position are somewhat general variables, finer scale variables like slope position, curvature, and distance to streams seem to correspond well with known spotted owl nest sites. For example, spotted owls in northern California select the lower third of slopes more than expected in proportion to their availability, used the middle third of slopes in proportion to their availability, and used the upper third of slopes less than expected for roosting and nesting (Blakesley et al. 1992). The spotted owl nest locations within the action area exhibit a similar

trend, and tend to occur lower on the slope. These are likely areas with more stable microclimates, and larger trees with more complex forest structure that spotted owls are selecting as nest sites. It may also be that these same areas historically acted as refugia from stand replacement fires, due to being near the bottom of the canyons and on north tending slopes that maintained spotted owl habitat over time.

As described in Appendix C and below, best available information suggests that even with loss of forest canopy cover and other key habitat components typically found in NRF habitat, burned areas can provide some habitat function for spotted owls depending on fire severity. For example, areas that burned at low severity in some cases still provided spotted owl nesting, roosting, and foraging function. Areas that were burned at moderate and high severity may provide some limited nesting and foraging depending on burn patch size, edge type, and proximity to known sites (Bond et al. 2002, Bond et al. 2009, Clark 2007, Clark et al. 2011, and Clark et al. 2013 plus other authors per Appendix C). During the District's post-fire habitat updates areas that were characterized as NRF habitat pre-fire and still had some structure present post fire were characterized herein as Post-Fire Foraging (PFF) Habitat. These areas generally burned at moderate and high severity and the Level 1Team's interpretation of the best available information suggests that most likely for the Medford Douglas circumstances, limited spotted owl foraging opportunities may still be available in these stands, albeit depending on scale and proximity factors mentioned above. Depending on the mosaic of the burn, if spotted owl nest sites and core-use areas are relatively intact and adjacent to moderate and high severity burned areas, spotted owls have shown some use of these burned areas. However, some research shows reduced occupancy and survival of spotted owls in these conditions in the short-term.

The primary prey of spotted owls in the Oregon Klamath Province is the dusky-footed woodrat (*Neotoma fuscipes*) and the northern flying squirrel (*Glaucomy sabrinus*). Forsman et al. (2004) and Ward (1990) found spotted owls in the Klamath Province (in Oregon and California) consumed woodrats at a rate of two to three times higher than most other areas within the range of the spotted owl. Woodrats comprised nearly one-third of the prey items in the diet and account for nearly half of the biomass. As a result, key features of woodrat habitat (typically brushy areas or younger forest stands) strongly influence how spotted owls use the available mosaic of habitat in the Klamath Province (Solis and Gutierrez 1990, Zabel et al. 1995 and Franklin et al. 2000). Where woodrats are the primary food source, spotted owls have home ranges that are significantly smaller and contain significantly more edge habitat and less older forest (Zabel et al. 1995, Carey et al. 1992) than other areas in the range of the spotted owl. As discussed in the Effects to Prey Species section below, burned areas provide some neutral to beneficial effects to spotted owl prey such as mice and woodrats; however, flying squirrels in high severity burn areas are likely negatively impacted.

Table 3. Spotted owl habitat, post-fire, occurring within 1.3 miles of the Medford Douglas Project Action Area (FWS reference #01EOFW00-2014-F-0161).

	ACRES	NSO NRF HABITAT ACRES (% TOTAL)	POST FIRE FORAGING[6] (% TOTAL)	CAPABLE[4] NSO HABITAT ACRES (% TOTAL)	RESERVED ACRES[1] (% OF TOTAL)	NON-RESERVED[3] ACRES (% OF TOTAL)	DISPERSAL [2,4] (NRF+Dispersal-Only) ACRES (% OF TOTAL)
OWNERSHIP							
All Ownerships	98,717	39,619 (40%)	3,327 (3%)	11,708 (12%)	9,837 (10%)	89,978 (91%)	46,124 (47%)
Non-Federal (Private, State)	47,480	11,059 (23%)	N/A[4]	N/A[4]	N/A[4]	N/A[4]	11,059 (23%)
Federal (BLM, USFS)	51,237	28,559 (56%)	3,327 (65%)	11,708 (23%)	9,837 (19%)	42,498 (83%)	35,604 (69%)

	ACRES	NSO NRF HABITAT ACRES (% TOTAL)	POST FIRE FORAGING[6] (% TOTAL)	CAPABLE[4] NSO HABITAT ACRES (% TOTAL)	RESERVED ACRES[1] (% OF TOTAL)	NON-RESERVED[3] ACRES (% OF TOTAL)	DISPERSAL [2,4] (NRF+Dispersal-Only) ACRES (% OF TOTAL)
LAND ALLOCATION - FEDERAL (*hierarchal, no acres double-counted*)							
Administratively Withdrawn Areas (Congressionally Reserved)	538	302 (56%)	0	173 (32%))	9,837 (100%)	0	354 (66%)
Late-Successional Reserves (mapped)	8,166	4,270 (52%)	9 (0.1%)	2,637 (32%)			5,248 (64%)
KSOAC in the Matrix	1,133	623 (55%)	328 (29%)	35 (3%)			769 (69%)
Matrix [3]	42,498	23,970	3,318	8,889	0	42,498 (100%)	29,443
Spotted Owl Critical Habitat							
Critical Habitat Unit	**Sub-unit**	**Acres[5]**	**NRF Habitat Acres**	**Post Fire Foraging Acres**	**Capable NSO Habitat Acres**	**RESERVED**	**NON-RESERVED**	**DISPERSAL**
KLW 9	**KLW1**	30,383	17,306 (57%)	1,406 (5%)	6,749 (22%)	6,195 (20%)	27,188 (89%)	21,554 (71%)
KLW 9	**KLW2**	3,381	2,360 (70%)	0	459 (14%)	3,103 (92%)	278 (8%)	2,774 (82%)

Notes: 1. Reserved = land allocation with no programmed timber harvest which includes Congressionally Reserved land, LSRs, Owl Cores and Wild and Scenic River Corridors. 2. Dispersal includes NRF habitat. 3. Non-reserved = Matrix/AMA includes Riparian Reserves (no Riparian Reserved layer is available). 4. Capable and dispersal-only acres are primarily calculated on federal lands only in this BLM layer (BLM used the same layer to be consistent with the BA data). Capable habitat is forest land that is currently not habitat but can become NRF or dispersal habitat in the future as trees mature and canopy closes. Dispersal only habitat at a minimum consists of stands with adequate tree size and canopy cover to provide protection from avian predators and at least minimal foraging opportunities. 5. Includes CH on state lands. 6. Post-Fire Foraging created from 2013 fires.
Please see the Assessment for more comprehensive definitions of some of these terms.

Known Spotted Owls within the Action Area

The action area overlaps the home ranges of 45 historic spotted owl sites on the Medford and adjacent Roseburg BLM Districts (Assessment, Appendix D). Forty-two of these sites occur within the KDSA whereas three sites are immediately adjacent to the KDSA. The District utilized the long-term annual survey history to determine whether the original or alternate nest locations would be analyzed in their Assessment to represent a territory and were able to make this determination based on the spotted owls being individually color marked (Assessment, page 23). The Service used the District determined site location and analyzed the corresponding 0.5 mile core-use area and home range scales for reasons articulated in the *Spotted Owl Resource Selection* section. Numerous barred owls have been detected across the action area in that barred owls have been detected in almost half of the known spotted owl sites (Davis et al. 2014, Draft).

Un-surveyed NRF habitat may provide sufficient habitat for spotted owls to occupy and this situation is analyzed in the Effects section below. Giving the benefit of the doubt to the spotted owl pursuant to national ESA section 7 policy where significant data gaps exist [see page 1-6 of the *Endangered Species Consultation Handbook* (USDI FWS/USDC NMFS 1998)], the Service concludes that this portion of the action area may support one spotted owl-occupied core use area.

Role of the Action Area in the Survival and Recovery of the Spotted Owl

As noted above, the action area is located within the Oregon Klamath Mountains Province, which serves as a Recovery Unit as identified in the final *Revised Recovery Plan for the Spotted Owl* (USDI FWS 2011, p. III-1). The Oregon Klamath Mountains Province provides a southward link to the California Klamath Province as well as connectivity easterly to the Oregon West Cascades Province. The intended function of this Recovery Unit, inclusive of the action area, is to support high quality spotted owl NRF and dispersal habitats. Many spotted owl home ranges across the District have relatively little habitat pre-fire (Assessment) and the Douglas Complex fire resulted in varied impacts to the habitat. For example, nearly half of the spotted owl sites had either no change and/or less than 10 percent change in NRF habitat at the home range scale. Some sites experienced between 11 and 49 percent change in habitat (Assessment, Table 9). However, several sites, in particular those sites associated with the Perkins and Poorman drainages, where the fire burned with the greatest intensity, experienced more than 50 percent habitat change (Figure 2).

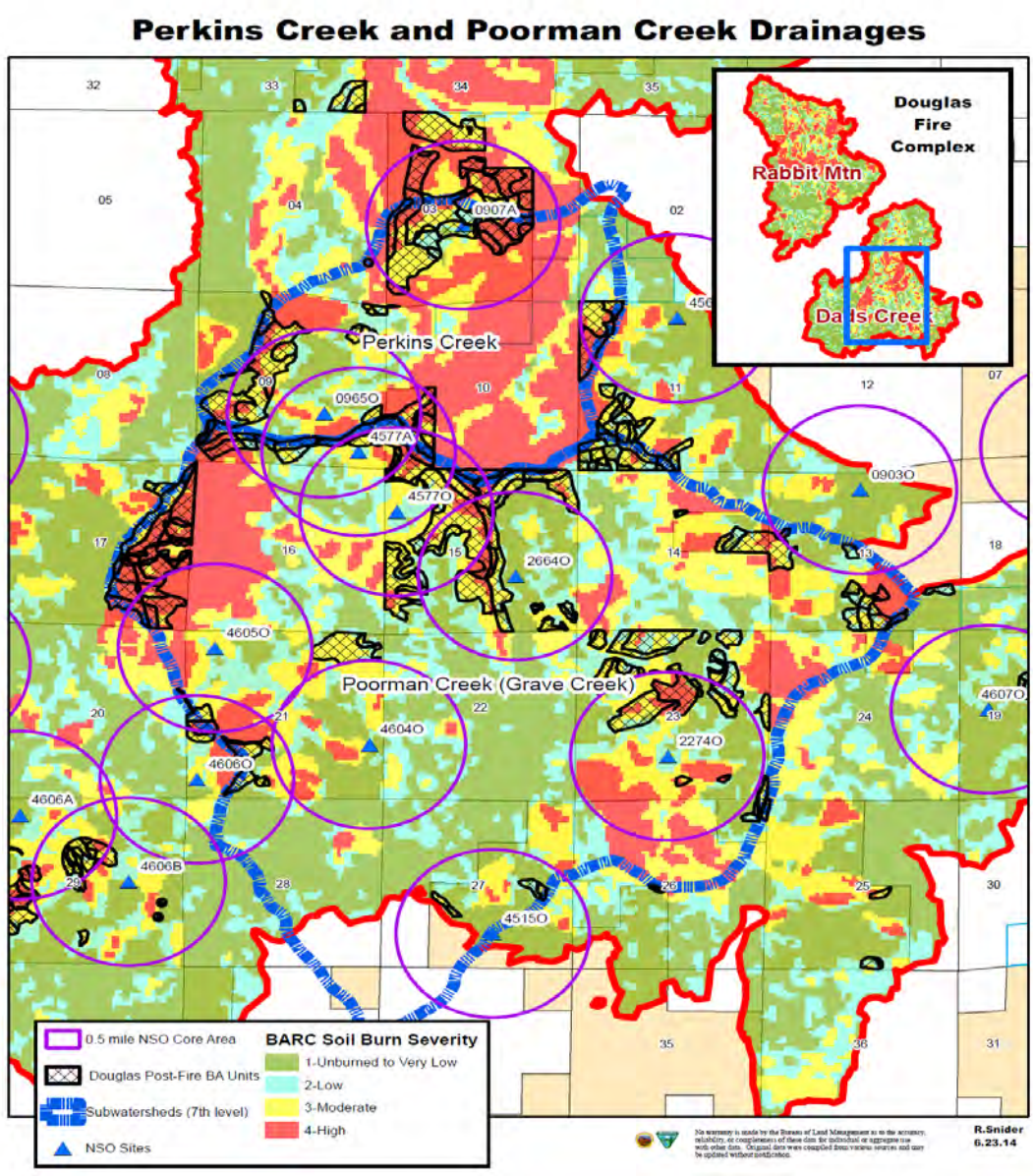
Northwest Forest Plan

The District manages its lands according to NWFP Standards and Guidelines, which were designed to address the conservation needs of the spotted owl. Under the conservation strategy set forth in the NWFP, the Federal forest lands containing the action area are intended to provide: (1) habitat blocks in LSRs for breeding spotted owls; and (2) sufficient habitat amounts and distributions in the Matrix/Adaptive Management Area (AMA) land use allocation (LUA) to facilitate spotted owl dispersal between LSRs. Under the NWFP, the Matrix LUA represents the area within "which most timber harvest and other silviculture activities will be conducted." Activities associated with the proposed action are planned to occur within the Matrix LUA. Approximately 9,837 acres of Reserved LUA (e.g., late-successional reserves [LSR] and individual 100 acre spotted owl reserves) (Table 3) are located within the action area; however, no activities associated with the proposed action are planned to occur within the Reserve LUAs.

Although some proportion of the spotted owls in the Matrix LUA and on private lands within and adjacent to the action area are likely to be nesting and rearing young, the NWFP conservation strategy for the spotted owl does not rely on these nesting pairs and this nesting habitat to maintain the spotted owl population on Federal lands. However, as noted above, in recognition of the declining status of the spotted owl, Recovery Action 10 of the *Revised Recovery Plan for the Spotted Owl* recommends conserving all spotted owl sites and high value spotted owl habitat to provide additional demographic support to the spotted owl population.

LSRs in and near the action area are intended to provide habitat blocks for a breeding population of spotted owls. In addition, a large area of Matrix/AMA is expected to continue to support nesting spotted owls and the overall species' population while additional spotted owl NRF habitat is developing within the LSR system because, as discussed above under the *Status of the Species* section (and Appendix B), the NWFP assumed that about 2.5 percent of the Matrix/AMA LUA would be subject to timber harvest per decade. In the first decade of the NWFP and a subsequent 15-year monitoring report (Davis et al. 2011) on NWFP implementation, consultation records show timber harvest in the Matrix/AMA LUA was consistent with (and lower than) that assumption. Although habitat for spotted owls to disperse between LSRs does not appear to be limiting (Davis et al. 2011), spotted owl occupancy data from local DSAs suggest reduced spotted owl demographic performance in LSRs and other LUAs likely due to the presence of barred owls (see below plus Davis et al. 2013).

Figure 2. Burn severity and proposed salvage units in the Perkins and Poorman Creeks area, Medford District BLM. Map provided by District.



SPOTTED OWL RESOURCE USE

This section is provided in advance of the *Effects of the Action on the Spotted Owl* section to provide some important contextual information that helps to inform that analysis.

Because complete range-wide population surveys for the spotted owl are not available, it is a well-established analytical approach to analyze the effects of proposed activities on the spotted owl based on the extent, duration, and timing of habitat-altering activities and how those alterations are likely to affect spotted owl nesting, roosting, foraging, and dispersal behavior based on known spatial and habitat use relationships exhibited by the spotted owl (see USDI BLM et al. 1994, Lehmkuhl and

Raphael 1993, Meyer et al. 1998, and Courtney et al. 2004). The anticipated amount of forest habitat likely to be used by spotted owls is based on the known range of habitat conditions used by spotted owls for nesting, roosting, and foraging (see Thomas et al. 1990 and Courtney et al. 2004). In addition, the basis for a finding that a proposed action is likely to significantly impair the breeding, feeding, sheltering and/or dispersal of affected spotted owls relies on the scientifically-recognized range of habitat conditions that are known to adequately provide for spotted owl life history requirements.

Spotted owls exhibit clear, consistent patterns of habitat association, and these patterns can provide the foundation for assessing the potential effects caused by land management activities. In the 1990 *Conservation Strategy for the Northern Spotted Owl,* the Interagency Scientific Committee (Thomas et al. 1990) stated that:

> "With the exception of recent studies in the coastal redwoods of California, all studies of habitat use suggest that old-growth forests are superior habitat for northern spotted owls. Throughout their range and across all seasons, spotted owls consistently concentrated their foraging and roosting in old-growth or mixed-age stands of mature and old-growth trees....Structural components that distinguish superior spotted owl habitat in Washington, Oregon, and northwestern California include: a multilayered, multispecies canopy dominated by large (>30 inches dbh) conifer overstory trees, and an understory of shade-tolerant conifers or hardwoods; a moderate to high (60-80 percent) canopy closure; substantial decadence in the form of large, live coniferous trees with deformities- such as cavities, broken tops, and dwarf mistletoe infections; numerous large snags; ground cover characterized by large accumulations of logs and other woody debris; and a canopy that is open enough to allow owls to fly within and beneath it."

Fifteen years later, the conclusions of the Interagency Scientific Committee were echoed in the *Scientific Evaluation of the Status of the Northern Spotted Owl* (Courtney et al. 2004), which found that the habitat attributes identified by Thomas et al. (1990) remain important components of spotted owl habitat. Notably, positive relationships were found with the aforementioned attributes whether the samples of spotted owl and random locations were within old-growth forest, non-old growth forest, National Parks, public land, or private land. In 2011, the *Revised Recovery Plan for the Northern Spotted Owl* (USDI FWS 2011) again reiterated the association of spotted owls with older forest conditions, stating: "Spotted owls generally rely on older forested habitats (Carroll and Johnson 2008) because such forests contain the structures and characteristics required for nesting, roosting, and foraging (NRF)."

Spotted Owl Spatial Use of Forest Landscapes

A major advance in our understanding of spotted owl habitat relationships from Thomas et al. (1990) to the present is that we now have a much better understanding of the spatial scale of habitat selection (see Hunter et al. 1995, Meyer et al. 1998, Zabel et al. 2003) and the relationships of habitat to spotted owl fitness (Franklin et al. 2000, Olson et al. 2004, Dugger et al. 2005). Generally, for management activities addressing territorial organisms is typically spatially explicit and such activities are applied to an area corresponding to the movements and activity patterns of the individuals of the organism occupying the territory(ies). Spotted owls are territorial raptors that range widely in search of prey but are 'anchored' during the breeding season to a nest site (Rosenberg and McKelvey 1999). That is, spotted owls are a central-place forager. Foraging close to the nest reduces travel time and energetic expenditures of adults and also increases the ability of the adults to remain nearby and protect their

young. Several studies have shown that spotted owls optimize selection of their nest sites to maximize the amount of older forest habitat close to the nest (see Ripple et al. 1991, Ripple et al. 1997, Swindle et al. 1999, and Perkins 2000) in addition to selecting habitat on a larger landscape basis (Ripple et al. 1997 and Swindle 1998). On that basis, evaluations of spotted owl spatial use of an area and habitat are most meaningfully conducted at two spatial scales: the home range and core-use area, recognizing that habitat selection at a larger home range scale is likely dependent on the smaller core-use area (see Johnson 1980 for hierarchy of habitat selection).

The home range is the "area traversed by the individual in its normal activities of food gathering, mating, and caring for young" (Burt 1943:351). Within home ranges, areas receiving concentrated use, typically surrounding the nest site and favored foraging areas, are called core areas (Bingham and Noon 1997). Establishing the exact spatial extent of a spotted owl's home range and core area based on relative use within a home range typically requires use of radio-telemetry. Because of the intensity and high cost of radio-telemetry, action agencies are not able to conduct this type of study for specific projects. Therefore, for the purposes of assessing a project's potential impacts to the spotted owl, the Service approximates circles of similar size to the provincial median home range and core-use area estimates of spotted owls (see home range estimates in Thomas et al. 1990 and reaffirmed in Courtney et al. 2004), centered on spotted owl nest sites or activity centers (see below).

There are numerous analytical techniques for estimating home range sizes based on animal locations (reviewed in Powell 2000). For estimating median annual home range size of spotted owl pairs in Oregon (and elsewhere in the spotted owl's range), the estimator typically used was the minimum convex polygon or MCP method (Thomas et al. 1990 and USDI FWS 1992a). Because the MCP estimates are generally large (as compared to other methods), they provide relatively conservative values on which to base the outer habitat-analysis area in that they include distant but likely important patches of habitat in such home ranges.

Resources such as food and breeding and resting sites can be patchily distributed in heterogeneous landscapes, such as those prevalent throughout the NWFP provinces. In such landscapes, animals are likely to disproportionately use areas that contain relatively high densities of important resources (Powell 2000), with concentrated use close to their nests. These disproportionately used areas are referred to as "core areas" (Bingham and Noon 1997). Thomas et al. (1990) found that amounts of suitable habitat within 0.7 miles (986 acres) of spotted owl activity centers were important to spotted owl life history functions, and that the amount of suitable habitat around nest sites was significantly greater than the amount of suitable spotted owl habitat in random circles. The findings of Thomas et al. (1990) illustrate the importance of the amount of suitable habitat within a spotted owl territory to support the life history requirements of the spotted owl. The results of subsequent studies (see below) have also indicated that a 0.5-mile radius circular area encompassing 500 acres around spotted owl activity centers is likely a more appropriate scale at which to evaluate the amounts of suitable habitat required by breeding spotted owls (USDI FWS 2009 and USDI FWS 2011 Appendix B). These studies relied on three primary sources of information to support the 500-acre core area size: (1) the distribution of locations of radio-telemetered spotted owls; (2) the territorial spacing patterns of spotted owls; and (3) the results of studies comparing relative habitat selection by spotted owls at different scales (see Appendix B Status of the Species, Habitat Use and Selection).

Based on best available information, we are utilizing the documented spotted owl spatial use patterns of home range and core-use areas to inform potential project effects to the species. However, because of the impracticality of conducting radio-telemetry on each individual owl potentially affected, the Service

uses circles as surrogates for approximating spotted owl home range and core–use areas to inform impacts to the species. It is recognized that spotted owls may adjust the shape of their home ranges to encompass as much older forest habitat as possible (Carey et al. 1992). As such, the use of circles may not correspond exactly with the areas used by spotted owls and may be more defined by other factors such as topographic features (e.g., drainages), abundance and availability of prey species, and the distribution and/or abundance of competitors and predators (Anthony and Wagner 1998 and Courtney et al. 2004). However, the practice of using circles has a biological basis (Lehmkuhl and Raphael 1993), and has been utilized by many researchers (Thomas et al. 1990, Ripple et al. 1991, Lehmkuhl and Raphael 1993, Ripple et al. 1997, Swindle et al. 1999, Perkins 2000, Franklin et al. 2000, Olson et al. 2004, Dugger et al. 2005, and see summary in Courtney et al. 2004) by providing a uniform method for quantifying (comparing/contrasting) spotted owl habitat. Use of circles, as opposed to other shapes (i.e., square, rectangles, etc) imposes no bias on what is included or excluded for analysis. The use of circles also seems appropriate for species, like the spotted owl, characterized as a "central place species" and provides a simple unbiased measure of habitat availability at multiple ecologically-relevant scales surrounding spotted owl sites. The use of circles, as described herein that correspond to MCP estimates (and used interchangeably) should be large enough to include habitat to meet all major life history needs and include areas important to both members of most pairs.

Based on the median MCP home range estimate for spotted owl pairs, the following estimates by NWFP Province will help inform a spotted owl spatial analysis for Oregon: Coast Ranges Province = 4,524 acres or a circle with a 1.5-mile radius; West Cascades Province = 2,895 acres or a circle with a 1.2-mile radius; and the Klamath Province = 3,398 acres or a circle with a 1.3- mile radius. Within a home range, the smaller core-use area estimate of 500 acres or a circle with a 0.5 mile radius will inform the spotted owl core-use area analysis for each of the aforementioned provinces (Thomas et al. 1990, USDI FWS 1992a, Carey et al. 1992, Anthony and Wagner 1998, Irwin et al. 2000, Courtney et al. 2004, Glenn et al. 2004 and USDI FWS 2011a). For purposes of this analysis, the core-use/home range area circle(s) will be centered on a spotted owl activity center that represents the area that spotted owls are likely to use for nesting and foraging in any given year. In situations where there is local information available on home range and core-use areas, those estimates should be given consideration for use.

Habitat Availability in Spotted Owl Core Areas and Home Ranges

Best available information indicates that spotted owl sites that are occupied over the long-term are positively associated with mosaics of forest habitat at the provincial core-use area and home range scales that are capable of providing the resources necessary to meet the essential life functions of individual spotted owls.

Core Area

Recently developed habitat-fitness (see below) and landscape models and other publications have demonstrated the validity of the core-use area and the importance of having sufficient amounts of NRF habitat within spotted owl core areas to adequately provide for spotted owl survival and reproduction, and access to prey (Franklin et al. 2000, Olson et al. 2004, Dugger et al. 2005, Zabel et al. 2003). Best available information to date indicates that spotted owl survival and fitness are positively correlated with large patch sizes of older forest or large forest patches containing a high proportion of older forest (Franklin et al. 2000, Olson et al. 2004 and Dugger et al. 2005). Habitat-based fitness, or habitat fitness potential (HFP), is the "fitness conferred on an individual occupying a territory of certain habitat

characteristics" (Franklin et al. 2000). HFP is function of both the survival and reproduction of individuals within a given territory. For example, the data sets analyzed by Franklin et al. (2000) were re-analyzed to evaluate the relationship between HFP and the simple proportion of older forest within spotted owl core areas. The results of that analysis (USFWS Service 2007, Appendix D), indicate a quadratic relationship between spotted owl HFP and older forest conditions, with optimum HFP occurring when 53 percent of the estimated core area consisted of older forest (Franklin et al. 2000). More than half (55 percent) of the high-quality (with a HFP greater than 1) spotted owl territories had core areas comprised of 50 to 65 percent older forest. In a similar study in southern Oregon, Dugger et al. (2005) found that spotted owl HFP was positively related to the proportion of older forest in the core area, although the strength of the relationship decreases with increased proportions. Roughly 72 percent of core areas with a HFP greater than 1.0 had more than 50 percent older forest; whereas core areas with a HFP of less than 1.0 never contained more than 50 percent older forest.

Collectively, researchers (Hunter et al. 1995, Ripple et al. 1997, Gutiérrez et al.. 1998, Meyer et al. 1998, Franklin et al. 2000 and Dugger et al. 2005) have reported a wide range (ca. 35 to 60 percent) of mean proportions of older forest at the core area scale around spotted owl nests in southwest Oregon and northwest California. It is difficult to assess how much of this variation was due to differences in ecological setting, spatial scale, habitat classification, and individual variation among owls. Nonetheless, the central tendency of these results was roughly 50-60 percent older forest habitat within spotted owl core areas. The best available information suggests that older forest is more likely than other vegetation classes to provide the spotted owl with suitable structures for perching and nesting, a stable, moderate microclimate at nest and roost sites, and visual screening from both predators and prey.

Annual Home Range

Bart (1995) evaluated the suggestion in the 1992 draft recovery plan for the spotted owl (USDI FWS 1992a) that at least 40 percent of the estimated home range be retained as suitable habitat. Using demographic data from throughout the spotted owl's range, including Oregon, Bart (1995) calculated that spotted owl populations are stable when the average proportion of NRF habitat in the home range is 30 to 50 percent. Olson et al. (2004) found for their Oregon Coast Ranges study area that mid and late-seral forest is important to spotted owls, but also found that a mixture of these forests with early seral forest improved spotted owl productivity and survival. Spotted owl demography and the presence of spotted owls appear to be positively associated with an intermediate amount of horizontal heterogeneity in forest habitat at the home range scale (Schilling et al. 2013); findings reported in more recent papers (see USDI FWS 2009) have been consistent with those of Bart (1995).

Site Occupancy

Habitat-based assessments have been used in various studies to estimate the presence (occupancy) of breeding spotted owls; these tools are important for evaluating the species-habitat relationships. Bart (1995) reported that occupied spotted owl core areas contained at least 30 to 50 percent mature and old growth forest and spotted owl demographic performance, particularly occupancy, increases with increasing amounts of NRF habitat in the core area. Meyer et al. (1998) examined landscape indices associated with spotted owl sites versus random plots on BLM lands throughout Oregon. Across provinces, landscape indices highly correlated with the probability of spotted owl occupancy included the percent of older forest (approximately 30 percent) within the 500 acres (analogous to a core area) surrounding the site (and this predictive value decreased with increasing distance) and that territory

occupancy decreased following the harvest of NRF habitat in the vicinity of the affected core area. Zabel et al. (2003) found for their northwest California study area that the highest probability of spotted owl occupancy occurred when the core area is comprised of 69 percent nesting/roosting habitat. Stepping up to the larger home range scale, Thomas et al. (1990), Bart and Forsman (1992), Bart (1995), Olson et al. 2004, and Dugger et al. (2005) suggest that when spotted owl home ranges are comprised of less than 40 to 60 percent NRF habitat, they were more likely to have lower occupancy and fitness.

The Service recognizes that many different combinations of forest habitat structure and amount at various spatial scales may support viable spotted owl territories sufficient for the survival and reproduction of individual owls. Despite consistent patterns of habitat selection by spotted owls, structural conditions of forest habitats occupied by spotted owls are highly variable. However, overall, the best available information suggests that: (1) the probability of spotted owls occupying a given patch of forest habitat is increased when core areas contain a range of forest habitat conditions that support the essential life history requirements of individual spotted owls; and (2) the survival and fitness of spotted owls are positively correlated with larger patch sizes of older forest or larger patches of forest habitat with a high proportion of older forest (Franklin et al. 2000, Olson et al. 2005 and Dugger et al. 2005).

Dispersal Habitat

As for dispersal habitat considerations, the effects analysis for the spotted owl in this Opinion is informed at a landscape scale, as suggested by Thomas et al. (1990) along with Lint et al. (2005) and Davis et al. (2011). Typical dispersal-only habitat is characterize as forest stands less than 80 years old, of simple structure, and providing some foraging structure and prey base for spotted owls as they disperse across the landscape. Dispersal habitat not only includes the forests as previously described but also forests greater than 80 years old which provides better dispersal conditions due to stand structure and available prey. An assessment of dispersal habitat condition was recommended on the quarter-township scale by Thomas et al. (1990); the Service has subsequently used a fifth field or larger landscapes for assessing dispersal habitat conditions because watersheds or provinces offer a more biological meaningful way to conduct the analysis.

EFFECTS OF THE ACTION ON THE SPOTTED OWL

Analytical Approach

The effects analysis in this Opinion differs, to some extent, from analyses typically conducted by the Service under formal consultation to evaluate the effects of green tree timber harvest on the spotted owl largely due to the differences in how spotted owls use a landscape the first several years after a wildfire. For the purposes of this analysis, we are relying on general observed habitat use patterns by spotted owls reported in the literature to base our assessment of the likely effects of post-fire management activities proposed herein (such as salvage, fuels reduction, or hazard tree removal) on spotted owls, given our understanding of their use of burned landscapes. Our evaluation is consistent with the high degree of variability in habitat used by spotted owls and associated range of stand conditions frequently used by spotted owls post-fire (see the Spotted Owl Resource Use section above and Appendix C, Effects of Wildfire on the Northern Spotted Owl and its Habitat).

Specific terms are used herein to categorize the estimated degree of change (potential effect) to spotted owl habitat elements that may or are likely to be caused by the proposed Project. For example, the term *treat and maintain* indicates that changes in affected spotted owl habitat may be neutral or beneficial to habitat function even though the habitat element may be modified because the manner of the change retains habitat structure that supports spotted owl life history requirements. The term *remove* or *downgrade* signifies that the proposed treatments may have a negative influence on the quality of affected spotted owl habitat by removing or reducing habitat elements that support spotted owl life history requirements. Determination of the significance of changes to spotted owl habitat likely to be caused by proposed activities, and whether these changes are likely to adversely affect spotted owls or their critical habitat, must also be based on an analysis of site conditions, type of treatment(s), and the scale of dependent factors (e.g., nesting, foraging, or dispersal).

Post-fire Occupancy of Known Spotted Owl Activity Centers

Because post-fire habitat conditions used by spotted owls that are evaluated in the literature were highly variable, not adequately described, and not directly comparable to one another, these studies cannot be used to determine a single threshold value for determining post-fire occupancy by spotted owls of affected stands. For those reasons, this analysis of spotted owl use of a post-fire landscape relies on professional judgment and interpretation of best available information, including pre- and post-fire habitat conditions in the action area, data in the literature on spotted owl habitat use and occupancy following both fire and post-fire forest management practices, and other site-specific information cited below. In addition to pre- and post-fire habitat conditions, abiotic factors such as distance to streams, slope position, elevation, and aspect also influence site selection by spotted owls (Forsman et al. 1984, Irwin et al. 2007, USDI 2009). Site fidelity, or continued use of an area over time, is also considered in determining spotted owl use of burned areas that were previously used (Bond et al. 2009, Clark 2007, Lee et al. 2012). For example, Bond et al. (2002) quantified post-fire site fidelity of all three recognized subspecies of the spotted owl and found that 16 of 18 banded owls re-sighted after a fire were at the same sites where they bred previously; these rates were the same as those at unburned sites. On average, however, only a third of the spotted owl-utilized habitat burned at high severity in the study conducted by Bond et al. (2002), which likely minimized the effects of the fire on spotted owl occupancy compared to sites where a greater proportion of the habitat burned. Clark et al. (2013) found approximately a 64 percent reduction in spotted owl site occupancy following a wildfire whereas the unburned portion of his study area had roughly a 25 percent reduction in spotted owl use during the same time period. A similar pattern was reported by Gains et al. (1997), who found a statistically significant association between the amount of unburned spotted owl habitat within core-use areas and their occupancy status, with extensively burned areas being unoccupied by spotted owls and larger unburned areas being occupied by reproductive pairs on the Hatchery Complex fire in eastern Washington.

Several radio-telemetry studies reported a positive correlation between higher amounts of suitable habitat remaining post-fire and the probability of post-fire site occupancy by spotted owls (Bond et al. 2009, Clark 2007, Gaines et al. 1997). Areas that were not spotted owl habitat pre-fire, such as brush fields or meadows, were not used to a greater extent post-fire and are not expected to contribute to spotted owl territory occupancy (Clark 2007). The amount and condition of spotted owl nesting and roosting habitat following fires is therefore the most powerful predictor of the probability of spotted owl occupancy and nesting in a post-fire landscape. Spotted owl territories with large amounts of non-habitat will likely not support spotted owl occupancy in post-fire landscapes where suitable habitat was burned (Clark 2007).

Where spotted owl activity centers are affected by fire (any range of severities) but sufficient habitat remains in the home range and immediately adjacent area, site fidelity may cause spotted owls to increase the size of their home ranges or ***shift*** locations to encompass the best available habitats rather than vacate the burned site (King et al. 1998, Clark 2007, Clark et al. 2011, 2013). Thus, a shift by spotted owls may occur under conditions where the burned area is presumably still functional in terms of extant spotted owl habitat and the affected area is considered to be occupied. This shift is likely to occur within the pre-fire home range of the affected spotted owl(s).

When high-severity fire affects a significant portion of suitable spotted owl habitat in the core-use area and home range, available literature suggests that such affected activity centers may no longer be functional and the spotted owls were either killed during the fire, have move significantly, or perished soon after the fire (Clark 2007, Gaines et al. 1997, King et al. 1998). In some instances, spotted owls have been observed temporarily returning to their pre-fire territories, though the territory no longer contained sufficient habitat to support spotted owl occupancy into the future (Clark 2007). In these cases, spotted owl site fidelity was over ridden by the lack of suitable habitat remaining within the historic use area. For these reasons, ***loss*** of affected spotted owl activity centers is likely to occur when fire renders suitable habitat to be no longer functional due to habitat alteration caused by high-severity fire, and there is insufficient spotted owl habitat immediately nearby to allow the affected spotted owls to shift their foraging, nesting, and sheltering activities. Such an affected activity center would be considered unoccupied for purposes of this analysis and may not be functional to support spotted owls for several decades. It is important to recognize that salvage in burned but functional spotted owl habitat may exacerbate the reduced habitat value following fire and result in losses of spotted owl activity centers where shifts might have otherwise occurred (Appendix C).

As mentioned above, best available information suggests that a single threshold value for determining post-fire occupancy of burned areas by spotted owls is difficult to ascertain. To help inform decisions on what post-fire habitat conditions are likely to support occupied spotted owl core-use areas, the pre-fire habitat conditions of spotted owl sites that have been surveyed over the long-term on the KDSA were evaluated. This evaluation found that nearly all of the core-use areas had 20 percent or greater habitat across all lands. Therefore, the possibility of spotted owl occupancy of sites with less than 20 percent core-use area habitat was unlikely. In general, for this consultation, if the post-fire condition of remaining unburned NRF is well below this percentage, this may represent a ***loss*** of the site. Salvage harvesting is likely to reduce potential site occupancy and will factor into the evaluation as well as other site- specific circumstances including the type, amount and spatial location of burn severity. The amount of habitat mentioned here is less than and should not be view as the amount of habitat that informs the habitat-fitness evaluation of spotted owls as discussed below. It is recognized that spotted owls will occupy landscapes with habitat less (Medford District unpublished data) than best available suggests for spotted owl survival and reproduction.

Post-Fire Habitat Use by Spotted Owls

Areas selected by spotted owls for nesting and roosting in post-fire landscapes generally reflect either no fire impacts or low- to moderate- severity fire impacts (Bond et al. 2009, Clark 2007, Clark et al. 20011 and 2013, King 1998). Key features of spotted owl habitat such as high canopy cover, large trees, and multiple-layered canopies may be negatively impacted in the short-term and/or remain largely intact and are seemingly functional for spotted owls following low to moderate severity fires. These burn severities typically do not entirely consume or largely alter snags and coarse woody debris

used by spotted owl prey. Contrastingly, high-severity burned areas are generally not used by spotted owls for nesting or roosting (Bond et al. 2009, Clark 2007, Clark et al. 20011 and 2013, King 1998) presumably because the live canopy is essentially consumed in the fire. Although severely burned areas are known to be used by spotted owls to a limited extent for foraging, observations indicate that, under these circumstances, spotted owls select the edges near less severely burned areas and avoid large, contiguous patches of high severity fire disturbance. It has also been reported that spotted owls may use small patches of habitat subject to high severity fire that are surrounded by suitable habitat subject to low-to-moderate severity fire impacts (Clark 2007 and Comfort 2014). Diffuse edges are likely to be good habitat for supporting spotted owl prey species (Bond 2009, Clark 2007 and Sakai and Noon 1993). Based on the discussion above, the term "Post-fire Foraging" (PFF) habitat characterizes suitable spotted owl habitat based on local conditions that may still provide some limited foraging function. While these burn areas may not meet the standard definitions of spotted owl foraging habitat, nonetheless, spotted owl use of these burned areas has been documented (Clark 2007 and Comfort 2014, Appendix C). As described herein, several landscape-scale studies of spotted owls have suggested that a mosaic of suitable habitat, albeit in a green tree environment, may confer some benefits to spotted owls, in particular those landscapes with a mix of late and early seral forest where edge habitat is available. Edge ecotone benefits likely include increased prey availability and increased spotted owl reproduction. In a post-fire environment, early seral habitat/ecotones and associated prey are likely to occur as well. It is likely that these relationships are somewhat similar (pre and post-fire) but salvage harvest likely diminishes this value to some degree because of the loss of stand structure.

The use of burned landscapes by spotted owls may depend both on fire severity and the distance of burn impacts from the activity center (Bond 2009, Clark 2007, Clark et al. 2001 and 2013). Because spotted owls exhibit site fidelity and are central-place foragers (Rosenberg and McKelvey 1999), spotted owls may continue to use the post-fire landscape depending on remaining post-fire habitat conditions (i.e., sufficient habitat) (Clark 2007, Clark et al. 2011 and 2013, Gaines et al. 1997 and King et al. 1998).

The amount, arrangement and connectivity of suitable habitat remaining post-fire may influence how spotted owls use that habitat. For example, the amount of remaining suitable habitat within a core-use area was correlated with the breeding and occupancy status of spotted owls (Gaines et al. 1997). Although there may be lags in the response by spotted owls, reductions in carry capacity and habitat connectivity could affect the persistence of the affected spotted owl population (Anderson and Mahato 1995, Lamberson et al. 1992 and 1994). Fires close to the nest or in heavily-used foraging areas probably have greater negative impacts than fires in less used portions of the home range (Jenness et al. 2004). In general, recent studies suggest a negative influence of high severity wildfire on affected spotted owl site occupancy and survival, though these results may be compounded by prior forest management or post-fire management activities (Bond et al. 2002, Clark et al. 2011, Clark et al. 2013, Jenness et al. 2004, Lee et al. 2012 and Roberts et al. 2011). It should be noted that results from some of these observational studies suffer from small sample size and study duration; therefore, inferences are somewhat limited. As described above, spotted owls may shift their habitat use patterns and/or increase their home range size to encompass the best available suitable habitat post-fire rather than vacate the affected site, unless very poor habitat conditions exist over much of their home range (King et al. 1998, Clark 2007). For the purposes of the Affects analysis contained herein, spotted owl NRF habitat that burned at moderate to high severity, in this case PFF habitat is considered to contribute , to what degree is unclear, toward habitat-fitness of spotted owls in the short-term. While the role of this burned habitat is unclear in overall spotted owl population maintenance, available information suggests that in the short-term this habitat, in particular when it is salvage logged, likely contributes to reductions in spotted owl survival and occupancy. Therefore in giving conservation deference to the

species, in the Effects to Spotted Owls section below, that in addition to green tree harvest, the removal of PFF in any significant amount in relationship to the spatial scale and other factors discussed herein may warrant an adverse effect determination.

Adverse Effects to Spotted Owl Habitat caused by the Project

Approximately 46,000 plus acres is characterized as spotted owl habitat (NRF plus dispersal only habitat) on Medford District BLM lands across the action area (Tables 3 and 4). Of those, the District proposes 1,612 acres of harvest activities, of which, the primary action affecting spotted owls will be the removal or downgrade of up to 34 acres of NRF habitat and 1,285 acres of PFF habitat (Table 4). As described below, spotted owl habitat (NRF and dispersal-only) with a treat and maintain prescription or dispersal removal is not expected to adversely affect spotted owls. As discussed in this Opinion, the PDC and spatial extent of the proposed action is likely offset to some degree these impacts.

Table 4. Amount of spotted owl habitat (acres) likely to be impacted by the proposed Medford Douglas Project on the BLM Medford District (see Table 3 for habitat definitions; Table copied from Assessment and partially modified) (FWS reference #01EOFW00-2014-F-0161).

	NRF Remove	NRF Downgrade	NRF T&M	PFF Remove	Dispersal-Only Remove	Dispersal-Only T&M	Capable Treated	Total Acres
Action Area Baseline of Habitat on Medford BLM lands	***28,559***			***3,327***	***46,124 (NRF+Dispersal Only)***		***11,708***	***61,159 (excludes non-habitat)***
Economic Recovery	13	13	8	498	5	0	101	**638**
Safety/Fire Planning	0	0	9	87	0	0	4	**100**
Economic Recovery and Safety/Fire Planning combined	0	8	42	700	0	4	120	**874**
TOTAL	**13**	**21**	**59**	**1,285**	**5**	**4**	**225**	**1,612**
% Change to Action Area Baseline Habitat	**-0.03**	**-0.05**	**0**	**-39**	**-0.01**	**0**	**0**	**2**

Adverse effects to spotted owl habitat are likely to occur by removing and downgrading NRF habitat and removing PFF habitat. These adverse impacts are caused by Project removal of key habitat elements such as large diameter trees (generally greater than 16 inches DBH) (R. Snider pers. comm. June 2014) that may have potential nesting structure and the associated reduction in canopy cover and the loss of multiple canopy layers that provide concealment cover, foraging perches, and suitable microclimate conditions for spotted owls. Some spotted owl foraging opportunities are likely to be reduced due to the removal of PFF which may diminish spotted owl habitat-fitness because of reductions in spotted owl prey (see below) along with spotted owls having to travel greater distances for prey due to post-fire habitat conditions and salvage harvest (Clark 2007). The greater distance traveled would most likely occur during the breeding season (central place foraging as described above) and result in foraging well beyond the size of the normal core use area size. As a result spotted owl reproduction could be affected, the physical health likely impacted, such as emaciation, then likely site abandonment or reduced survival.

No adverse effects to spotted owl NRF and Dispersal-only habitat are likely to be caused by Project activities with "treat and maintain" prescriptions. As described above, key habitat elements (e.g., basal area, overstory canopy cover [i.e., 60 and 40 percent for NRF and Dispersal-only], downwood components, etc.) are expected to function post-treatment similarly to the pre-treatment condition. Therefore, spotted owl life history functions are not anticipated to be altered due to this activity except for disturbance during timber harvest operations (though see Disturbance section below).

Similarly, no adverse effects are likely to be caused by Project removal of 39 acres of spotted owl dispersal quality habitat (NRF plus dispersal only) (Table 4). Spotted owl dispersal function is generally considered to be best approximated through an evaluation of landscape condition in which habitat connectivity is evaluated (Thomas et al. 1990, Lint et al.2005 and Davis et al. 2011). The role of PFF in spotted owl dispersal is not unclear (but likely not contributing significantly to dispersal) due to the loss of canopy cover to less than 40 percent (see Thomas et al. 1990 for canopy cover discussion) and resulting in reduced concealment cover. To be conservative, the Service anticipates that PFF could be used to some degree for dispersal. However, forest landscapes traversed by dispersing spotted owls typically include a mosaic of clear-cuts, non-forested area, and a variety of forest age classes (Forsman et al. 2002). Post-fire, including salvage harvest of the proposed action, over 70 percent of the action area (calculated per Table 4) is anticipated to be comprised of dispersal quality habitat. In the Service's view, the removal of 39 acres of "dispersal plus habitat" is minor and along with the removal of PFF habitat is not anticipated to reduce the capability of spotted owls from moving across the landscape in the action area.

Note: The District has determined that the proposed removal of 225 acres of unsuitable, but capable, spotted owl habitat (see habitat definition in the *Environmental Baseline* section, Table 3) in the action area will not affect the spotted owl. The District plans to implement their snag and downwood standards in capable habitat.

Adverse Effects to Spotted Owls caused by the Project

The Service has relied upon the results of multiple studies (see *Spotted Owl Resource Use* section above and Appendices B and C) to inform our evaluation of anticipated effects of the proposed Project on the spotted owl and to develop the conditions provided below. In addition to the aforementioned studies, many of the known spotted owl sites likely to be affected by the Project are anticipated to be surveyed in 2014 via the KDSA and the results of that monitoring will continue to inform Project planning (and the need for any further formal consultation on the Project) in a manner that is intended to further minimize adverse effects of the action on the spotted owl; see the Conservation Recommendations section below. The PDC discussed above to minimize and reduce adverse Project impacts to spotted owls will be implemented to their fullest extent.

This analysis relies on best available science, professional judgment and site-specific circumstances such as the condition of NRF habitat post-fire, the amount of PFF habitat remaining or to be removed, spotted owl site occupancy in the action area, abiotic factors such as slope position of proposed harvest units, and the proximity of these units to spotted owl nest sites in the action area (see Figures 3 and 4 for overall context). The Service relies on the following general factors to determine if proposed Federal action is likely to adversely affect (LAA) the spotted owl:

- Alteration of NRF habitat in the nest patch.
- Removal or downgrade of NRF habitat in core-use areas and home ranges with generally less than 50 and 40 percent NRF habitat, respectively.

- The scale and amount of PFF habitat removal within spotted owl core-use areas and home ranges resulting in a reduction of foraging opportunities that could likely lead to significant impairment of spotted owl survival and reproduction. This determination will be informed by a combination of factors, such as the amount, location and spatial arrangement of pre and post-harvest habitat conditions.

- Removal of any spotted owl habitat in severely habitat-deficit spotted owl-occupied home ranges.

Proposed actions that avoid the above outcomes will generally be considered as Not Likely to Adversely Affect (NLAA) the spotted owl (see below).

As discussed above in the Environmental Baseline section, there are 45 known spotted owl sites within or that overlap the action area. Of these, 39 sites have home ranges that overlap areas of proposed harvest activities consisting of salvage and road/route/landing construction. Of the 39 sites, the Service anticipates that up to 14 known spotted owl sites/home ranges are likely to be adversely affected due to the District's proposed action of removing and downgrading NRF habitat and removing PFF habitat (for reasons discussed above) within these 14 sites/home ranges (Tables 4 and 5) (Assessment, Table 15 and associated text). Please note that spotted owl sites are grouped together in Table 5 because multiple alternate sites most likely represent one territory (i.e., a pair or resident single spotted owl), based on spotted owl color banding data. The effects analysis focuses on the affected owl pair or resident single rather than the multiple sites that they may occupy through time.

There is only one substantial block of un-surveyed NRF habitat outside of known spotted owl home ranges within the action area. This includes a contiguous 150-acre block of NRF habitat that has high relative habitat suitability (Assessment). Overall, within a 0.5 mile core-use area radius, 207 acres is NRF habitat-quality. Local habitat conditions of known sites (see above) and best available habitat-spatial relationships suggest this area could have spotted owl occupancy. Therefore, the proposed action of removing 126 acres of PFF habitat in the proximal core-use area has the potential to adversely affect any spotted owls that may occupy this un-surveyed area.

Spotted owl sites with NRF habitat amounts above 40 to 50 percent at the home range and 0.5 mile core-use area spatial scales respectively, are considered to be of higher habitat quality and to support higher levels of spotted owl occupancy and habitat fitness (Bart and Forsman 1992, Bart 1995, Dugger et al. 2005, Olson et al. 2004). Recently developed habitat-fitness and landscape assessments have demonstrated the importance of having sufficient amounts of NRF habitat within spotted owl core use areas to adequately provide for spotted owl survival and reproduction along with access to prey. For example, Franklin et al. (2000) found that the proportion of good habitat was around 60 percent relative to lesser quality habitat for spotted owl core use areas in northwest California. Dugger et al. (2005 and unpublished data) showed that when spotted owl core areas in their southern Oregon study area had at least 50-60 percent older forest habitat, spotted owl fitness (i.e., survival and reproduction) was relatively higher than in core use areas with lesser amounts. Olson et al. (2005) found similar results on their Oregon Coast Ranges study area.

Figure 3. Distribution of spotted owl sites and proposed harvest activities across the proposed Medford Douglas action area. Copied from the Assessment.

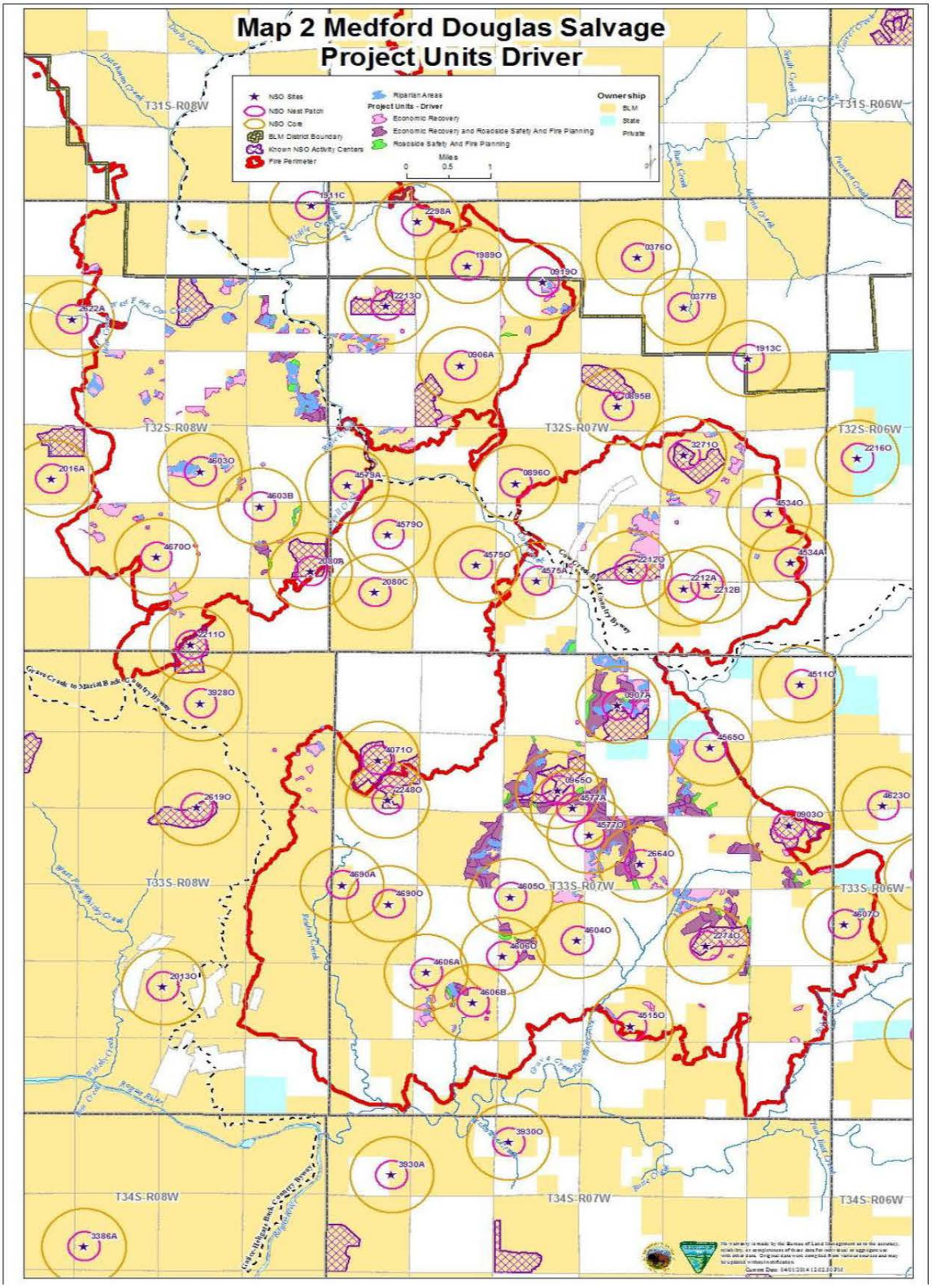
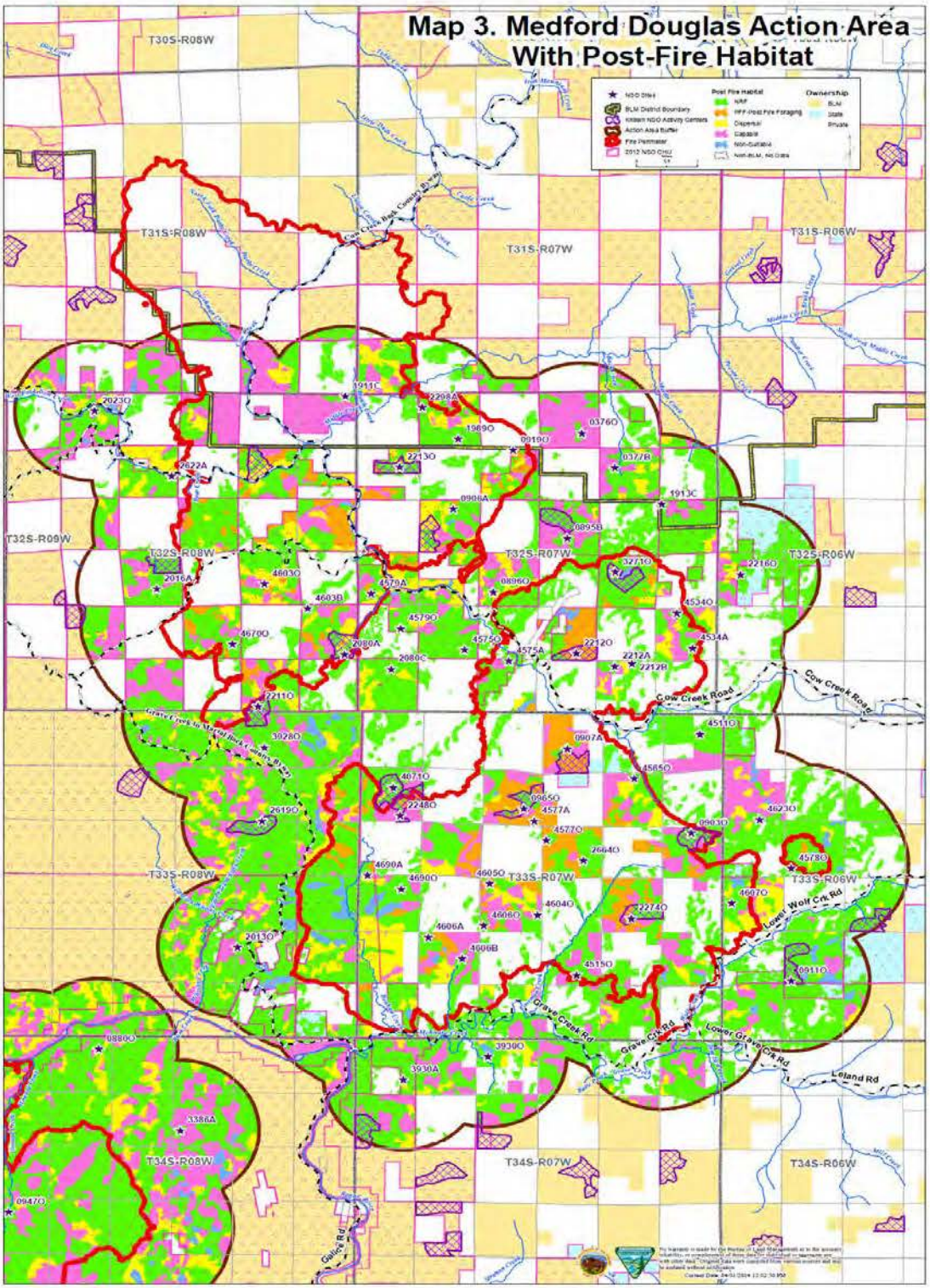


Figure 4. Post-fire habitat condition across the Medford Douglas action area. Copied from the Assessment.



Based on the above information, as well as information provided in Appendices B and C, the proposed removal and downgrading of 1,208 acres (NRF = 33 acres and PFF = 1,175 acres, excludes overlapping home ranges) (note due to rounding up in Table 5, these numbers may not totally align with the

summary values; regardless, the effects remain the same) of NRF and PFF habitat are likely to cause measurable reductions in spotted owl habitat quality within 14 known spotted owl sites and a block of un-surveyed but NRF habitat. The extent of the reductions is likely to impair the ability of affected spotted owls to breed and replace themselves, based on the findings of Olson et al. (2004), Dugger et al. (2005), Zabel et al. (2003), Meyer et al. (1998), and Carey et al. (1992). Whether these anticipated impacts represent a significant disruption of breeding activity to an extent that results in the death or injury of affected spotted owls is discussed below.

Table 5. Percent of post-fire spotted owl habitat and proposed acres for removal on District lands affected by the proposed Medford Douglas Project (FWS reference #01EOFW00-2014-F-0161).

Spotted Owl Site[1, 2, 3 & 4]	HR NRF	CUA NRF	HR NRF + PFF	CUA NRF + PFF	Post Salvage HR NRF (acres)	Post Salvage CUA NRF (acres)	Post Salvage HR NRF + PFF (acres)	Post Salvage CUA NRF + PFF (acres)
0903O	23	48	27	49	22 (4)	48	24 (101)	48 (5)
0907A	6	7	21	62	6	7	16 (195)	40 (110)
0965O/4557A/O	11	17	34	77	11(1)	17 (1)	22 (395)	52 (106)
2212A/2212B/2212O[1]	12	13	21	19	12 (3)	13	20 (108)	39 (45)
2274O	21	34	30	65	21(11)	34	26 (129)	57 (38)
2248O/4071O	31	23	36	30	30 (11)	23	35 (31)	30
2664O	17	51	38	74	16 (6)	51	26 (417)	57 (88)
3271O[1]	28	64	33	64	28 (1)	64	30 (102)	64 (2)
4515O	25	40	27	40	25(4)	39 (4)	27 (1)	39
4603B/4603O[1]	26	28	29	32	26 (2)	28	28 (91)	31 (9)
4604O	16	20	24	25	15 (4)	20	19 (148)	23 (9)
4605O	15	10	26	21	15	10	21 (181)	16 (24)
4606A/4606B/4606O	14	10	22	18	14 (2)	10 (1)	18 (125)	12 (30)
4565O	14	30	22	30	14	30	19 (82)	30

[1] – Spotted owl site centers located with Spotted Owl Critical Habitat.

[2] – More specifically on the home range habitat modification calculations: A total of 1,082 acres of habitat modification within the home range circles comprised of 1,049 PFF, 33 NRF and 126 acres of PFF in the unsurveyed block (not shown in Table 5).

[3] – In areas with multiple sites, the percentages shown are for the site with the lowest amount.

[4]- Note: Throughout this Table, the percentages represent the minimum amount of habitat among the areas with multiple sites (Assessment Appendix C). HR= Home Range and includes Core Use Area; Core-Use Area = CUA only; NRF = nesting, roosting, foraging habitat. The amount of acres (acres) proposed for harvest are rounded up and represent the greatest acreage for areas with multiple sites (Assessment, Appendix C). Shaded rows indicate sites with the likelihood of harm to spotted owls.

The habitat information presented in Table 5 is for District-managed lands only. Spotted owl home ranges encompass non-Federal lands as well. A cursory analysis conducted by the District shows that lower quality NRF, mostly dispersal type habitat occurs on non-Federal lands within the spotted owl home ranges. Taking into account the amount of post-fire spotted owl habitat on these non-Federal lands, two (0903O and 2274O) of the 14 affected spotted owl sites discussed above may have enough NRF habitat remaining (across all of the ownerships) within these home ranges post-Project to avoid impairing the ability of affected spotted owls to breed and replace themselves. However, up to 400 to 600 acres of this spotted owl habitat on non-Federal lands also burned at varying severity and the common practice of private timber companies is to aggressively salvage the burn trees immediately post-fire. Results of field surveys by the District show harvest on non-federal lands in at least one of the two sites identified above. As a result, it is unlikely that the post-fire NRF habitat on non-Federal lands within these two spotted owl home ranges is still available to contribute to spotted owl habitat.

To determine if habitat removal likely to be caused by a proposed Federal action is also likely to significantly disrupt the breeding, feeding, or sheltering behavior of the spotted owl to the extent that it actually injures or kills affected spotted owls, there must be a reasonable certainty that the spotted owl occupies the affected habitat area. The following analysis focuses on the 14 spotted owl sites discussed above and the un-surveyed block of NRF habitat that would likely be adversely affected by the proposed action and whether there is a reasonable likelihood of spotted owl occupancy of these sites post-fire. In addition, the following analysis considers whether the proposed action of salvage harvest will compound the fire effects leading to a significant disruption of breeding, feeding, or sheltering behavior of the affected spotted owls to the extent that it actually injures or kills them. As described above, in areas with spatially extensive, moderate to high severity burn, spotted owls, if they did not perish in the fire, may respond by abandoning the site or shifting their home range use patterns or due to very insufficient habitat, the site may be considered a loss (Appendix C).

Best available information provided in the Assessment indicates that sufficient habitat conditions likely remain post-fire to support spotted owls at 8 of the 14 sites listed in Table 5 (0903O, 22740, 2248O/4071O, 4515O, 4565O, 4604O, 4605O, 4606A, B, and O) although these spotted owls may shift their use at these eight sites in response to fire-related habitat impacts. Additionally, some of these sites have a history of occupancy during the last five years and/or early results of the 2014 survey data indicate spotted owl presence despite suitable habitat being limited in some cases. While current habitat conditions are likely to support spotted owl occupancy, the proposed salvage harvest will further reduce available suitable habitat that supports spotted owl breeding, feeding and sheltering functions at 7 of the 8 sites to an extent that is likely to cause the injury or death of the affected spotted owls. We reached this finding based on the studies and findings discussed above under *the Spotted Owl Resource Use* section above. The exception is site 4515O. Although the extent of NRF habitat at site 4515O is below what best available information suggests is necessary to adequately support the spotted owl, the proposed action will modify only a very minor amount of NRF habitat within this home range (Table 5). On that basis, we conclude that this minor amount of adverse habitat change likely to be caused by the proposed Project is not reasonably certain to significantly disrupt the behavior of the spotted owl.

Four spotted owl sites (2664, 3271O, 0965O/4577A,O, and 4603B,and O) are not anticipated to be occupied post-fire because 2012 and 2013 surveys and/or long-term pre-fire surveys indicate that these sites are not occupied by spotted owls and/or as having an overall low probability of occupancy. Therefore, no effects to spotted owls from the Project are anticipated. Proposed removal of NRF habitat is minimal at these sites (Table 5) and is not likely to preclude future occupancy. However, at least one site, 0965O/4577A, O is currently NRF habitat limited (11 and 17 percent at the home range

and core use areas, respectively) and may not be sufficient for occupancy. The extent of salvage logging at this site, is not likely to preclude future occupancy given the past poor occupancy history of the site. The extent of salvage logging within the home range of site 2664O may preclude future occupancy of the site; however, the core area has greater than 50 percent NRF habitat post-fire and the core area condition may be sufficient to provide occupancy despite 16 percent NRF at the home range. The habitat conditions post-salvage at sites 3271O and 4603B/O are likely sufficient for occupancy given what is known about the spotted owl habitat-occupancy relationships for the action area. Surveys for spotted owls are being conducted for 2014 and if spotted owls are located at these sites prior to harvest, the BLM should seek technical assistance with the Service to determine if formal consultation needs to be reinitiated.

The amount of NRF habitat likely needed to support spotted owl occupancy at two known spotted owl sites (0907A and 2212A/ B/O) is likely to have been destroyed due to the fire. Only a very minor amount of NRF habitat remains at the core-use and home range scales at these sites (Table 5). While pre-fire occupancy data indicates a high likelihood of occupancy and site fidelity may result in spotted owls initially attempting to occupy these sites post-fire, it is not reasonably certain that spotted owls will occupy these sites because of the significant loss of habitat caused by the fire. The proposed removal of 3 acres of NRF habitat at site 2212A,/B/O is not likely to preclude future occupancy given the current habitat deficit at the site, only 12 percent NRF habitat remains at the home range scale. The proposed salvage for either site is not likely to compound the situation. The District is conducting surveys for spotted owls in 2014 and if spotted owls are found occupying these sites, the Level 1 Team will need to discuss appropriate ESA measures

Effects to the Spotted Owl in the Unsurveyed Block of NRF Habitat

As discussed above in the Environmental Baseline section, given the available information collected at the KDSA that is the basis for characterizing the action area to include 39 spotted owl sites currently or recently known to be occupied, and giving the benefit of the doubt to the spotted owl pursuant to national ESA section 7 policy where significant data gaps the Service concludes that this portion of the action area supports one spotted owl-occupied core use area. The proposed harvest of 126 acres of PFF habitat by the Project is likely to adversely affect the spotted owl because of the reduced potential for foraging opportunities in a core area. However, given the amount of barred owls across the action area, barred owls may preclude spotted owls from occupying this block of habitat. Additionally, the amount NRF habitat within the core use areas is well within the range of known occupied sites. The removal of PFF habitat, which is not necessarily contributing to the overall function of the area provides uncertainty as to whether its removal would provide significant disruption to spotted owl life history functions.

Proposed Project Actions Not Likely to Adversely Affect Spotted Owls

As discussed above, the proposed Project will affect 39 sites known to be occupied (currently or in the recent past) by the spotted owl. Based on consideration of the following information and specific measures (i.e., the PDC discussed below) in the proposed action for avoiding and minimizing adverse effects to the spotted owl, the Service has determined that the proposed Project is not likely to adversely affect the spotted owl at 25 of the 39 sites.

As described in the *Spotted Owl Resource Use* section above, spotted owls use landscapes in a spatial manner that reflects the amount and quality of available NRF habitat. For example, best available information suggests that, in general, the most persistent and productive spotted owl sites contain about 40 percent NRF habitat at the home range scale and 50 percent at the core use area. However, the same

information also shows that spotted owls can persist and be productive under a range of habitat conditions that contain lesser amounts of NRF habitat (Assessment, Table 9, Pre-fire NRF column). As discussed above in this Opinion, spotted owls are "central place" animals with the nest and core use areas being the focal area of habitat use during the breeding season. As such, spotted owl habitat-spatial relationships are the strongest at the core area scale and less so at the home range scale.

The quality and location of NRF habitat also figures prominently in spotted owl habitat selection. For example, NRF habitat characterized as having relatively low relative habitat suitability is infrequently used by spotted owls. Additionally, spotted owls generally do not nest or forage in the upper portions of slopes (Anthony and Wagner 1998, Clark 2007, Schilling 2013, Blakesley et al. 1992, and Courtney et al. 2004).

Based on the findings of Clark (2007), if given a choice, spotted owls use the best available habitat, which largely consists of areas of nesting/roosting or foraging habitats that are unburned or were burned at low-to- moderate severity. NRF habitat that has little to no overstory canopy mortality is considered to be the most important habitat for spotted owls following a wildfire (Gains et al. 1997, Clark 2007). However, it is important to note that while medium and high-severity burn areas as described herein do not meet standard definitions of foraging habitat, spotted owl use of these burned areas is well documented (Bond et al 2002, Bond et al. 2009, Clark 2007, Clark et al. 2011, Clark et al. 2013, Gaines et al. 1995, Jenness et al. 2004, King et al. 1998, Lee et al. 2012, Roberts et al. 2011).

While severely burned areas were used, observations suggest that spotted owls select edges near less severely burned areas (Comfort 2014). Clark (2007) also described that within salvaged areas, 60 percent of the locations were associated with "leave islands", riparian reserves, and stands of thinned trees. Comfort (2014) found that spotted owls avoided large, continuous patches of high severity fire that are surrounded by moderate to low-severity fire. Diffused edges are likely to be good habitat for woodrats and other prey associated with early seral and old-growth habitat. Clark (2007) also reported that spotted owls are more likely to select nesting, roosting or foraging habitats in areas of lower elevation and/or close to perennial streams, where available.

Based on the above information, inclusive of Project PDC, the Service finds that implementation of the proposed Project is not likely to adversely affect the spotted owl that were not identified above (Table 5) in the previous section because (see Assessment, Table 16 and Assessment, Appendix C):

1. Post-project NRF habitat levels are generally near 40 and 50 percent at the home range and core-use scales, respectively at a site; or if multiple sites, the aggregate of NRF habitat approximating 40 and 50 percent at the home range and core-use area (Sites: 2016A, 2080A/C, 2211O, 2619O, 3928O, 4690A/C).

2. Post-fire NRF habitat amount is severely limited, usually less than 20 percent at both the home range and core-use areas, and surveys show a pattern (usually the most recent 3-5 years) of non-occupancy by spotted owls (Sites: 0919O, 0377B and 1911C).

3. Through surveys, spotted owls have been determined to not occupy these sites in the past 2-3 years or longer periods of times for some of the sites. Proposed NRF removal is no more than one acre. Proposed PFF removal is minimal at the core use area. Minor amount of PFF removal may occur in the outer perimeter of the home range and in relatively low habitat suitability areas (Sites: 0896O, 0906A, 1913O, 1989O, 2213O, 4579A/O, 4578O, 4607O, 4670O, and 4623O).

4. These spotted owl sites may have current occupancy. Two sites of the sites have proposed NRF removal of 1 and 5 acres at the home range scale and in habitat that is of relatively low suitability. This removal is for road/landing construction. Minor amounts of PFF removal is planned at the outer perimeter of these home ranges and in areas of relatively low habitat suitability (Sites: 0377B, 0895B, 2298A, 2622A, 4534A/O, 4575A/O).

Potential Project Effects causing Disturbance of Spotted Owls

The District plans to restrict Project activities that potentially could disturb nesting spotted owls by scheduling their implementation to periods outside of the spotted owl critical breeding period (March 1 – June 30) and/or beyond the Level 1 Team recommended disturbance distance thresholds (see Appendix A and the PDC under the Description of the Proposed Action). Because nesting spotted owls are confined to an area close to the nest, but once the young fledge, they can move away from noise, restricting these Project activities as described above is not likely to cause adverse effects to the spotted owl. This approach and effects determination also applies to the block of un-surveyed habitat as described above.

Potential Project Effects on Spotted Owl Prey Species

Spotted owl prey species in this portion of the spotted owl's range, including the action area for the Project, consist primarily of woodrats and northern flying squirrels and a variety of other small mammals (Forsman et al. 2004 and Clark 2007). The overall relationship between burned landscapes, spotted owl prey responses, and spotted owl foraging efficiency is unclear. However, salvage harvest (and NRF green-tree removal) may compound adverse impacts to spotted owl prey species by changing their preferred habitat conditions. Fire consumes, alters, and creates snags used by nesting spotted owls and coarse woody debris used by spotted owl prey. Spotted owls are "perch and pounce" predators and medium to high severity fire consumes, and salvage removes, hunting perches and removes canopy cover thereby decreasing concealment cover from predators. Spotted owl nest patch/core-use areas are also focal points for spotted owls (Bingham and Noon 1997 and Rosenberg and McKelvey 1999) and medium to high severity fire along with salvage harvest may reduce habitat quality and therefore impact spotted owl life history functions in these biologically important areas.

Best available information indicates that harvest of intact green tree stands reduces stand density, overstory canopy cover and mid-story structure and negatively impacts northern flying squirrel abundance and survival (Wilson 2010, Manning et al. 2011, Wilson and Forsman 2013). In the case of the proposed action, salvage harvest is planned for stands that have burned at medium to high severity where many of these habitat elements (e.g., canopy cover and structure) have been destroyed or significantly reduced due to the fire. Therefore, most of these areas likely no longer serve as habitat for flying squirrels. However, due to the mosaic of burned and unburned areas in the Project action area, it is likely that flying squirrels still persist in the area, albeit at a lower density. Spotted owls may be able to continue to forage on flying squirrels in the unburned areas but availability of flying squirrels is likely much reduced. Because the proposed PFF salvage is in habitat likely no longer functioning in any significant way as flying squirrel habitat, the project is not anticipated to further reduce flying squirrels. As described below (and per the PDC that are part of the Project), the District is providing measures to minimize those impacts to flying squirrel by providing legacy structures in burned areas that may provide future denning and foraging areas for the species. While impacts to flying squirrels may be relatively minor due to the Project, Clark (2007) found that in high severity burned landscapes,

and landscapes with salvage harvest, spotted owls are likely to increase their home ranges to compensate for the loss of suitable habitat and this will likely impact spotted owl habitat-fitness.

Woodrats, specifically dusky-footed woodrats, are the other primary prey species of the spotted owl in the action area. Fire increases the abundance of shrubby vegetation used by woodrats (along with mice and vole species). Edge ecotones created from fire can be areas of increased woodrat abundance and exposure to foraging spotted owls (Zabel 1995). Clark (2007) suggested that fire created diffuse edges are likely good habitat for woodrats, which are more likely to occur at high densities in early seral (brush/sapling to pole-sized trees) and late-successional forest habitat (Sakai and Noon 1993). Several habitat studies have shown spotted owl use of edges (Clark 2007, Folliard 1993, Irwin et al. 2013, and Comfort 2014). The Douglas Complex fire most likely reduced woodrat habitat due to the loss of late-successional forest. However, the fire has also created early-seral conditions that are anticipated to promote woodrat populations throughout much of the burned area. The proposed removal/downgrade of NRF habitat could be detrimental to woodrats in that removing hardwoods or downed wood material may reduce affected food sources and concealment cover. Hardwood removal may occur in the case of NRF removal/downgrade, not is the salvage units expect for safety considerations. The proposed salvage of PFF will likely cause ground disturbing actions the preclude woodrats in the short-term along with a reduction in foraging perches for spotted owls. Soon thereafter, the resulting early-seral conditions will provide beneficial conditions for woodrats. It is anticipated that remaining spotted owls will forage along the edges of the unburned and burned-salvaged area because of the diverse vegetation that support a variety of spotted owl prey species.

Within the fire perimeter, spotted owl prey habitat connectivity is anticipated to remain largely functional, albeit connectivity may be compromised in the areas that burned at high severity. Overall, as much as 90 percent of spotted owl habitat on Federal lands will not be affected by the proposed action. Therefore, these untreated areas will continue to provide foraging opportunities for spotted owls.

To minimize Project salvage harvest impacts on the spotted owl's primary prey species, the District proposes to implement the following conservation measures:

1. Existing NRF habitat and areas burned at low severity that are largely unaffected by the proposed action and well over half of the PFF habitat within the action area will not be harvested. Therefore at a landscape scale, the District's proposed action will impact a relatively small proportion of spotted owl prey habitat.
2. The proposed salvage harvest, to the extent practical, will avoid spotted owl nest patch and core-use areas (see PDC and Recovery Action 10 sections of the Description of the Proposed Action above). At the stand scale, all existing coarse woody debris in proposed salvage units within 0.5 miles of core areas of high priority spotted owl sites (see below), spotted owl critical habitat, and Del Norte salamander occupied areas would be retained at greater than RMP standards, along with retention of large wolf trees (see PDC in the Description of the Proposed Action section above). Snag and down wood retention provide for den, connectivity, dispersal and concealment cover for spotted owl prey.
3. Many of the proposed Project harvest units are relatively small in size. Given the mosaic of habitat conditions created by the Douglas Complex Fireand the distribution of harvest units of various sizes may contribute to creating favorable habitat conditions for spotted owl prey diversity (e.g., woodrats and P*eromyscus sp*) and abundance by further creating edge/ecotone habitat adjacent to retained stands of NRF habitat within the action area. It is possible that

spotted owl foraging efficiency may increase in a habitat mosaic post-fire because of possible increases in prey populations. However factors such as distance to nest patches and intact NRF habitat are likely to influence spotted owl use of burned landscapes (Clark 2007).

Based on the above findings, the Service concludes that the proposed Project is likely to have both adverse and beneficial effects to spotted owl prey species as a result of salvage harvest activities.

Project Impacts on Spotted Owl/Barred Owl Competition

Numerous barred owls are known to occur within the action area at sites with higher quality spotted owl NRF habitat. Available evidence suggests that the presence and distribution of barred owls may affect habitat quality for spotted owls (Wiens 2012, Yackulic et al. 2012). Additionally, many studies suggest that the two species compete for resources and maintaining older, high quality forest habitat may help spotted owls persist, at least in the short-term (see the discussion in the Threats section in Appendix B).

To date, there are no known forest conditions, including post-fire landscapes, where spotted owls have a competitive advantage over barred owls. It is also not known if forest habitat removal directly results in a local range expansion of barred owls (E. Forsman, pers. comm. 2011, Service 2012, pp. 43-44).

The District's proposed action is not significantly impacting high quality, "Recovery Action 32" type habitat because only two acres may be altered with a treat and maintain prescription due to a yarding corridors that were not previously identified. The non-treatment of Recovery Action 32 habitat is a project measure intended to ameliorate any barred owl to spotted owls. Otherwise, up to 13 acres of non-Recovery Action 32 habitat is planned for removal (mostly associated with road and/or landing construction) and distributed among nine home ranges.

Up to 1,285 acres of PFF habitat are proposed for removal by the Project and this habitat essentially serves, albeit in a limited way, as potential foraging habitat for spotted owls. In the absence of information on barred owl use of post-fire landscapes and because best available information indicates that barred owls are a forest habitat generalist but select pre-fire spotted owl NRF habitat similar to spotted owls (Hamer et al. 2007 and Wiens et al. 2014), we assume barred owls could also make use of PFF habitat. As mentioned in the Environmental Baseline, barred owls are numerous across the action area in that nearly half of the known spotted owl sites have barred owls detected. As demonstrated in Forsman et al. (2011) and Davis et al. (2013) for this area, barred owls are having a significant impact on spotted owl survival and site occupancy. It could be surmised that spotted owls displaced because of fire and/or salvage are less likely to find new territories to colonize when barred owls are present (see Dugger et al. 2011). The proposed salvage of PFF habitat in general terms will create small clearcuts, albeit with aggregates of remaining green trees, snags and downwood material retained in the units. Wiens (2014) found that both spotted owls and barred owls use non-forest areas (clearcuts) and young forests (less than 60 years old) less than available on the landscape. Given the similar use patterns of this type of habitat, the competitive interactions between the two species may not be exacerbated. However, because there is relatively less overall habitat on the landscape, post-fire, and barred owls are generally the dominant species, it is anticipated that competitive interactions between the two species may occur due to the proposed action.

POTENTIAL EFFECTS OF THE PROJECT FROM THE PERSPECTIVE OF THE NORTHWEST FOREST PLAN (NWFP) AND THE REVISED RECOVERY PLAN FOR THE SPOTTED OWL

NWFP

The Project was designed to conform to the 1995 Medford District Resource Management Plan (USDI 1995) and the NWFP (USDA USDI 1994a). No treatments are proposed in the Known Spotted Owl Activity Center (KSOAC) or Riparian Reserve land use allocations. Matrix lands are Federal lands outside of reserves that are available for scheduled timber harvest at varying levels as well as for salvage harvest of timber killed or damaged by events such as wildfire, windstorms, insects or disease, consistent with management objectives for other resources (USDI 1995).

Activities associated with the proposed action are planned to occur within the Matrix LUA. Approximately 9,837 acres of Reserved LUA (e.g., late-successional reserves [LSR] and individual 100 acre spotted owl reserves) (Table 3) are located within the action area; however, no activities associated with the proposed action are planned to occur within the Reserve LUAs.

Although some proportion of the spotted owls in the Matrix LUA and on private lands within and adjacent to the action area are likely to be nesting and rearing young, the NWFP conservation strategy for the spotted owl does not rely on these nesting pairs and this nesting habitat to maintain the spotted owl population on Federal lands. However, as noted above, in recognition of the declining status of the spotted owl, Recovery Action 10 of the *Revised Recovery Plan for the Spotted Owl* recommends conserving all spotted owl sites and high value spotted owl habitat to provide additional demographic support to the spotted owl population.

As discussed above under the *Status of the Species* section (and Appendix B), the NWFP assumed that about 2.5 percent of the Matrix/AMA LUA would be subject to timber harvest per decade. In the first decade of the NWFP and a subsequent 15-year monitoring report (Davis et al. 2011) on NWFP implementation, consultation records show timber harvest in the Matrix/AMA LUA was consistent with (and lower than) that assumption. Although habitat for spotted owls to disperse between LSRs does not appear to be limiting (Davis et al. 2011), spotted owl occupancy data from local DSAs suggest reduced spotted owl demographic performance in LSRs and other LUAs likely due to the presence of barred owls (see below plus Davis et al. 2013).

Recovery Plan

The *Revised Recovery Plan for the Spotted Owl* recommends continued application of the NWFP reserve network, and the maintenance and restoration of more occupied and high-value spotted owl habitat, including increased conservation of habitat on some Federal "Matrix" lands (USDI FWS 2011, p. III-41). The conservation of high value habitat that is known or likely to be occupied by spotted owls the BLM is implementing through implementation of Recovery Actions 10 and 32 on all applicable lands (USDI FWS 2011, p. III-41), which along with Recovery Action 12 are discussed below. In addition, Recovery Actions 2 and 3 are applicable in that the BLM will continue spotted owl demographic monitoring of known sites within the action area that are part of the long-term KDSA.

Recovery Action 10

The Project occurs within the NWFP Matrix LUA and the Project's primary objectives are economic recovery and safety/fire planning. To the extent practicable in keeping with the Project's purpose, the District developed the Project to meet the intent of Recovery Action 10 (USDI FWS 2011 and USDA and USDI 2013). However, because of the high overlap of spotted owl home ranges across action area, only about 12 percent of the action area is not covered by a home range. Therefore, most of any proposed PFF habitat salvage would likely occur in a home range and therefore becomes challenging to meet the full intent of this recovery action. Only 266 acres of PFF habitat occurs outside of known spotted owl home ranges and the District plans to salvage harvest 68 of these acres. In the District's planning process, the conservation of high priority spotted owl sites (Assessment, Appendices C and D) was addressed based on ranking the 39 known spotted owl sites in the action area relative to the duration of spotted owl site occupancy and successful reproduction, along with post-fire habitat conditions. For the top tier of identified sites, the District attempted to avoid and minimize Project impacts by excluding over 800 acres of PFF habitat from salvage activities in core-use areas and KSOCs (Table 2). Route and landing construction and other similar activities were also avoided and/or minimized within the high priority spotted owl site core-use areas. In keeping with Recovery Action 10 concepts, spotted owl sites with demonstrated non-occupancy for several years prior to the fire were focus areas for salvage. Based on the above discussion, the Service concludes the Project is reasonably consistent with the intent of Recovery Action 10.

Recovery Action 12

On lands where management is focused on the development of spotted owl habitat, Recovery Action 12 recommends that "post-fire activities should focus on the conservation and restoration of habitat elements that take a long time to develop (e.g., large trees, medium and large snags, downed wood). These areas should promote habitat elements to support spotted owls and their prey, including retention of large trees, snags, defective trees, and coarse woody debris."

The proposed action specifically identifies and retains habitat elements for spotted owls that persist for long periods on the landscape and take a long time to replace once removed. At the stand scale for example, the Project will provide for a higher retention of snags (up to 5 times more) and coarse woody debris within spotted owl critical habitat and 0.5 mile core-use areas of high priority sites as compared to the District's 1995 RMP standards for Matrix lands which is the underlying LUA of the action area. Under the Project, the largest snags and coarse woody debris will be targeted for retention and left in aggregates and are likely to provide both short and long-term benefits to spotted owl prey species.

Approximately 18,665 acres of spotted owl habitat burned on District-managed lands as a result of the Douglas Complex fires (Table 6). Of this acreage, just over 14,000 acres (73 percent) burned at low severity and none of this acreage will be subject to salvage harvest. Another 3,114 acres (16 percent of the total burned acres) were burned at varying levels of severity within spotted owl site centers, core-use areas and within riparian reserves; this acreage will also not be subject to salvage harvest (based on information in Table 2 above). Overall, approximately eight percent of the post-fire landscape on District lands is proposed for salvage harvest. As a result, this leaves a large portion of the action area landscape with both burned and green legacy features (e.g., snags, downwood and a mosaic of habitat features) important to the spotted owl now and for future stands of NRF habitat. Reforestation of the burned units is also planned with a suite of species appropriate for conditions on the action area.

Table 6. Potential salvage acres by spotted owl habitat category for the Medford Douglas Post-Fire Salvage Project, Medford District BLM (acres reflect BLM lands; copied from Assessment, Table 13) (FWS reference #01EOFW00-2014-F-0161).

Potential salvage acres by spotted owl habitat category for the Medford Douglas Post-Fire Salvage Project, Medford District BLM (acres reflect BLM lands; copied from Assessment, Table 13) (FWS reference #01EOFW00-2014-F-0161).					
	PFF	**NRF**	**Dispersal-Only**	**Capable**	**Total**
Total Post-Fire Acres (Medford BLM lands)	3,309	9,299	2,646	3,412	18,665
Treatment Acres[1]	1,285	93	9	225	1,612
Percent of Fire Perimeter (on BLM) Treated	**39%**	**1%**	**0.3%**	**7%**	**9%**

Based on the above discussion, the Service concludes the Project is reasonably consistent with the intent of Recovery Action 12.

Recovery Action 32

The proposed Project's salvage harvest units are located in stands that burned at moderate to high severity and no longer have the characteristics of high quality spotted owl habitat such as high canopy cover and multiple layers. Because of their condition, an evaluation of these stands for Recovery Action 32 consideration is not warranted. Areas with planned green tree removal (road and landing construction, anchor trees, yarding corridors, etc.) will be reviewed in the field and if they are characterized as Recovery Action 32 stands (USDA and USDI 2010), the District plans to avoid work in these stands. However, for logistical purposes related to yarding corridors and skid trail construction, the District may impact up to 2 acres of Recovery Action 32 habitat through a treat and maintain prescription and this is accounted for in the analysis. If the proposed activity is anticipated to further compromise the function of the stand, the District will reinitiate consultation, as appropriate.

Potential Effects of Interrelated and Interdependent Activities

Interrelated actions are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration. These actions were identified in the Project Description section and are accounted for this analysis.

Summary of Adverse and Beneficial Effects of the Proposed Action on the Spotted Owl

Based on the above information, the Service concludes that the removal and downgrading of NRF and PFF habitats (collectively affecting 1,319 acres) caused by the proposed Project is likely to have adverse effects on spotted owls in the action area. Spotted owl habitat and PFF habitat on seven spotted owl sites is likely to be removed to an extent that is likely to significantly disrupt the breeding, feeding, or sheltering behavior of the affected spotted owls and cause their injury or death. Overall, these effects may lead to a reduction in habitat-fitness and a decline in reproductive output and therefore impair the ability of spotted owls to replace themselves in the action area. Additionally, juvenile spotted owls are to be adversely affected as well. The mean brood size for spotted owl pair in

the KDSA is 1.5 young (Davis et al. 2013). Herein, adult feeding attempts to the young could be significantly impaired due to the harvest of habitat, within the breeding season, likely resulting in impairment to the development and fitness of the young owls. Adverse effects are also anticipated to spotted owls that occupy the unsurveyed block of habitat, although harm is not reasonably certain to occur for factors described above.

The proposed action is expected to adversely affect spotted owls within the action area due to the removal of NRF and PFF habitat within the home ranges of seven spotted owl sites and one pair of spotted owls that may occupy the unsurveyed block of habitat. After reviewing the current status of the spotted owl, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the Service's Biological Opinion that the District's Medford Douglas proposed action, ***is not likely to jeopardize*** the continued existence of the spotted owl. The Service reached this conclusion because the action area is expected to continue to fulfill its role in the survival and recovery of the spotted owl at the provincial and range-wide scale, where the jeopardy determination is both informed and determined, for the following reasons.

The proposed action is consistent with the NWFP in that the Project will occur outside the reserve LUAs (i.e., LSRs, Riparian Reserves, and 100 acre spotted owl core areas) but within the Matrix LUA, which is for programmed timber harvest and salvage (USDA FS/USDI BLM 1994a). Although some proportion of the spotted owls in the Matrix LUA and on private lands within and adjacent to the action area are likely to be nesting and rearing young, the NWFP conservation strategy for the spotted owl does not rely on these nesting pairs and this nesting habitat to maintain the spotted owl population on Federal lands. Results provided herein indicate that habitat connectivity across the action area is likely sufficient for spotted owl movement and foraging. At the larger Oregon Klamath Province scale, the pre-fire condition of the large reserve network is currently well connected, despite localized losses of habitat due to wildfire (Davis et al. 2011). Post Douglas Complex Fire, less than one percent NRF habitat with the Province was impacted by medium to high severity fire and the proposed salvage will still have less than one percent of change of the Oregon Klamath Province. Therefore, the effectiveness of the NWFP provides for well-connected and distributed spotted owl populations.

The NWFP reserve system coupled with spotted owl Recovery Actions 10, 12 and 32, as discussed above, are intended to enhance spotted owl demographic support through habitat conservation. The proposed action is anticipated to adversely affect spotted owls at seven sites within the action area due to habitat modification. The unsurveyed block of habitat is likely occupied by spotted owls and there is the potential of adverse effects due to the removal of PFF habitat. However, due to the potential impacts of barred owls occupying the area and precluding spotted owl occupancy and the uncertain role of PFF habitat in spotted owl life history function, it is not reasonably certain that the adverse impacts rise to the level of harm. The mere potential of take is not a legitimate basis for exempting take. Therefore take is not exempted for spotted owls associated with the unsurveyed block of habitat. The Service anticipates that the action area's contribution to Oregon Klamath Province's demographic support function is not likely to be appreciably diminished because of an apparent stationary population trend; however, there are concerns regarding this trend more recent declines in spotted owl site occupancy on the Klamath DSA (Davis et al. 2013).

As noted above in the Environmental Baseline, there are approximately 884,300 acres of extant spotted owl NRF habitat in the Oregon Klamath Province. The Medford Douglas action area is comprised of 46,000 acres or well over 50 percent NRF habitat and the proposed action will reduce this by 34 acres of NRF (less than one percent) and 1,285 acres of PFF habitat. Scaling this up to the Oregon Klamath Province, NRF habitat in the action area represents much less than one percent of NRF habitat in the

province. The revised recovery plan continues to rely on the NWFP reserve system and recovery recommendations 10 and 32 to help recovery of the spotted owl. Harvest NRF and PFF habitat will locally be impactful and likely delay recovery at the local scale. However, it is anticipated that removal of this habitat will not appreciably alter the provincial baseline condition or its capability to support breeding owls. Information collected during the first fifteen years of the NWFP affirms overall NRF habitat declines have been less than anticipated on Federal lands (3.4% over fifteen years versus the 2.5% per decade anticipated) (Davis et al.2011). Based on the above information, the proposed action is not likely to appreciably reduce the likelihood of survival or recovery of the spotted owl population at the provincial or range-wide scales.

CUMULATIVE EFFECTS ON THE SPOTTED OWL

Cumulative effects include the effects of future State, tribal, local or private activities that are reasonably certain in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to secti9on 7 of the ESA.

The action area for the proposed Project has a checkerboard pattern of ownership of private land interspersed with BLM administered lands. Management practices occurring on private lands range from residential home site development to intensive industrial timber management. Salvage logging has already been initiated on private timber company lands by removing trees killed by the 2013 Douglas Complex fires. There are approximately 47,480 acres of non-Federal land within the Medford Douglas action area and a large proportion of it may be subject to salvage and/or green-tree harvest. The BLM does not track pre-harvest habitat on non- BLM managed lands, so it is unknown how many of these acres functioned as NRF before and after the fire and would be removed through salvage on private land. Given private lands forest practices and relatively short harvest rotations, it is likely that much of the forest habitat on private land provided a dispersal function for spotted owls. Non-Federal lands are not expected to provide demographic support for spotted owls across and between physiographic provinces (Thomas et al. 1990; USDA and USDI 1994a).

Reciprocal Right of Way (ROW) permit holders may fell hazard trees and adjacent trees on BLM lands. Landowners or their agents are required to obtain Road Use Permits to build roads across BLM managed land for commercial purposes or to haul commercial products on BLM maintained road systems. Reciprocal ROWs with private parties already cover many existing road activities in the Action Area. According to BLM Information Bulletin (IB) # OR-2000-174, the felling of hazard trees along reciprocal rights-of-way is a non-discretionary action, including the disposal of the logs. Regardless of the underlying LUA (i.e., LSR or Riparian Reserves), the BLM cannot require the permittees to leave these trees as coarse wood debris. In the most hazardous situations, especially for roads within high to moderate burn severity areas, a 700 feet clearing width may occur along the road. Based upon cursory GIS mapping, a total of 245 acres of NRF, PFF, and dispersal habitat could be removed on District lands due to this action; though it is uncertain if this will occur.

The Service finds that no significant cumulative effects to the spotted owl are likely to occur on non-Federal lands in the action area for this consultation due to the current degraded condition of forest habitats on these lands relative to the life history requirements of the spotted owl.

STATUS OF SPOTTED OWL CRITICAL HABITAT

When designating critical habitat, the Service considers the physical or biological features (PBFs) essential to the conservation of the species, and which may require special management considerations or protection (50 CFR §424.12; USDI FWS 2012a, p. 71897). These PBFs include, but are not limited to: (1) space for individual and population growth and for normal behavior; (2) food, water, air, light, minerals, or other nutritional or physiological requirements; (3) cover or shelter; (4) sites for breeding, reproduction, or rearing (or development) of offspring; and (5) habitats that are protected from disturbance or are representative of the historical, geographical, and ecological distributions of a species" (USDI FWS 2012a, p. 71897). The final rule for spotted owl critical habitat (CH) defined the PBFs essential to the conservation of the spotted owl as forested areas that are used or likely to be used for nesting, roosting, foraging, or dispersing" (Service 2012, p. 71897). The final rule provides an in-depth discussion of the PBFs; that discussion is herein incorporated by reference (USDI FWS 2012a, pp. 71897-71906).

The primary constituent elements (PCEs) of spotted owl critical habitat are the specific elements of the PBFs that are considered essential to the conservation of the spotted owl and are those elements that make areas suitable as spotted owl nesting, roosting, foraging, and dispersal habitat (USDI FWS 2012a, p. 71904). The PCEs should be arranged spatially such that it is favorable to the persistence of spotted owl populations by promoting the survival and reproductive success of resident pairs, and the survival of dispersing juvenile spotted owls until they are able to recruit into a breeding population (USDI FWS 2012a, p. 71904). Within the areas considered essential for the conservation of the spotted owl, the USDI FWS (2012a, pp. 72051-72052) has defined the PCEs of spotted owl critical habitat as:

1) Forest types that may be in early-, mid-, or late-seral stages and that support the spotted owl across its geographic range;
2) Habitat that provides for nesting and roosting;
3) Habitat that provides for foraging;
4) Habitat to support the transient and colonization phases of spotted owl dispersal, which in all cases would optimally be composed of nesting, roosting, or foraging habitat (PCE 2 or 3), but which may also be composed of other forest types that occur between larger blocks of nesting, roosting, or foraging habitat.

In general, spotted owl critical habitat is intended to protect and restore high quality NRF habitat and good quality dispersal habitat to promote viable/persistent populations of the spotted owl throughout its historic range. See Appendix B for a detailed description of spotted owl critical habitat and a detailed discussion of the range-wide status of that critical habitat.

As discussed in the Environmental Baseline for Spotted Owl Critical Habitat section below, the proposed action is located within spotted owl critical habitat unit (CHU) 9, in Klamath West (KLW) subunits 1 and 2, in the Southern Oregon Klamath Mountains. The intended conservation function of this unit is to provide demographic support to the overall spotted owl population, and to provide for north-south and east-west connectivity between spotted owl critical habitat units and subunits. The increase and enhancement of spotted owl habitat is necessary to provide for viable populations of spotted owls over the long term by providing for population growth, successful dispersal, and buffering from competition with the barred owl.

ENVIRONMENTAL BASELINE FOR SPOTTED OWL CRITICAL HABITAT

In general, the condition of spotted owl critical habitat within the Oregon Klamath Province includes approximately 481,577 acres of spotted owl NRF habitat (see Appendix B, Table B-5). Up to 0.7 percent of the provincial baseline has been affected by habitat alteration due to management and natural events.

The action area for this consultation overlaps spotted owl CHU 9, more specifically, 30,383 acres in the Subunit KLW 1 and 3,381 acres of Subunit KLW 2. Approximately 500 acres of critical habitat in Subunit KLW 1 will potentially be affected by the proposed action whereas no salvage/harvest units are proposed within Subunit KLW 2. On that basis the following analysis focuses on Subunit KLW 1.

Critical Habitat Unit 9

CHU 9 encompasses 1,197,389 acres and consists of nine designated subunits. A long north-south trending system of mountains (particularly South Fork Mountain) within this unit creates a rain-shadow effect and more xeric conditions in the eastern portion of the unit. More mesic conditions occur in the western portion of the unit. The region containing CHU 9 is characterized by climatic and vegetative diversity resulting from steep gradients of elevation, dissected topography, and the influence of marine air. These conditions support a highly diverse mix of mesic forest communities dominated by Douglas-fir, Douglas-fir and tanoak, and mixed evergreen forest interspersed with more xeric forest types. Overall, the distribution of tanoak is a dominant factor distinguishing the western portion of the Oregon Klamath Mountains Province. As discussed above in this Opinion, the diet of the spotted owl in southwest Oregon is dominated primarily woodrats and flying squirrels (Forsman et al. 2004 and Clark 2007). Both prey species are associated with late-successional forest, habitat used by spotted owls for nesting, roosting and foraging, and woodrats also occur in the early stages of these forests.

<u>Subunit KLW-1</u>
The KLW-1 subunit occurs in Douglas, Josephine, Curry, and Coos Counties, Oregon, and comprises lands managed by the State of Oregon and the BLM. Within this subunit, 7,682 ac are managed by the State of Oregon for multiple uses including timber revenue production, recreation, and wildlife habitat according to the Southwest Oregon State Forests Management Plan (ODF 2010b, entire). Federal lands within this subunit are managed in accordance with the NWFP (USDA FS / USDI BLM 1994, entire). Special management considerations or protection are required in this subunit to address threats to the essential PBF of spotted owl critical habitat from current and past timber harvest, losses due to wildfire, and the effects on vegetation from fire exclusion, and competition with barred owls. This subunit is expected to function for demographic support to the overall population and for north-south and east-west connectivity between subunits and critical habitat units. This subunit sits at the western edge of an important connectivity corridor between coastal Oregon and the western Cascades. There are approximately 109 historic spotted owl sites in this subunit on BLM and Forest Service lands.

Current habitat baseline conditions for Subunit KLW 1 consist of 119,045 acres of spotted owl habitat ([NRF and dispersal only habitat (PCEs 2, 3 and 4)] out of the 147,263 acres in the subunit. There are 21,544 acres of spotted owl habitat in this subunit that overlap the Project action area (Table 7).

Table 7. Current (post-fire) condition of spotted owl critical habitat (within subunit KLW 1) in the Medford Douglas Post Fire Action Area, Medford District BLM (FWS reference #01EOFW00-2014-F-0161).

Spotted Owl Critical Habitat	Total Acres	Acres NRF Habitat (PCEs 2 and 3)	Acres Dispersal Habitat (NRF + dispersal-only habitat) (PCEs 2,3 and 4)
Subunit KLW 1 total[1]	147,263	72, 396	119,045
Subunit KLW 1[2]	30,383	17,306	21,554

1 Acres calculated using habitat data from Davis et al 2011 clipped to the 2012 Spotted Owl Critical Habitat units/subunits.

[2] Acres that overlap the action area and subunit.

Other habitats not shown in Table 7 include 1,406 acres of PFF habitat and 6,749 acres of capable habitat (see Table 3). While these habitats are within Subunit KLW1, capable habitat in its current conditions does not contain any PCEs. As discussed above, PFF habitat provides some limited foraging opportunities for spotted owls and does not necessarily meet the definition of PCE 3 (- spotted owl foraging habitat) because canopy cover and multiple layer characteristics are not present post-fire. For the purposes of this analysis and giving benefit to the species as is customary Service practice, we are considering PFF habitat to contain PCE 3.

Special Management Considerations

Oregon Klamath Mountains Province

The special management considerations or protections identified by the Service for the Oregon Klamath Mountains Province are directed at a mix of spotted owl NRF and dispersal habitats needed in both moist and dry forest types that are found interspersed across the province. In dry forests where natural disturbance regimes and vegetation structure, composition, and distribution have been substantially altered since Euro-American settlement, such as the action area, vegetation and fuels management that influence fire behavior, severity and distribution may be necessary to retain and recruit spotted owl NRF and dispersal habitats on the landscape, to conserve other biodiversity, and to restore more natural vegetation and disturbance regimes and heterogeneity that are conducive to conservation of the spotted owl (USDI FWS 2012a, pp. 71908-71911). Management actions that contribute to restoring landscapes to a more resilient state in the face of alterations projected to occur with ongoing climate change are encouraged (USDI FWS 2011, p. III-32).

EFFECTS OF THE ACTION ON SPOTTED OWL CRITICAL HABITAT

This section evaluates how the proposed action is likely to affect the capability of affected critical habitat PCEs to support spotted owl NRF and dispersal habitat by considering how project impacts affect the landscape scale of spotted owl life history requirements regardless of the species' presence or absence in the affected critical habitat (77 FR 233:71876-72068).

The proposed action may potentially affect up to 495 acres of critical habitat Subunit KLW-1 with the following acres subject to removal or downgrade: 18 acres of spotted owl nesting and roosting habitat containing PCEs 2 and 3, one acre of spotted owl dispersal-only habitat containing PCE 4, 19 acres of capable habitat (currently considered as unsuitable), and 454 acres of PFF (PCE 3) habitat (Assessment, Table 17). In addition, 3 acres of spotted owl nesting and roosting habitat containing PCEs 2 and 3 are

planned for a "treat and maintain" prescription where post-treatment the habitat is anticipated have a similar function to its pre-treatment condition. These three acres, along with the one acre of dispersal-only habitat, will not be further analyzed because PCE function is not anticipated to be modified.

Project effects to the 19 acres of capable habitat are not anticipated to affect PCEs because these acres are currently considered as unsuitable habitat. However, the salvage of these acres could delay the attainment of PCEs in the future by the removal of potential legacy structures that take a long time to develop, such as large snags and downwood material. This delay is anticipated to be offset by implementation of up to five times more of the Medford District RMP (1995) standards that provide for the retention of snags and downwood on Matrix lands. As described in the *Description of the Proposed Action*, forest restoration efforts are planned for harvested lands associated with the proposed action, assisting the areas to more quickly return to forest conditions providing PCEs.

The potential effects to critical habitat through the removal of 18 acres of spotted owl nesting and roosting habitat, containing PCEs 2 and 3, are considered below.

Up to 454 acres of PFF habitat is proposed for salvage in Subunit KLW-1. As described above, PFF habitat was considered as NRF habitat (containing PCEs 2 and 3) pre-fire; however post-fire, this habitat lacks several key components of PCEs 2 and 3, in particular, a reduction in adequate canopy cover and multi-layer structure. However, best available information indicates that while deficient in some key habitat components, spotted owls due make limited foraging use of NRF habitat that burned at moderate to high severity (=PFF habitat). Therefore, at least in the short-term, PFF habitat may play a role in supporting spotted owl fitness. However, available information indicates a decrease in spotted owl survival and occupancy in moderate to high severity post-burn environments. Because of the role PFF habitat may play in spotted owl foraging behavior, and for the purposes of this analysis, we are considering it to contain PCE 3 (foraging habitat). As more information becomes available on spotted owl use of post-fire landscapes, this type of analysis may not be appropriate in the future or contemporaneously on similar projects elsewhere.

According to the 2012 Final CHU rule (77 *Federal Register* 46:14062-14165), Section 7 consultations need to consider the temporal and spatial scale of impacts a proposed action may have on the PCEs. Therefore a utilizing a scale that is relevant to the needs and biology of the spotted owl can be applied when assessing effects on critical habitat. For this analysis, the Level 1 Team used a 500 acre scale because this metric approximates a spotted owl core-use area (USDI FWS 2009) and has been used in previous consultation analyses conducted by the Rogue Basin Level 1 Team. Therefore, the District delineated 500 acre (0.5 mile radius) circles geographically centered on proposed treatment units that would likely be the most impactful in terms of acres within critical habitat; this analysis was conducted on two units (Assessment, Table 18). This approach provides for determining the potential localized effects to critical habitat without the need to analyze each project site. Pre-and post-treatment of NRF (PCE2) and PFF (PCE3) habitat amounts in the 500 acre analysis areas were compared to determine effects to PCEs and PBFs of spotted owl CH.

As a result of this analysis, the estimated pre- to post-harvest change in NRF habitat within CH ranges from two to five percent. When impacts to PFF habitat pre- to post-harvest are included in the analysis, a change of 15 to 33 percent is anticipated in the PCEs within the 500 acre analysis area (Assessment, Table 18). The reduction in the available NRF habitat is not insignificant or discountable because we expect the ability of those areas to support spotted owl nesting (PCE 2) and it will be reduced in a meaningfully measureable manner (Dugger et al. 2005, Olson et al. 2004, Franklin 2000).

The removal/downgrading of 18 acres of NRF habitat containing PCEs 2 and 3will likely reduce spotted owl foraging opportunities and decrease northern flying squirrel abundance within the 500-acre area. Best available information indicates that harvest of intact green tree stands reduces stand density, overstory canopy cover and mid-story structure and negatively impacts northern flying squirrel abundance and survival (Wilson 2010, Manning et al. 2001, Wilson and Forsman 2013). Post-treatment, these acres are not expected to function as spotted owl NRF habitat in the short-term, though some foraging opportunities may be available (Folliard 1993 and Irwin et al. 2013). It will take several decades for the attainment of PCE 4 and longer for PCEs 2 and 3. However, attainment of the PCE's will be facilitated by the District's PDC for snag and downwood retention levels that are greater than RMP standards along with forest restoration efforts, which will hasten development of spotted owl prey habitat.

As discussed above, the proposed action includes the removal of 454 acres of PFF habitat. Bbest available information indicates that while deficient in some key habitat components that make it PCE 3, spotted owls due make limited foraging use of PFF habitat, at least in the short-term and therefore it is recognized as PCE 3 for the purposes of this Opinion. The demographic rates of spotted owls in post-burn environments indicate a decrease in spotted owl survival and occupancy (Appendix C), though this finding is somewhat compounded by the influence of salvage harvest. As described above in the prey section, the landscape condition as a result of the fire and then salvage harvest (a mosaic of units mostly five to 10 acres in size) is likely to provide abundant edge type habitat for woodrats (and deer mice) that are associated with both early and late seral forests (Sakai and Noon 1993). Multiple studies have shown that spotted owls make use of edge habitat (Folliard 1993, Clark 2007, Irwin et al. 2013, and Comfort 2014). PFF habitat is essentially trees that are dead or dying. Because of this situation, they are not contributing to the function of critical habitat, except for the contribution of snags and downwood. The proposed PDC at the stand scale indicate that snag and downwood retention levels will be several times higher than normal standards for the underlying NWFP Matrix LUA and these actions will help retain and hasten development of prey habitat. Large wolf trees or trees with heavy branching or poor form (i.e., legacy structures) would also be retained and these may serve as future spotted owl nest trees or denning sites for prey when the forest matures.

At the landscape scale, as contemplated under Recovery Action 12 (see above), salvage harvest of PFF is only planned for a small proportion of the burned landscape and represents less than one percent of the existing spotted owl habitat within the Subunit. Specific to green tree harvest of NRF habitat (PCE 2 and 3), only 18 acres of green tree NRF habitat is proposed for harvest out of over 17,000 acres from PCE 2 and 3. According to the Assessment, there are large contiguous blocks of spotted owl habitat within this Subunit post fire which would facilitate dispersal connectivity. As a result at the landscape scale, the remaining habitat is likely adequate to meet the intended recovery support function of the CH in the action area.

As described above, the proposed action is likely to have adverse effects to CH at the project-level scale, due to either the NRF removal/downgrade or NRF plus PFF removal. However, at the larger subunit scale, the proposed removal of spotted owl habitat, primarily PFF habitat, is not anticipated to diminish spotted owl dispersal habitat at a landscape scale, which is likely the most appropriate way to evaluate dispersal connectivity (see Thomas et al. 1990, and Davis et al. 2011), because more than half of the action area and over three –quarters of the subunit will be comprised of spotted owl dispersal or better habitat (Table 7) post-fire/post-harvest. Thomas et al. (1990) suggested that landscapes having more than 50 percent spotted owl habitat most likely provide adequate conditions supporting spotted owl dispersal. Forest landscapes traversed by dispersing spotted owls typically include a fragmented

mosaic of clear-cuts, non-forested area, and a variety of forest age classes (Forsman et al. 2002). Prior to the fire, best available analyses indicated that spotted owl dispersal habitat connectivity was not limiting in the Province (Lint et al. 2005 and Davis et al. 2011). Overall, the Service anticipates that habitat connectivity within the CH subunit and between CH subunits will continue to adequately function post-harvest because sufficient spotted owl dispersal quality habitat (NRF plus dispersal-only) will be provided for across the action area and Subunit.

The other intended recovery support function of the affected CH subunit is for spotted owl demographic support. This may be best approximated by assessing the spotted owl demographic parameters such as site occupancy and fitness. According to the Assessment, at least 109 historic spotted owl sites are known to occur in the KLW 1 CH subunit and 24 of these sites are associated with the proposed action (Assessment, Tables 15 and 16) (these sites are also part of the KDSA). Of the 24 sites, the proposed action is anticipated to adversely affect three of them and suggests the possibility of reduced fitness or occupancy at these sites. The remaining 21 of sites either have: 1) projects not planned within their home ranges or 2) projects are planned but effects are anticipated to be insignificant and discountable. The post-fire habitat quality of spotted owl sites ranges from many sites having relatively low amounts of habitat (Assessment, Table 9) and could be considered as habitat limited when view in the context of best available information for habitat fitness, to a smaller proportion of sites having greater than 40 and 50 percent NRF habitat at the home range and core use area. However, pre-fire, these same sites were view similarly but the overall population trend for the KDSA was stationary (Forsman et al. 2011). More recently though, Davis et al. 2013 documented many sites on the KDSA becoming vacant and most likely due to barred owls. There is only limited survey information available for 2014 and not timely enough due to seasonal considerations (see Conservation Recommendations) to inform this Opinion as related to demographic rates post-fire. Because only three sites are anticipated to be adversely affected and green tree harvest of NRF habitat is minimal within the subunit, and previous analysis show a somewhat stationary population trend, the Service anticipates the proposed action is not anticipated to reduce the overall demographic support of the subunit.

The Service does not anticipate any beneficial effects to spotted owl CH resulting from the implementation of the proposed Project.

CUMULATIVE EFFECTS ON SPOTTED OWL CRITICAL HABITAT

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

Critical habitat for the spotted owl is not designated on non-Federal lands (although a few acres are designated on State managed lands) within or adjacent to the Project action area. Non-Federal lands within and adjacent to the action area are primarily concerned with timber production and recreation. While State and private lands comprise more than half of the area within 1.3 miles of the project area, these lands at best provide marginal habitat for the spotted owl, and do not notably contribute to the viability of this species, given the management practices on those lands. Portions of these lands do not currently provide any habitat for the spotted owl and most likely any burned habitat on non-Federal land that may have provided a PFF function has already been salvage given the industry's aggressive actions toward removal of burned forest. The effects of non-Federal actions within and adjacent to the action area are not likely to indirectly affect spotted owl critical habitat because these lands most likely

marginal habitat for spotted owls and do not provide contiguous habitat that would be beneficial to the spotted owl.

CONCLUSION

After reviewing the current status of the spotted owl, spotted owl critical habitat, the environmental baseline for the action area, the effects of the proposed action and cumulative effects, it is the Service's biological opinion that the District's proposed action is not likely to jeopardize the continued existence of the spotted owl and is not likely to adversely modify spotted owl critical habitat.

The Service reached these findings for the spotted owl and spotted owl critical habitat based on the following reasons:

The proposed action is located on Matrix lands which under the NWFP include a land-use allocation for timber production. The proposed action will not affect NWFP areas with riparian or LSR reserve allocations. Therefore these reserve areas will continue to be managed to maintain and further restore older forest habitats to benefit a myriad of native species, including the spotted owl.

The proposed action is on Matrix lands which under the NWFP and where salvage harvest is allowed. Although some proportion of the spotted owls in the Matrix LUA and on private lands within and adjacent to the action area are likely to be nesting and rearing young, the NWFP conservation strategy for the spotted owl does not rely on these nesting pairs and this nesting habitat to maintain the spotted owl population on Federal lands.

The proposed action is consistent with Recovery Actions 12 and 32 of the spotted owl recovery plan. Within the fire perimeter, approximately 75 percent of fire burned at low severity and none of these acres will be subject to harvest. Therefore much of the spotted owl habitat that existed pre-fire remains including those areas characterized as Recovery Action 32 habitat. Approximately 25 percent of area (approximately 5,000 acres) within the fire perimeter burned at medium to high severity and one-third of these acres (1,612 acres) are planned for harvest. Because a relatively small portion of the area is proposed for harvest and PDC provide for snags and downwood in the salvage areas, both green tree and burned legacy features important to spotted owls both in the short and long-term will be provided and broadly distributed across the action area as described in Recovery Action 12.

The District attempted to plan salvage harvest consistent with the intent of Recovery Action 10 in that high priority spotted owl sites would be conserved (i.e., not adversely impacted). However, given coincident location of the high severity burn with high priority sites, meeting the intent of Recovery Action 10 was very challenging and some PFF habitat in the high severity burned areas is proposed for salvage. The proposed action avoided and minimized to the extent practical, salvage within spotted owl home ranges and approximately 1,100 acres of PFF habitat within spotted owl core-use areas is not planned for salvage. Only a very minor amount of green tree harvest is proposed and most of this will occur in the outer perimeter of spotted owl home ranges and due to road/landing construction.

Just over 1,600 acres of PFF habitat is planned for salvage harvest. Best available information indicates forests that burned at moderate to high severity are used by spotted owls for foraging, albeit in a limited extent, and likely just short-term. This is because best available information shows spotted owl occupancy and survival decreases post-fire, and this is compounded where salvage harvest occurs. The role of PFF habitat in providing long-term contributions to spotted owl life history functions is not

clear, other than the trees proposed for harvest are dead and dying and not likely to contribute to long term life history functions. Much of the post-fire landscape in the action area will not be impacted by the proposed action.

The injury to spotted owls occupying 7 of 39 affected spotted owl home ranges is likely to impair but not preclude the capability of the action area to fulfill its conservation role, which is to contribute demographic and dispersal support to the spotted owl population within the Oregon Klamath Province, which is also designated as a recovery unit, for the following reasons. This impact will not impair or preclude the demographic support function assigned to the province because (1) the rate of habitat loss at the province scale is below the 2.5 percent per decade anticipated by the NWFP; and (2) the additional impacts to the provincial baseline due to the proposed action (the loss of 1,612 acres of mostly PFF habitat) will not significantly change the habitat baseline condition of the province with approximately 884,000 acres of NRF habitat remaining (Appendix B, Table 2). As described above, green tree harvest is a minor component of the proposed action.

No cumulative effects to the spotted owl likely to be caused by future, non-Federal actions in the action area were identified in this consultation.

For the above reasons, the capability of the habitat and of the current population of spotted owls in the Oregon Klamath Mountains province to support a persistent spotted owl population are likely to be retained with implementation of the Project.

Spotted Owl Critical Habitat

Taking into account the current status of spotted owl habitat in subunit KLW-1, the adverse effects of the proposed Medford Douglas project are not likely to appreciably diminish the conservation support function of this CHU or critical habitat at the Provincial and range-wide scales primarily because these project impacts are relatively very small in relation to the total amount of existing spotted owl habitat in CHU KLW 9. The trees proposed for salvage are dead or dying. As a result they are not anticipated to contribute to the recovery support function of CH; however, PDC criteria provide for aggregates of green tree, snag and downwood retention in the salvage units. Additionally some of the 21,000 acres of spotted owl habitat (NRF plus dispersal-only) was burned at low severity but still functions as habitat and this will not be harvest. Overall, relatively little of the CHU was compromised by the fire and therefore its current function remains. The proposed removal of mostly PFF habitat is not anticipated to appreciable reduce it's the CHU's function because it represents only a very minor fraction of 481,000 plus acres of NRF habitat in the CHU and therefore the connectivity and demographic objectives are anticipated to remain functional post Project. Conservation measures in the Project at the stand and landscape scales in terms of retention of spotted owl prey habitat features along with their broad distribution across the landscape are likely to provide some benefits to spotted owls. The retention of older forest habitat within the burn area and its adjacency to complex early seral habitat likely to be present in the area in the short-term is also likely to facilitate spotted owl capture of prey, particularly woodrats. Removal of some of the burned trees may reduce bug-disease threats posed to green trees in a post-burn environment and potentially lessen impacts to remaining spotted owl habitat.

No cumulative effects to spotted owl critical habitat likely to be caused by future, non-Federal actions in the action area were identified in this consultation.

INCIDENTAL TAKE STATEMENT

The Service anticipates spotted owls could be taken as a result of this proposed action.

Amount or Extent of Take Anticipated

Based on the findings presented in the "Effects of the Action on the Spotted Owl" section above, the Service concludes that the proposed Project is likely to incidentally take 14 adult and up to10 young spotted owls at seven sites. The take is in the form of harm caused by habitat destruction or degradation via timber harvest of up 33 acres of NRF habitat and 1,049 acres of PFF habitat that is likely to significantly disrupt the breeding, feeding, and sheltering behavior of these spotted owls to an extent that causes injury or death.

Although we are able to quantify the take in terms of the likely number of affected individuals, it is not practical to monitor spotted owls for purposes of verifying that take has occurred and determining if the take limit has been reached or exceeded for two reasons. First, there is a low likelihood of finding an injured or dead spotted owl because their home ranges are large (about 3,000 acres on average) and there is a high rate of removal of injured or dead individuals by predators and scavengers. Second, the nature of the anticipated take impact to the spotted owl is primarily in the form of reduced fitness of the affected adult and juvenile owls caused by degraded habitat conditions and associated impacts on spotted owl prey populations as a result of the proposed action. That reduced fitness is likely to cause reduced survival and reproduction of the affected spotted owls as discussed under the *Effects of the Action* section above. Documenting this reduction is very difficult, and doing so may take months or years at considerable expense.

Using impacts to spotted owl habitat as a surrogate to express the amount or extent of take and to monitor the impacts of take on the spotted owl is a practical alternative because effects to habitat are the basis for the take impacts, and effects to habitat are observable and can be readily monitored. For those reasons, the amount or extent of take exempted herein is the removal and downgrading of 1,082 acres of spotted owl NRF and PFF habitat.

Effect of the Take

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat.

Reasonable and Prudent Measures

The Service believes the following reasonable and prudent measure(s) are necessary and appropriate to minimize impacts of incidental take of the species.

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

Terms and Conditions

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

The District shall monitor the extent of spotted owl habitat affected by the proposed Project to ensure that those effects are consistent with description of the Proposed Action, the findings in the Effects of the Action analysis, and the incidental take limits presented herein. The District shall conduct that monitoring and report the results to the Service using the Project Implementation and Monitoring Form most recently updated in March 2004 (Appendix D) that was developed by the Service for that purpose. The District shall submit the form by November 30 each year during the term of the Project. The annual submittal shall summarize Project impacts to spotted owl habitat that occurred in the preceding 12 months and describe anticipated impacts to spotted owl habitat caused by the Project for the upcoming 12 months.

This consultation incorporates annual monitoring of projects that have adverse effects to listed species. The Level 1 team has agreed to use a Project Implementation and Monitoring Form developed by the Service, most recently updated in March 2004 (Appendix D). The District will report all projects for which the District has reached an effects determination of "likely to adversely affect" listed species for the preceding fiscal year to the Service by November 30 of that year, unless otherwise scheduled by Level 1 team agreement.

Implementation of the PDC is monitored through the District's sale-contracting program in coordination with the District's Resource Area wildlife biologist.

CONSERVATION RECOMMENDATIONS

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

The Service believes the following conservation action may facilitate further conservation of spotted owls within the action area:

- The Service recommends that annual spotted owl surveys continue in the KDSA at the sites affected by the Project. Survey findings should be reported annually to the Level 1 Team and used to inform and refine project placement so as to avoid and minimize Project impacts to spotted owls.

- To minimize hard edges due to salvage activities adjacent to low severity burned areas and/or unburned NRF habitat, the Service recommends that a site potential tree height buffer be considered from the low/unburned area to the salvage unit border.

- In order for the Service to be kept informed of actions that minimize or avoid adverse effects or benefit listed species or their habitats, the Service requests notification regarding the

implementation of any conservation recommendation.

- The Service recommends that the Level 1 Team be involved in pre-project layout in selected areas to ensure calibration on PDC implementation.

REINITIATION NOTICE

This concludes formal consultation on the proposed Project described in your Assessment. As provided in 50 CFR § 402.16, re-initiation of consultation is required where discretionary Federal agency involvement or control over the action has been maintained (or is authorized by law) and if: (1) the amount or extent of exempted incidental take is exceeded; (2) new information reveals effects of the agencies' action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to listed species or critical habitat that was not considered in this Opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. When consultation is reinitiated, the provisions of section 7(d) of the ESA apply.

This concludes formal consultation on the District's proposed Project. If you have any questions regarding this Opinion, please contact Cindy Donegan of the Service's Roseburg Field Office at 541-618-2374.

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Personal Communication

R. Snider, Medford District BLM Biologist, June 2014.

APPENDIX A. MEDFORD DOUGLAS POST FIRE PROJECT OBJECTIVES AND DESCRIPTIONS, MEDFORD DISTRICT BLM (COPIED FROM THE ASSESSMENT) (USDI BLM 2014).

Economic Recovery and Roadside Safety and Fire Planning

The Douglas Fire Complex burned approximately 19,082 acres in the Matrix, Connectivity/Diversity Block, and KSOAC land use allocations (LUAs) within the Medford District. Approximately 1,612 (8 percent) of the acres burned within the Medford BLM District are proposed for salvage (or associated road and landing construction). Table 4 below outlines the process the BLM used to identify final acres proposed for salvage on Medford BLM managed lands. Approximately 34 percent of the total high and moderate severity burn areas on Medford BLM lands are proposed for salvage. Salvage of dead or dying trees on Matrix would allow the Grants Pass Resource Area to retrieve some economic value from these trees while retaining sufficient levels of coarse woody debris and standing snags according to the Medford Resource Management Plan.

Areas Proposed for Treatment

In early December, BLM foresters started the process of determining areas for salvage. Initial efforts were accomplished by using GIS and post-fire aerial photos to look for areas greater than 3 acres where trees were dead or would die soon, and trees were > 12 inches DBH in size. The initial assessment focused on high and moderate severities across the landscape with very few resource sideboards. All logging systems were considered, including helicopter. After the office assessment was complete, field crews were sent out to verify and assess the proposed units. The field crews delineated unit boundaries using GPS technology and dropped units if they were non-economical or riparian dominant.

After all of the units were identified in the field, the Grants Pass Resource area biologists followed principles in the SW Oregon Recovery Action 10 Guidance Document (2013) and worked with the Medford Douglas interdisciplinary core team to reduce impacts to spotted owl sites in the project area. The GPRA biologists used NSO survey data to prioritize sites for 10 protection based on occupancy and reproduction history (See Appendix C - RA 10 Site Prioritization Summary). This effort resulted in approximately 1,612 acres of proposed salvage to be analyzed in this Biological Assessment. The units are scattered across BLM managed lands in the fire perimeter, with the highest concentration in the Perkins Creek and Poorman Creek drainages where large areas of high fire severity occurred. Additional acres will likely be dropped due to red tree voles (RTVs), botany, and cultural buffers, as well as logging feasibility issues.

Assessment Category	Acres subtracted from treatment	Total acres
Total acres in the Douglas Complex Fire on the Medford and Roseburg Districts of the BLM		48,671
Total Medford BLM acres within the area of the Douglas Complex Fire		19,082
Total burned acres within the Matrix LUA on the Medford District		19,069
Low severity burned acres (not salvaged)	14,286	
Initial field reconnaissance estimate of high and moderate burned acres		4,783
Burned acres excluded due to low timber volume	681	
Burned acres excluded within high priority 0.5 mile spotted owl core areas	1,115	
Burned acres excluded from KSOAC	346	
Acres of Administratively Withdrawn lands	93	
Riparian Reserve Acres	879	
Net Matrix acres available for salvage		**1,669**
Additional adjustments to Project Units Layer	57	
Final acres proposed for salvage		**1,612**[1]

Project Objectives

There are two main objectives for salvage treatments in the Matrix for this project: 1) Economic Recovery and 2) Roadside Safety and Fire Planning. Of the 1,612 total acres proposed for salvage, 638 are for only economic recovery, 874 for both economic recovery and roadside safety planning, and 100 acres are proposed for only roadside safety and fire planning as the objective. See Appendix B Map 2 (Assessment USDI BLM 2014) for a display of the Medford Douglas Salvage units with corresponding objectives.

Salvage for Economic Recovery Objectives:
This project is designed to meet the BLM's need to provide a sustained yield of timber in addition to other forest commodities to provide jobs and contribute to community stability as defined by the Medford District RMP, ROD 1995. Fire killed and damaged trees have resulted in reduced lumber quality and merchantable value. Timely salvage is crucial to capture remaining merchantable timber values before further deterioration occurs. As directed in the Medford RMP, salvage on Matrix LUA, would only harvest mortality above the level needed to meet snag 11 retention and other habitat goals and provide desired levels of coarse woody debris (USDI BLM 1995). Salvage harvesting for economic recovery would not occur in Riparian Reserves, mapped LSRs, or KSOACs. Another goal of this project is to reduce the risk of stand mortality from insects and disease. Fire injured trees are at greater risk of damage or mortality from bark beetles or borers because these trees lack the ability or have a reduced ability to produce defensive compounds to resist attack (SWOFIDSC 2014). Bark beetles and woodborers are the two insects that have been detected inside the fire area and within one mile of the fire area. Most of the insect activity in fire-affected areas occurs during the first three years following the fire, most of it within the first year or two (SWOFIDSC 2014). Salvage of fire-injured trees on Matrix lands would reduce but not eliminate the potential for the build-up of insect populations. With the reduced amount of breeding habitat, there would be a corresponding reduction of insects and reduced potential for additional green tree mortality near areas salvaged prior to beetle emergence. Insect populations are expected to increase in areas where salvage is not proposed, which

could affect healthy green trees adjacent to the burned areas resulting in additional post-fire mortality. These areas include Riparian Reserves, nest patches, and KSOACs.

Salvage for Road Safety and Fire Planning Objectives:
Burned trees have compromised the safety of roads used by the BLM, other agencies, private land owners, forest workers and the general public. This safety concern has been raised by state and county government, private industrial landowners and timber companies, residents, and Oregon Occupational Safety and Health Administration (Oregon OSHA). Existing conditions have also increased fuel loading in areas, as well as the potential for re-burn. The objectives are to reduce the fuel loading, eliminate the safety hazards, and provide safe access to manage future wildfires. The proposed treatments would also meet federal (29 CFR 1960.8) and state OSHA regulations (OAR 437-0025,0200, 0225, and 0500) for providing safe employment conditions, as well as safe travel conditions for the public, contractors, and adjacent land owners with reciprocal rights to transport timber or minerals on BLM roads. Hazard trees with likely failure potential within 1-10 years of their rating (Toupin et al 2008) would be targeted for removal. Potential failure describes the lack of stability of the tree and the probability of when the entire tree or a large part of the tree could fall and potentially strike someone traveling the roads.

Road Safety and Fire Planning objectives would be met within the Medford Douglas Project by implementing the salvage prescription, as described below, on approximately 14 miles of primary mainline roads and one mile of a key ridge within the fire perimeter. The majority of the Roadside Safety/Fire Planning units also overlap acres identified for economic recovery objectives. The following areas are targeted for Roadside Safety and Fire Planning objectives:

- Primary mainline roads and one key ridge were selected that occurred in moderate and high severity burn areas. These areas were identified for future fire suppression operational needs. The hazard tree removal in these areas would improve safety for fire fighters, provide greater flexibility in suppression tactics, and enhance the probability of success for stopping future fires. By decreasing the hazards, the proposed action would allow for a more direct attack of potential fires by allowing engine and personnel access closer to the fire. The key ridge was identified as a tactical north/south running ridge to use as a fire break for future fire suppression of uncontrolled wildfires.
- Treatment along mainline roads include:
    - 1.5 times the existing tree height (as opposed to site potential tree height) below the road
    - 2.5 times the existing tree height above roads on slopes greater than 35%
    - 1.5 times the existing tree height above roads on slopes less than 35%
- Salvage harvesting for roadside safety and fire planning would not occur in Riparian reserves, Late Successional Reserves, or KSOACs.

Salvage Description and Prescription (Economic Recovery and Roadside Safety/Fire Planning):

The silvicultural prescriptions will be the same for the Medford Douglas Project, regardless of the different objectives, economic recovery or roadside safety and fire planning. Treatments would focus on Matrix forest land within the fire perimeter and would follow the Medford RMP Management Direction for Salvage in Matrix. Only mortality above the level needed to meet snag retention and other habitat goals and provide desired levels of coarse woody debris would be harvested (120 feet of logs per acre greater than or equal to 16 inches in diameter and 16 feet long) (USDI BLM 1995). Prescriptions on Matrix lands would be designed to:

- Provide a sustainable supply of timber and other forest products (USDI BLM 1995).
- Provide for salvage harvest of timber killed or damaged by events such as wildfire (USDI BLM 1995).
- Restore the vigor, resiliency, and stability of forest stands that are necessary to meet land use allocations objectives (USDI BLM 1995).
- Conifer planting would be done where appropriate and safe to assure that reforestation objectives are promptly met (USDI BLM 1995).
- Implement silvicultural treatments that reduce the potential for epidemic levels of insects and wood borers.
- Accelerate the reestablishment and growth of conifer seedlings in stands that had fire damage that resulted in stocking less than the site potential. A mix of conifer species would be planted followed by maintenance treatments to insure the growth potential of the stand is maximized and desirable tree species, including fire resilient species, are established.

The proposed action plans to harvest dead and dying trees due to wildfire and initiate a stand with species suited to the natural plant community including drought resistant tree species. Only fire-injured or fire-killed trees considered dead, dying, or high risk (tree health condition indicates that the tree death would occur within 4 years) would be harvested. However, to facilitate removal of these dead and dying trees, some incidental live trees may be felled and removed through yarding corridors, landings, and road/route construction. Green tree removal would be minimized through PDC and sale administrator approval.

Dead and dying trees to be harvested would be determined by analyzing the amount of crown scorch. Crown scorch is a measure of the proportion of foliage that has been killed by the fire relative to the entire amount of foliage present before the burn (SWOFIDSC 2001). Using crown scorch alone (excluding cambium inspections) is a conservative measure for determining post-fire mortality in trees, with a high probability of dying within the next 4 years (SWOFIDSC 2001, SWOFIDSC 2014, Fowler and Seig 2004, Filip et al. 2007). Tree planting would take place after harvest in order to restore necessary stocking levels in a timely manner for the land use allocation. Retained legacy structures would generally occur as aggregated residuals. A legacy of the previous stand large live green trees, standing dead, and coarse woody debris would remain to meet the needs of species and provide for ecological functions. Overstory fire-killed trees (as defined above) would be retained at a unit average of 2 snags per acre of the largest available diameters within salvage units in Matrix LUA. In Matrix LUA, a minimum of 120 linear feet of logs per acre greater than or equal to 16 inches in diameter and 16 feet long would be left per the 1995 ROD/RMP management direction. Where naturally occurring merchantable coarse woody

debris exceeds 120 linear feet per acre, additional merchantable coarse woody debris may be removed as a commercial product provided that a minimum of 280 linear feet of non-merchantable down woody debris would be retained. Where present, the total retention for coarse woody debris per unit would be 400 linear feet on average. When stands are deficient in coarse woody debris (less than 120 feet of logs per acre greater than or equal to 16 inches in diameter and 16 feet long), merchantable material would be used to make up the deficit (USDI BLM 1995). This merchantable material would generally be left standing unless it needs to be felled for safety considerations. Additional retention above Matrix standards would occur in spotted owl 0.5 mile core use areas of high priority sites, critical habitat, and Del Norte salamander areas (see below). All existing coarse woody debris in units within 0.5 mile core areas of high priority sites, critical habitat, and Del Norte salamander areas would be retained.

Prescription Summary:

- Within stands burned at a high and moderate burn severity, fire-killed and fire-injured trees 8 inches DBH and greater that exhibit a high probability of mortality be targeted for salvage. Targeted trees would be based on a species specific crown scorch amounts which would result in a 75 percent probability of mortality.
- Fire-killed hardwoods 8-16 inches DBH may be cut and removed for reforestation site preparation. Live or dead standing material (hardwoods and conifers) < 8 inches DBH would be slashed and/or hand pile burned where they impede establishment of conifers.
- An average of two dead/dying trees (snags) per acre would be retained within each salvage unit. Retained snags would generally be grouped in clusters and would reflect the species mix of the original stand. Emphasis would be placed on retaining the largest snags available (USDI BLM 1995). Large wolf trees or trees with heavy branching or poor form would be targeted for retention because they provide habitat for numerous wildlife species. Snags that exhibit a greater chance of remaining on the landscape and surviving future windstorms would also be targeted for retention, where safety allows.
- Non-hazardous older decay class snags (3, 4, and 5) would be retained where available and protected to the greatest extent possible from disturbance. If a retention snag needs to be felled for safety concerns another snag of similar size would be retained in substitution.
- Even spacing of the retention trees is not required and the leave trees/snags would generally be clustered in groups of 3 or more. These trees are meant to act as wildlife trees/snags and future coarse woody debris on the harvested areas. The untreated clusters would be selected in a location within the unit to avoid felling the trees to meet federal and state safety laws.
- In Matrix LUA, a minimum of 120 linear feet of logs per acre greater than or equal to 16 inches in diameter and 16 feet long would be left per the 1995 ROD/RMP management direction. Merchantable material would be used to make up the deficit (USDI BLM 1995).
- Generally, live trees without a high probability of mortality would be retained. However, some live trees would need to be felled and extracted for landing construction, road/route construction, and road widening for suitable haul widths. Yarding corridors would minimize going through patches of live trees to reduce the effects to unburned forest stands. However, all potential yarding corridors were factored into the effects to habitat for each unit.

Additional retention in high habitat suitability areas within Critical Habitat (according to the Relative Habitat Suitability (RHS) output from the MaxEnt model), 0.5 mile core areas of high priority sites, and Del Norte salamander areas:

- Where available, retain a minimum of 4 dead/dying trees (snags) per acre over 16 inches DBH would be retained. Retained trees would reflect the species mix of the original stand and

emphasize retention of the largest snags available (USDI BLM 1995). Large wolf trees or trees with heavy branching or poor form would also be targeted for retention

- All existing down coarse wood would be retained. When stands are deficient in coarse woody debris (less than 120 feet of logs per acre greater than or equal to 16 inches in diameter and 16 feet long), merchantable material would be used to make up the deficit (USDI BLM 1995).

Proposed Action Implementation Methods

The salvage treatments described above will be implemented using a variety of manual and mechanical tools. They are described below because each method has a different impact to existing vegetation and have been considered in the overall effects determinations for the salvage project, including the effects analysis for each unit. For example, the openings created from proposed yarding corridors, landings, and road/routes were assessed and added to the potential treatment effects determination for each unit. Reinitiation will occur if the actual effects from these tools exceed our anticipated effects during analysis.

Ground based extraction: On slopes averaging < 35 percent, woody biomass and saw log material created from salvage operations would be cut, and skidded to landings or road sides using low ground pressure machinery. Skidding machinery would be restricted to approved skid trails. This method requires narrow skid trails, up to 12 feet in width as measured from the outer edges of the standard width dozer blade in the straight position (yarding tractor). Existing skid trails would be used where possible. Skid trail locations would be approximately 150 feet apart, but vary depending on the site-specific terrain, and would be thereby, minimizing soil disturbance. Openings from skid trails will be assessed for the overall unit effects determination.

Cable based extraction: On slopes ≥35 percent, woody biomass and saw log material created from salvage operations would be yarded to landings or road sides. Cable yarding drags trees with one end suspended and one end on the ground. Corridors would be generally less than 15 feet wide, depending on the size of trees to be removed and the terrain. Corridor locations would be pre-approved by the BLM Contract Administrator. Landings would generally be a minimum of 150 feet apart. Openings from corridors and landings will be included in the overall effects analysis for each project, and may include some green tree removal. When the corridor and landings are located in a unit, the additional openings will be assessed for the overall unit effects determination. However, when the landings are located outside of a unit, then those will be assessed as an extended portion of the unit or a separate unit. Approximately 16 acres of openings outside of units would occur from landing construction (6 acres of NRF removal, 0.5 acres of PFF removal, 4 acres dispersal removal, and 5.5 acres in capable habitat).

Guy line anchor and tailhold trees used for anchors will likely be green trees but may be burned trees. If needed to ensure the safety of logging operations, as specified under Oregon OSHA laws, these trees may be felled and removed.

Anchor trees are selected to match the size of the yarder. Trees with suitable spotted owl habitat features will be avoided when possible, and anchor trees (i.e. tailhold trees) will be left standing when appropriate with safety considerations. The majority of the spotted owl nest trees or center of activities have been located and mapped within the Action Area. The nest tree locations were compared with the draft cable corridor GIS layer and no known nest trees are located near potential guy line anchor or tailhold tree estimated locations, so it is unlikely that any known nests would be removed. Additionally,

in areas where anchor trees need to be placed in live tree patches a wildlife biologist or wildlife field crew member would review the anchor tree location in the field to ensure known spotted owl nest trees would not be removed. Trees felled in Riparian Reserves, LSRs, KSOACs, Critical Habitat, and RA32 stands will remain on site. These measures would help to reduce impacts to spotted owl habitat. The exact number of guy or tailhold trees that would be cut is unknown, but likely several could be cut adjacent to each unit. However, according to Oregon OSHA Regulations, felled trees would be removed from the site if they cannot be stabilized and pose an additional threat of sliding or rolling onto the roadways (OAR 437-007-0225 and OAR 437-007-0500). As mentioned above, the effects from anchor tree removal will be considered in the overall effects analysis for the Medford Douglas Salvage Project.

Helicopter Based Extraction: This is an aerial system that uses helicopters to extract logs off the landscape. A cable suspended from the underside of a helicopter would be lowered to the forest floor. The cable is then attached to logs and lifted upwards until the logs are fully suspended. The logs are then flown to the most advantageous path back to a large landing. Once at the landing the logs are lowered to the ground and released for processing. Typically log landings for helicopter based extraction are approximately one acre in size. Helicopter extraction also requires service landings. These landings must be large enough to land a helicopter and have access for a fuel truck to approach the equipment for refueling. Some landings proposed for this project are in spotted owl NRF, PFF, or dispersal habitat. The effects from the construction of the landings in suitable spotted owl habitat have been incorporated into the total effects from the projects. Polygons representing the landings were included in the proposed units GIS layer used to determine effects from the proposed action.

Access Route Construction

Access route and landing construction would be needed to extract timber for salvage. The habitat effects from the road/route construction that occur outside of treatment units are analyzed as a separate treatment area and have been incorporated into the total habitat effects for the project (Table 12). The roads were buffered to create polygons to represent the effects from the road building and included in the proposed units GIS layer used to determine effects from the proposed action. Approximately 10 acres of spotted owl habitat would be removed from road/route construction. All other roads and openings are within treatment units or existing road beds.

Permanent Road Construction: A permanent route is an access road constructed on undisturbed terrain. These are intended for long-term used and will stay on the landscape. Construction includes clearing, grubbing, removing, and disposing of vegetation and debris from within established clearing limits. Work also includes construction of a width of approximately 40-60 foot wide area by excavation, embankment placement, leveling, grading, and outsloping. The proposed road would be designed per the *BLM Manual 9113-1 Roads Design Handbook (Rel. 9-388).* The new permanent road will be part of the designated transportation network system.

Temporary Route Construction: A temporary route is an access road constructed to minimum standards on undisturbed terrain, or existing footprints when feasible. These are intended for short-term use. Construction includes clearing, grubbing, removing, and disposing of vegetation and debris from within established clearing limits. Work also includes construction of a minimum width subgrade by excavating, placing embankment, leveling, grading, and outsloping. After use, the route would either be decommissioned (partially or fully), or obliterated. Partial decommissioning would include ripping and/or roughing up the surface, water barring, seeding, mulching and blocking. Some green tree

removal will occur where the proposed temporary routes are proposed and are incorporated into the effects analysis below.

Reconstruction of Existing Routes: Reconstruction of existing routes would occur on existing road prisms that were previously blocked, closed, or decommissioned, or are overgrown, and have not received periodic road maintenance. These routes also include re-opening fire lines that were blocked and rehabbed after the fire. The road would be made suitable for timber hauling by removing encroaching vegetation, repairing narrowed sections, and blading the road surface. The route would be made suitable for log haul by clearing, grubbing, and disposing of vegetation along with excavating and grading operations to establish a minimum width road prism. After use, the route would be decommissioned by ripping and/or roughing up the surface, water barring, seeding, mulching and blocking. This may involve clearing small diameter conifers within the road prism to allow for better hauling conditions.

Project Design Criteria and Conservation Measures

Project Design Criteria (PDC) are conservation measures developed to reduce disturbance impacts to listed species (Appendix A). Disturbance of listed wildlife species occurs when noise, smoke, vibration, or visual stimuli cause impairment of normal behavior. PDC are measures applied to project activities designed to avoid the potential adverse disturbance effects to nesting birds and their young. PDC that restrict activities to outside of the critical breeding season (Table 1) and/or occur beyond recommended disturbance distance thresholds will be incorporated into the Medford Douglas Salvage Project (Economic Recovery and Road/Fire Planning). PDC involving seasonal restrictions will be implemented unless surveys, following approved protocols, indicate either non-occupancy or non-nesting of target species. Seasonal restriction PDC will also be applied to unsurveyed NRF habitat (northern unsurveyed suitable habitat block) within the disturbance distance of proposed units.

Conservation measures for the Medford Douglas Salvage Project

(Economic Recovery and Roadside Safety and Fire Planning):

- Higher retention of large snags, including burned wolf trees, and large CWD would occur within high RHS habitat in critical habitat, 0.5 mile core areas of high priority sites (See Appendix C - RA 10 Site Prioritization Summary), and Del Norte salamander areas within the Douglas Fire Complex. Snag retention would be 1-5 snags/acre higher than the 1995 RMP standards for Matrix. In the Matrix LUA, CWD would be retained in order to meet RMP CWD standards. When stands are deficient in coarse woody debris (less than 120 feet of logs per acre greater than or equal to 16 inches in diameter and 16 feet long), merchantable material would be used to make up the deficit (USDI BLM 1995). Down wood is an important habitat feature for spotted owl prey species in southwest Oregon. Duskyfooted woodrats build stick nests, sometimes incorporating logs or the base of trees as part of the structure. Retained CWD in salvage units areas would provide some cover for prey species over time, and would help minimize harvest impacts to some prey species, such as dusky-footed woodrats, and provide long-term source of habitat structure.

- No salvage treatments are proposed in Known Spotted Owl Activity Centers (KSOAC) or Riparian Reserve land use allocations. Avoiding treatment in riparian will help mitigate potential adverse effects to northern spotted owls associated with this project because these

areas may serve as important refugia in the post-fire environment. Clark (2007) reported that in burned landscapes, owls were more likely to select habitats in areas of lower elevation and/or close to perennial streams where available.

- Project design followed the SW Oregon RA10 Principles to prioritize historical spotted owl sites to minimize effects to spotted owls (USDA FS/USDI BLM 2013). This prioritization of sites based on reproduction and occupancy, provides conservation of sites that provide the most support to spotted owl demography (USDI FWS 2011)
- RA 32 field evaluations are planned in areas with green tree removal (road and landing construction, anchor trees, yarding corridors, etc.). Attempts would be made to minimize potential yarding corridors and skid trails through RA32 stands. However, it is estimated that up to 2 acres of RA32 may be affected from yarding corridors and skid trail construction which would the function of the RA 32 stand. If more RA32 acres are located over this estimate, the BLM would attempt to re-located the yarding corridor or skid trail, or reinitiate consultation if the function of the RA32 would be compromised from the proposed action. Salvage would not occur in RA32 stands because the salvage units are planned in areas that burned at high and moderate burn severities and no longer have adequate numbers of habitat characteristics such as high canopy cover, multi-layers, large snags, large coarse woody debris, and decadence required to classify as RA32 (USDA FS/USDI BLM 2010).
- If new spotted owl sites are located during surveys, biologists will review PDC and the BO to confirm the ESA analysis remains valid. Timber sales have a contract clause (E-4) that authorizes stop work when threatened and endangered species are found in the timber sale or to comply with court orders. If or when a spotted owl or other listed species is found in the project area the timber operators are authorized to stop the work until the issue is evaluated further. If the impacts to the new site is no longer consistent with the analysis, the project will remain stopped until BLM completes one or more of the following:
  - Modifies the proposed action to ensure that impacts remain as described in the consultation documents. The BLM would evaluate if replacement acres could be added to the project if the owls moved from sites in this BA and the new impacts would be consistent with the analysis.
  - Imposes seasonal protections (if necessary);
  - Reinitiates and completes new consultation

Project Design Criteria continued

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

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

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

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

PDC for disturbance are intended to reduce disturbance to nesting spotted owls. For this consultation, potential disturbance could occur near either documented owl sites or projected owl sites. To estimate likely occupied habitat outside of known home ranges, nearest-neighbor distances and known spotted owl density estimates were utilized to "place" potential spotted owl occupied sites in suitable habitat

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

Mandatory Project Design Criteria

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

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

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

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

(I) Trees already on the ground in areas where large woody material is adequate;
(II) Trees that lack structural conditions (snags, cavities) suitable for spotted owls.

Appendix A-1. Mandatory Restriction Distances to Avoid Disturbance to Spotted Owl Sites

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

***** If below 1,500 feet above ground level

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

Recommended PDC

Recommended PDC will be incorporated during project implementation when practical. If recommended PDC cannot be incorporated, the project will still be in compliance with this BA.

- No NRF habitat removal will occur within 0.25 miles of any spotted owl site from March 1 through September 30, or until two (2) weeks after the fledging period, unless protocol surveys have determined owls are not present, are non-nesting, or nesting has failed.

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APPENDIX B. STATUS OF THE SPECIES, RANGE-WIDE HABITAT BASELINE AND STATUS OF 2012 REVISED CRITICAL HABITAT.

Status of the Species-Spotted Owl

Legal Status

The spotted owl was listed as threatened on June 26, 1990 due to widespread loss and adverse modification of suitable habitat across the owl's entire range and the inadequacy of existing regulatory mechanisms to conserve the owl (USDI FWS 1990a, p. 26114). The northern 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, p. 55). Priority numbers are assigned on a scale of 1C (highest) to 18 (lowest). The "C" reflects conflict with development, construction, or other economic activity (USDI FWS 1983, p. 43104). This number reflects a high degree of threat, a low potential for recovery, and the owl's taxonomic status as a subspecies (USDI FWS 1983, p. 51895). The most recent five year status review was completed on September 29, 2011, and did not propose changes to the listing status or introduce any new threats (USDI FWS 2011).

Life History

Taxonomy

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

Funk et al. (2008, pp. 1-11) tested the validity of the three current recognized subspecies of spotted owls and found them to be valid. During this genetics study, bi-directional hybridization and dispersal between northern spotted owls and California spotted owls centered in southern Oregon and northern California was discovered. In addition, a discovery of introregression of Mexican spotted owls into the northernmost parts of the northern spotted owl populations in Washington was made, indicating long-distance dispersal of Mexican spotted owls into the northern spotted owl range (Funk et al. 2008, pp. 1-11). Some hybridization of northern spotted owls with barred owls has been recorded (Hamer et al. 1994, pp. 487-491; Dark et al. 1998, pp. 50-56; Kelly 2001, pp. 33, 38).

Physical Description

The northern spotted owl is a medium-sized owl and is the largest of the three subspecies of spotted owls (Gutiérrez et al. 1995, p. 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 FWS 2011, p. A-1). 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 (Forsman 1981; Moen et al. 1991, p. 493). The northern spotted owl superficially resembles the barred owl, a species with which it occasionally hybridizes (Kelly and Forsman 2004, p. 807). Hybrids exhibit physical and vocal characteristics of both species (Hamer et al. 1994, p. 488).

Current and Historical Range

The current range of the spotted owl extends from southwest British Columbia through the Cascade Mountains, coastal ranges, and intervening forested lands in Washington, Oregon, and California, as far south as Marin County (USDI FWS 1990a, p. 26115). The range of the spotted owl is partitioned into 12 physiographic provinces (see Figure A-1) based on recognized landscape subdivisions exhibiting different physical and environmental features (USDI FWS 2011, p. III-1; Thomas et al. 1993). These provinces are distributed across the species' range as follows:

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

The spotted owl is extirpated or uncommon in certain areas such as southwestern Washington and British Columbia. Timber harvest activities have eliminated, reduced or fragmented spotted owl habitat sufficiently to decrease overall population densities across its range, particularly within the coastal provinces where habitat reduction has been concentrated (USDI FWS 2011, pp. B-1 to B-4; Thomas and Raphael 1993).

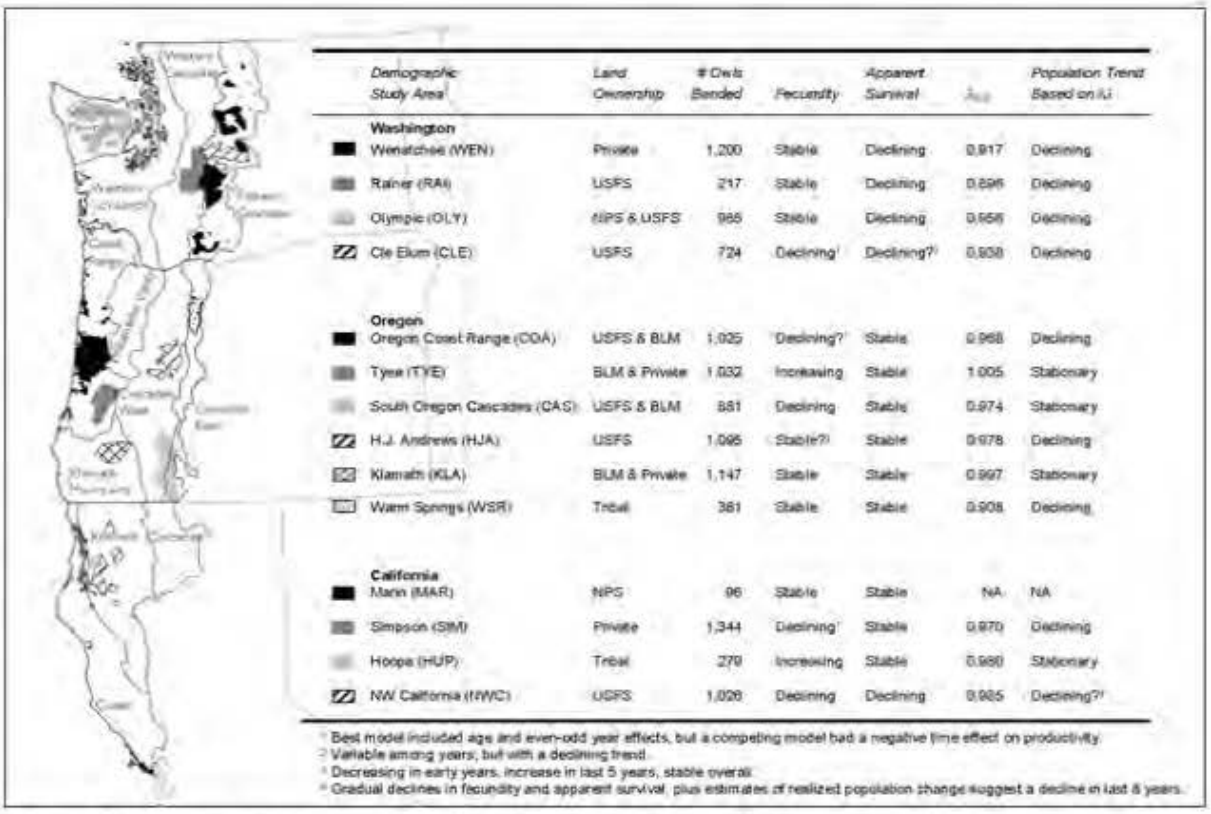
Behavior

Northern spotted owls are primarily nocturnal (Forsman et al. 1984, pp. 51-52) and spend virtually their entire lives beneath the forest canopy (Courtney et al. 2004, p. 2-5). They are adapted to maneuverability beneath the forest canopy rather than strong, sustained flight (Gutiérrez et al. 1995, p. 9). They forage between dusk and dawn and sleep during the day with peak activity occurring during the two hours after sunset and the two hours prior to sunrise (Gutiérrez et al. 1995, p. 5; Delaney et al. 1999, p. 44). They will sometimes take advantage of vulnerable prey near their roosts during the day (Laymon 1991, pp. 138-140; Sovern et al. 1994, p. 202).

Northern spotted owls seek sheltered roosts to avoid inclement weather, summer heat, and predation (Forsman 1975, pp. 105-106; Barrows and Barrows 1978; Barrows 1981; Forsman et al. 1984, pp. 29-30). Northern spotted owls become stressed at temperatures above 28°C, but there is no evidence to indicate that they have been directly killed by temperature because of their ability to thermoregulate by seeking out shady roosts in the forest understory on hot days (Barrows and Barrows 1978; Forsman et al. 1984, pp. 29-30, 54; Weathers et al. 2001, pp. 678, 684). During warm weather, spotted owls seek roosts in shady recesses of understory trees and occasionally will even roost on the ground (Barrows and Barrows 1978, pp. 3, 7-8; Barrows 1981, pp. 302-306, 308; Forsman et al. 1984, pp. 29-30, 54; Gutiérrez et al. 1995, p. 7). Glenn et al. (2010, p. 2549) found that population growth was negatively associated with hot summer temperatures at their southernmost study area in the southern Oregon Cascades, indicating that warm temperatures may still have an effect on the species. Both adults and

juveniles have been observed drinking water, primarily during the summer, which is thought to be associated with thermoregulation (Gutiérrez et al. 1995, p. 7).

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



Demographic Study Area	Land Ownership	# Owls Banded	Fecundity	Apparent Survival	λ_{avg}	Population Trend Based on λ_i
Washington						
Wenatchee (WEN)	Private	1,200	Stable	Declining	0.917	Declining
Rainier (RAI)	USFS	217	Stable	Declining	0.896	Declining
Olympic (OLY)	NPS & USFS	966	Stable	Declining	0.958	Declining
Cle Elum (CLE)	USFS	724	Declining[1]	Declining?[2]	0.938	Declining
Oregon						
Oregon Coast Range (COA)	USFS & BLM	1,025	Declining?	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	361	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 5 years.

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

Spotted owls are territorial; however, home ranges of adjacent pairs overlap (Forsman et al. 1984, p. 22; Solis and Gutiérrez 1990, p. 746) suggesting that the area defended is smaller than the area used for foraging. They will actively defend their nests and young from predators (Forsman 1975, p. 15; Gutiérrez et al. 1995, p. 11). 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, p. 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, p. 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, p. 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, p. 10).

Habitat Relationships

Home Range and Core Areas

Spotted owls are territorial raptors that range widely in search of prey but are 'anchored' during the breeding season to a nest site (central-place forager). Evaluations of spotted owl habitat are usually conducted at two spatial scales; the home range and core areas. The home range is the "area traversed by the individual in its normal activities of food gathering, mating, and caring for young" (Burt 1943:351, cited in USDI FWS 2009). Within home ranges, areas receiving concentrated use, typically surrounding the nest site and favored foraging areas, are called core areas. Because the size and pattern of NSO space use are typically unknown, estimates of use areas are derived from radio-telemetry studies. Results from Bingham and Noon (1997) showed that spotted owls typically used 20-21 percent of their home range as core use area habitat, which generally included 60-70 percent of the sites within their home range used during the breeding season. As central place foragers, nesting spotted owls are likely very sensitive to activities that occur within their core use areas and especially their nest patch (Swindle et al. 1997, Miller et al. 1989, and Meyer et al. 1998).

The habitat composition within cores and annual home ranges has been found to be directly correlated with demographic response such as occupancy, reproductive success, survival, and fitness. Meyer et al. (1998) examined landscape indices associated with spotted owl sites versus random plots on BLM lands throughout Oregon. Across provinces, landscape indices highly correlated with the probability of spotted owl occupancy included the percent older forest (30 percent) within the 500 acres (analogous to a core-use area) surrounding the site. Zabel et al. (2003) found for their northwest California study that the highest probability of owl occupancy occurred when the core use area comprised 69 percent nesting/roosting habitat. Bart (1995) found that core areas should contain 30-50 percent mature and old growth forest. Results from Thomas et al. (1990), Bart and Forsman (1992) Bart (1995) and Dugger et al (2005) suggest that when spotted owl home ranges have less than 40 to 60 percent NRF, they were more likely to have lower occupancy and fitness. Olson et al. (2005) found similar results on their Oregon Coast Ranges study area.

As further described in the 2009 FWS Guidelines (USDI FWS 2009, "Guidelines"), the probability of occupancy is increased when core areas contain a range of habitat conditions suitable for use by NSOs, and the survival and fitness of NSOs is positively correlated with larger patch sizes or proportion of older forests (Franklin et al. 2000, Dugger et al. 2005). The Guidelines express "the strongest type of information relevant to the evaluation of take relates to the fitness of NSOs to characteristics of their habitat." Depending on the availability of habitat, fitness may be compromised when additional habitat

degradation or losses occur. The final evaluation of incidental take is both a quantitative and qualitative analysis of the actual amount and distribution of habitat available to the NSO when compared to the effects of the proposed action

Recently developed habitat-fitness and landscape models have demonstrated the importance of having sufficient amounts of NRF habitat within core use areas to adequately provide for spotted owl survival and reproduction along with access to prey. For example, Franklin et al. (2000) found that the proportion of good habitat was around 60 percent to lesser quality habitat for owl core use areas in northwest California. In a recently published study of NSOs in the Oregon Klamath Province, survival was negatively correlated with forest fragmentation (Schilling et al. 2013).

Home-range sizes vary geographically, generally increasing from south to north, which is likely a response to differences in habitat quality (USDI FWS 1990a, p. 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, p. 194) to 14,211 acres on the Olympic Peninsula (USDI FWS 1994, p. 3). Zabel et al. (1995, p. 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, p. 22; Solis and Gutiérrez 1990, p. 746), suggesting that the defended area is smaller than the area used for foraging. 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, p. 134). Some studies have found that 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, p. iii). In Southern Oregon, one study found that home range and core areas remained essentially the same between seasons, concluding that perhaps this was due to the quality of available habitat (Schilling et al. 2013).

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

Habitat Use and Selection

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, p. 27; Forsman et al. 1984, pp. 15-16).

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, p. 19). Forested stands with high canopy closure also provide thermal cover (Weathers et al. 2001, p. 686) and protection from predators (Franklin et al. 2000, p. 578).

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, p. 30; Hershey et al. 1998, p. 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, p. 40; Buchanan et al. 1995, p. 1402; Hershey et al. 1998, p. 1404).

Roost sites selected by spotted owls have more complex vegetation structure than forests generally available to them (Barrows and Barrows 1978, p. 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.

Foraging habitat is the most variable of all habitats used by territorial spotted owls (Thomas et al. 1990; USDI FWS 2011, p. G-2). 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, p. 5). Foraging habitat for northern spotted owls provides a food supply for survival and reproduction. Foraging activity is positively associated with tree height diversity (North et al. 1999, p. 524), canopy closure (Irwin et al. 2000, p. 180; Courtney et al. 2004, pp. 5-15), snag volume, density of snags greater than 20 in (50 cm) dbh (North et al. 1999, p. 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. 1999, p. 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, p. 235; Forsman et al. 2004, pp. 372-373), but will forage in younger stands with high prey densities and access to prey (Carey et al. 1992, p. 247; Rosenberg and Anthony 1992, p. 165; Thome et al. 1999, pp. 56-57).

Dispersal habitat is essential to maintaining stable populations by filling territorial vacancies when resident northern 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 (USDI FWS 2011, p. G-1). Dispersal habitat may include younger and less diverse forest stands than foraging habitat, such as even-aged, pole-sized stands, but such stands should contain some roosting structures and foraging habitat to allow for temporary resting and feeding for dispersing juveniles (USDI FWS 2011, p. G-1). Forsman et al. (2002, p. 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, p. 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, p. 158; Diller and Thome 1999, p. 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, p. 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, p. 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, p. 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; Thomas et al. 1990; 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, p. 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, p. 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, p. 1038; Franklin et al. 2000, pp. 573-579; Meyer et al. 1998, p. 43). In Oregon Klamath and Western Oregon Cascade provinces, Dugger et al. (2005, p. 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, p. 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. In a large-scale demography modeling study, Forsman et al. (2011, pp. 1-2) found a positive correlation between the amount of suitable habitat and recruitment of young.

Reproductive Biology

The spotted owl is relatively long-lived, has a long reproductive life span, invests significantly in parental care, and exhibits high adult survivorship relative to other North American owls (Forsman et al. 1984; Gutiérrez et al. 1995, p. 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, p. 93; Franklin 1992, p. 821; Forsman et al. 2002,

p. 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 (USDI FWS 1990b; Forsman et al. 1984, pp. 32-34; Anthony et al. 2006, p. 28), and renesting after a failed nesting attempt is rare (Gutiérrez 1996, p. 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, p. 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, p. 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 (USDI FWS 1990a; Forsman et al. 1984, p. 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, p. 38). Telemetry and genetic studies indicate that close inbreeding between siblings or parents and their offspring is rare (Haig et al. 2001, p. 35; Forsman et al. 2002, p. 18). Hybridization of northern spotted owls with California spotted owls and barred owls has been confirmed through genetic research (Hamer et al. 1994, pp. 487-492; Gutiérrez et al. 1995, pp. 2-3; Dark et al. 1998, p. 52; Kelly 2001, pp. 33-35; Funk et al. 2008, pp. 161-171).

Dispersal Biology

Natal dispersal of spotted owls typically occurs in September and October with a few individuals dispersing in November and December (Miller et al. 1997; Forsman et al. 2002, p. 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, p. 143). The median natal dispersal distance is about 10 miles for males and 15.5 miles for females (Forsman et al. 2002, p. 16). Dispersing juvenile spotted owls experience high mortality rates, exceeding 70 percent in some studies (USDI FWS 1990a; Miller 1989, pp. 32-41). Known or suspected causes of mortality during dispersal include starvation, predation, and accidents (Miller 1989, pp. 41-44; USDI FWS 1990a; 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, p. 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, p. 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, p. 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, p. 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). In California spotted owls, a similar subspecies, the probability for dispersal was higher in younger owls, single owls, paired owls that lost mates, owls at low quality sites,

and owls that failed to reproduce in the preceding year (Blakesley et al. 2006, p.77). Both males and females dispersed at near equal distances (Blakesley et al. 2006, p. 76). In 72 percent of observed cases of dispersal, dispersal resulted in increased habitat quality (Blakesley et al. 2006, p. 77).

Dispersal can also be described as having two phases: transience and colonization (Courtney et al 2004, p. 5-13). Fragmented forest landscapes are more likely to be used by owls in the transience phase as a means to move rapidly between denser forest areas (Courtney et al 2004, p. 5-13; USDI FWS 2012a, p. 14086). Movements through mature and old growth forests occur during the colonization phase when birds are looking to become established in an area (Miller et al 1997, p. 144; Courtney et al 2004, p. 5-13). Transient dispersers use a wider variety of forest conditions for movements than colonizing dispersers, who require habitats resembling nesting/roosting/foraging habitats used by breeding birds (USDI FWS 2012a, p. 14086). Dispersal success is likely highest in mature and old growth forest stands where there is more likely to be adequate cover and food supply (USDI FWS 2012a, p. 14086).

Food Habits

Spotted owls are mostly nocturnal, although they also forage opportunistically during the day (Forsman et al. 1984, p. 51; 2004, pp. 222-223; Sovern et al. 1994, p. 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 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, p. 218; Ward et al. 1998, p. 84; Hamer et al. 2001, p. 224). 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, p. 218; Ward et al. 1998; p. 84; Hamer et al. 2001, p.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, p. 1720) showed a strong correlation between annual reproductive success of spotted owls (number of young per territory) and abundance of deer mice (*Peromyscus maniculatus*) ($r2 = 0.68$), 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, p. 1723). Ward (1990, p. 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, p. 148; 2004, pp. 218-219). In the southern portion of their range, where woodrats are a major component of their diet, northern spotted owls are more likely to use a variety of stands, including younger stands, brushy openings in older stands, and edges between forest types in response to higher prey density in some of these areas (Forsman et al. 1984, pp. 24-29).

Population Dynamics

The spotted owl is relatively long-lived, has a long reproductive life span, invests significantly in parental care, and exhibits high adult survivorship relative to other North American owls (Forsman et al. 1984; Gutiérrez et al. 1995, p. 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, p. 576).

Annual variation in population parameters for spotted owls has been linked to environmental influences at various life history stages (Franklin et al. 2000, p. 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, p. 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, p. 1). Annual variation in breeding may be related to weather (i.e., temperature and precipitation) (Wagner et al. 1996, p. 74; Zabel et al. 1996, p.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, p. 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.

Threats

The spotted owl was listed as threatened throughout its range "due to loss and adverse modification of suitable habitat as a result of timber harvesting and exacerbated by catastrophic events such as fire, volcanic eruption, and wind storms" (USDI FWS 1990a, p. 26114). More specifically, threats to the spotted owl included low populations, declining populations, limited habitat, declining habitat, inadequate distribution of habitat or populations, isolation of provinces, predation and competition, lack of coordinated conservation measures, and vulnerability to natural disturbance (USDI FWS 1992a, pp. 33-41). These threats were characterized for each province as severe, moderate, low, or unknown (USDI FWS 1992a, pp. 33-41). Declining habitat was recognized as a severe or moderate threat to the spotted owl throughout its range, isolation of populations was identified as a severe or moderate threat in 11 provinces, and a decline in population was a severe or moderate threat in 10 provinces. Together, these three factors represented the greatest concerns about range-wide conservation of the spotted owl. Limited habitat was considered a severe or moderate threat in nine provinces, and low populations were a severe or moderate concern in eight provinces, suggesting that these factors were also a concern

throughout the majority of the spotted owl's range. Vulnerability to natural disturbances was rated as low in five provinces.

The degree to which predation and competition might pose a threat to the spotted owl was unknown in more provinces than any of the other threats, indicating a need for additional information. Few empirical studies exist to confirm that habitat fragmentation contributes to increased levels of predation on spotted owls (Courtney et al. 2004, 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, p. 84; Laidig and Dobkin 1995, p. 155). As mature forests are harvested, great horned owls may colonize fragmented forests, thereby increasing spotted owl vulnerability to predation.

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

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

Threats, as identified in the 2011 Revised Recovery Plan for the Northern Spotted Owl, continue to emphasize that habitat loss and barred owls are the main threats to northern spotted owl recovery (USDI FWS 2011, Appendix B).

Barred Owls (Strix varia)

With its recent expansion to as far south as Marin County, California (Gutiérrez et al. 2004, pp. 7-12 to 7-13; Steger et al. 2006, p.226), 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, p.226) or habitat (Hamer et al. 1989, p.55; Dunbar et al. 1991, p. 467; Herter and Hicks 2000, p. 285; Pearson and Livezey 2003, p. 274). In addition, barred owls physically attack spotted owls (Pearson and Livezey 2003, p. 274), and circumstantial evidence strongly indicated that a barred owl killed a spotted owl (Leskiw and Gutiérrez 1998, p. 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, p. 46; Pearson and Livezey 2003, p. 267; Olson et al. 2005, p. 921). Recent research has shown that the two species of owls share similar habitats and are likely

competing for food resources (Hamer et al. 2001, p. 226). Research on barred owls and their interactions with northern spotted owls is lacking, but necessary to determine the specific effects barred owls may have on northern spotted owls and their habitat. Forsman et al. (2011, pp. 69-70) found that the presence of barred owls led to a decrease in fecundity, apparent survival, and caused a decline in populations in most of the demography study areas included in their large scale modeling effort. 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 evaluate quantitatively 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, though they are generalists, likely compete with northern spotted owls for prey resources (Hamer et al. 2001, p. 226; Gutiérrez et al. 2007, p. 187; Livezey and Fleming 2007, p. 319). The only study comparing northern spotted owl and barred owl food habits in the Pacific Northwest indicated that barred owl diets overlap strongly (76 percent) with northern spotted owl diets (Hamer et al. 2001, pp. 221, 226). Barred owl diets are more diverse than northern spotted owl diets and include species associated with riparian and other moist habitats (e.g. fish, invertebrates, frogs, and crayfish), along with more terrestrial and diurnal species (Smith et al. 1983; Hamer et al. 2001; Gronau 2005). Even though barred owls may be taking northern spotted owls' primary prey only as a generalist, northern spotted owls may be affected by a sufficient reduction in the density of these prey items due to barred owls, leading to a depletion of prey to the extent that the northern spotted owl cannot find an adequate amount of food to sustain maintenance or reproduction (Gutiérrez et al. 2007, p. 187; Livezey and Fleming 2007, p. 319).

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, p. 34; Iverson 1993, p.39). However, recent studies conducted in the Pacific Northwest show that barred owls frequently use mature and old-growth forests (Pearson and Livezey 2003, p. 270; Gremel 2005, Schmidt 2006, p. 1; Singleton et al. 2010, pp. 290-292). 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, p. 1).

The presence of barred owls has been reported to reduce spotted owl detectability, site occupancy, reproduction, and survival. Olson et al. (2005, p. 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, p. 51). Pearson and Livezey (2003, p. 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, p. 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. In contrast, Bailey et al. (2009, p. 2983), when using a two-species occupancy model, showed no evidence that barred owls excluded northern spotted owls from territories in Oregon. Most recently, preliminary results from a barred owl and northern spotted owl radio-telemetry study in Washington reported two northern spotted owls fleeing their territories and traveling six and 15 miles, believed to be as a result of frequent direct encounters with barred owls (Irwin et al. 2010, pp. 3-4). Both northern spotted owls were subsequently found dead (Irwin et al. 2010, p. 4).

Olson et al. (2004, p. 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, p. 89) was unfounded because of small sample sizes (Livezey 2005, p. 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 FWS 2011, p. B-11). Anthony et al. (2006, p. 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. Dugger et al. (2011, pp. 2463-2467) confirmed the synergistic effects of barred owls and territory habitat characteristics on extinction and colonization rates of territories by northern spotted owls. Extinction rates of northern spotted owl territories nearly tripled when barred owls were detected (Dugger et al. 2011, p. 2464).

Monitoring and management of northern spotted owls has become more complicated due to their possible reduced detectability when barred owls are present (Kelly et al. 2003, pp. 51-52; Courtney et al. 2004, p. 7-16 ; Olson et al. 2005, p. 929; Crozier et al. 2006, p.766-767). Evidence that northern spotted owls were responding less frequently during surveys led the Service and its many research partners to update the northern spotted owl survey protocol (USDI FWS 2012b). The recent changes to the northern spotted owl survey protocol were based on the probability of detecting northern spotted owls when barred owls are present.

In a recent analysis of more than 9,000 banded spotted owls throughout their range, only 47 hybrids were detected (Kelly and Forsman 2004, p. 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, p. 808).

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). In Oregon, Dugger et al. (2011, p. 2466) reported that some northern spotted owl pairs retained their territories and continued to survive and successfully reproduce during their study even when barred owls were present, but that the effects of reduced old growth forest in the core habitat areas were compounded when barred owls were present.

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. However, fire is often

considered a primary threat to spotted owls because of its potential to alter habitat rapidly (Bond et al. 2009, p. 1116) and is a major cause of habitat loss on Federal lands (Courtney et al. 2004, executive summary). Bond et al. (2002, p. 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, p. 1026). In a preliminary study conducted by Anthony and Andrews (2004, p. 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, p. 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, p. 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 understand further the relationship between fire and spotted owl habitat use. Overall, we can conclude that fires are a change agent for northern spotted owl habitat, but there are still many unknowns regarding how much fire benefits or adversely affects northern spotted owl habitat (USDI FWS 2011, p. III-31).

At the time of listing there was recognition that large-scale wildfire posed a threat to the spotted owl and its habitat (USDI FWS 1990a, p. 26183). New information suggests fire may be more of a threat than previously thought. In particular, the rate of habitat loss in the relatively dry East Cascades and Klamath provinces has been greater than expected (see "Habitat Trends" below). Moeur et al. (2005, p. 110) suggested that 12 percent of late-successional forest rangewide would likely be negatively impacted by wildfire during the first 5 decades of the Northwest Forest Plan. Currently, the overall total amount of habitat affected by wildfires has been relatively small (Lint 2005, p. 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, p. 77).

West Nile Virus

West Nile virus (WNV), caused by a virus in the family Flaviviridae, has killed millions of wild birds in North America since it arrived in 1999 (McLean et al. 2001; Caffrey 2003; Caffrey and Peterson 2003, pp. 7-8; Marra et al. 2004, p. 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, p. 3111; Komar et al. 2001). One captive spotted owl in Ontario, Canada, is known to have contracted WNV and died.

Health officials expect that WNV will eventually spread throughout the range of the spotted owl (Courtney et al. 2004; Blakesley et al. 2004, pp. 8-31), but it is unknown how WNV 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, breeding Eastern screech owls (*Megascops asio*) in Ohio 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). Some level of innate resistance may occur (Fitzgerald et al. 2003), which could explain observations in several species of markedly lower mortality in the second year of exposure to WNV (Caffrey and Peterson 2003). Wild birds also develop resistance to WNV through immune responses (Deubel et al. 2001). The effects of WNV on bird populations at a regional scale have not been large, even for susceptible species (Caffrey and Peterson 2003), perhaps due to the short-term and patchy distribution of mortality (K. McGowan, pers. comm., cited in Courtney et al. 2004) or annual changes in vector abundance and distribution.

Blakesley et al. (2004, pp. 8-35) offer competing propositions for the likely outcome of spotted owl populations being infected by WNV. One scenario is that spotted owls can tolerate severe, short-term population reductions due to WNV, because spotted owl populations are widely distributed and number in the several hundreds to thousands. An alternative 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. Thus far, no mortality in wild, northern spotted owls has been recorded; however, WNV is a potential threat of uncertain magnitude and effect (Blakesley et al. 2004, pp. 8-34).

Sudden Oak Death

Sudden oak death was recently identified as a potential threat to the spotted owl (Courtney et al. 2004). This disease is caused by the fungus-like pathogen, *Phytopthora ramorum* that was recently introduced from Europe and is rapidly spreading. The disease is now known to extend over 650 km from south of Big Sur, California to Curry County, Oregon (Rizzo and Garbelotto 2003, p. 198), and has reached epidemic proportions in oak (Quercus spp.) and tanoak (*Lithocarpus densiflorus*) forests along approximately 300 kilometers of the central and northern California coast (Rizzo et al. 2002, p. 733). 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, p. 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, p. 441). It has been found in several different forest types and at elevations from sea level to over 800 m. During a study completed between 2001 and 2003 in California, one-third to one-half of the hiker's present in the study area carried infected soil on their shoes (Davidson et al. 2005, p. 587), creating the potential for rapid spread of the disease. Sudden oak death poses a threat of uncertain proportion because of its potential impact on forest dynamics and alteration of key prey and spotted owl habitat components (e.g., hardwood trees - canopy closure and nest tree mortality); especially in the southern portion of the spotted owl's range (Courtney et al. 2004, pp. 11-8).

Inbreeding Depression, Genetic Isolation, and Reduced Genetic Diversity

Inbreeding and other genetic problems due to small population sizes were not considered an imminent threat to the spotted owl at the time of listing. Recent studies show no indication of reduced genetic variation and past bottlenecks in Washington, Oregon, or California (Barrowclough et al. 1999, p. 922; Haig et al. 2004, p. 36). 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). A 2004 study (Harestad et al. 2004, p. 13) indicates that the Canadian breeding population was estimated to be less than 33 pairs and annual population decline may be as high as 35 percent. In 2007, a recommendation was made by the Spotted Owl Population Enhancement Team to remove northern spotted owls from the wild in British Columbia (USDI FWS 2012a, p. 14078). This recommendation resulted in the eventual capture of the remaining 16 wild northern spotted owls in British Columbia for a captive breeding program (USDI FWS 2012a, p. 14078). 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.

Hybridization of northern spotted owls with California spotted owls, Mexican spotted owls, and barred owls has been confirmed through genetic research (Funk et al. 2008, p. 1; Hamer et al. 1994, p. 487; Gutiérrez et al. 1995, p. 3; Dark et al. 1998, p. 50; Kelly 2001, pp. 33-35).

Climate Change

Climate change, combined with effects from past management practices is influencing current forest ecosystem processes and dynamics by increasing the frequency and magnitude of wildfires, insect outbreaks, drought, and disease (USDI FWS 2011, pp. III-5 - III-11). In the Pacific Northwest, mean annual temperatures rose 0.8^{o} C (1.5^{o} F) in the 20th century and are expected to continue to warm from 0.1^{o} to 0.6^{o} C (0.2^{o} to 1^{o} F) per decade (Mote and Salathe 2010, p. 29). Climate change models generally predict warmer, wetter winters and hotter, drier summers and increased frequency of extreme weather events in the Pacific Northwest (Salathe et al. 2010, pp. 72-73).

Predicted climate changes in the Pacific Northwest have implications for forest disturbances that affect the quality and distribution of spotted owl habitat. Both the frequency and intensity of wildfires and insect outbreaks are expected to increase over the next century in the Pacific Northwest (Littell et al. 2010, p. 130). One of the largest projected effects on Pacific Northwest forests is likely to come from an increase in fire frequency, duration, and severity. Westerling et al. (2006, pp. 940-941) analyzed wildfires and found that since the mid-1980s, wildfire frequency in western forests has nearly quadrupled compared to the average of the period from 1970-1986. The total area burned is more than 6.5 times the previous level and the average length of the fire season during 1987-2003 was 78 days longer compared to 1978-1986 (Westerling et al. 2006, p. 941). The area burned annually by wildfires in the Pacific Northwest is expected to double or triple by the 2080s (Littell et al. 2010, p. 140). Wildfires are now the primary cause of spotted owl habitat loss on Federal lands, with over 236,000 acres of habitat loss attributed to wildfires from 1994 to 2007 (Davis et al. 2011, p. 123).

Potential changes in temperature and precipitation have important implications for spotted owl reproduction and survival. Wet, cold weather during the winter or nesting season, particularly the early nesting season, has been shown to negatively affect spotted owl reproduction (Olson et al. 2004, p. 1039, Dugger et al. 2005, p. 863), survival (Franklin et al. 2000 pp. 576-577, Olson et al. 2004, p. 1039, Glenn et al. 2011, p. 1279), and recruitment (Glenn et al. 2010, pp.2446-2547). Cold, wet weather may reduce reproduction and/or survival during the breeding season due to declines or decreased activity in small mammal populations so that less food is available during reproduction when metabolic demands

are high (Glenn et al. 2011, pp. 1288-1289). Cold, wet nesting seasons may increase the mortality of nestlings due to chilling and reduce the number of young fledged per pair per year (Franklin et al. 2000, p.557, Glenn et al. 2011, p. 1286).

Drought or hot temperatures during the summer have also been linked to reduced spotted owl recruitment (Glenn et al. 2010, p. 2549). Drier, warmer summers and drought conditions during the growing season strongly influence primary production in forests, food availability, and the population sizes of small mammals that spotted owls prey upon (Glenn et al. 2010, p. 2549).

In summary, climate change is likely to exacerbate some existing threats to the spotted owl such as the projected potential for increased habitat loss from drought-related fire, tree mortality, insects and disease, as well as affecting reproduction and survival during years of extreme weather.

Various types of changes in climate can have direct or indirect effects on species. These effects may be positive, neutral, or negative and they may change over time, depending on the species and other relevant considerations, such as the effects of interactions of climate with other variables (e.g., habitat fragmentation) (IPCC 2007, pp. 8–14, 18–19). For the more central portion of the northern spotted owl's range such as the location of the action area, climate models have provided a series of projections. For example, annual temperatures are likely to increase up to 3 degrees in the next couple of decades. Total precipitation may remain roughly similar to historic levels but likely increasing in the fall and winter months. Rising temperatures will cause snow to turn to rain in the lower elevations. As a result, the area is likely to experience more severe storm events, variable weather, higher and flashier winter and spring runoff events and increased flooding. Reduced snowpack and soil moisture along with hotter temperatures and longer fire seasons likely will increase significantly (Doppelt et al. 2008).

While a change in forest composition or extent is likely as a result of climate change, the rate of that change is uncertain. In forests with long-lived dominant tree species, mature individuals can survive these stresses, so direct effects of climate on forest composition and structure would most likely occur over a longer time scale (100 to 500 years) in some areas than disturbances such as wildfire or insect outbreaks (25 to 100 years) (McKenzie et al. 2009). The presence of high-quality habitat may buffer the negative effects of cold, wet, springs and winters on survival of spotted owls as well as ameliorate the effects of heat. This habitat might help maintain a stable prey base, thereby reducing the cost of foraging during the breeding season when energetic needs are high (Franklin et al. 2000).

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

Recovery implementation for spotted owls should, whenever feasible, look for opportunities where managing their habitat also meets other societal priorities concerning climate change. At this point though, it is unclear, what role, if any, Federal and State forest lands will ultimately play in mitigating climate change.

Disturbance

Northern spotted owls may also respond physiologically to a disturbance without exhibiting a significant behavioral response. In response to environmental stressors, vertebrates secrete stress hormones called corticosteroids (Campbell 1990, p. 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, p. 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, p. 1019). Recent studies of fecal corticosterone levels of northern spotted owls indicate that low intensity noise of short duration and minimal repetition does not elicit a physiological stress response (Tempel and Gutiérrez 2003, p. 698; Tempel and Gutiérrez 2004, p. 538). However, prolonged activities, such as those associated with timber harvest, may increase fecal corticosterone levels depending on their proximity to northern spotted owl core areas (Wasser et al. 1997, p.1021; Tempel and Gutiérrez 2004, p. 544).

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.

Information specific to behavioral responses of spotted owls to disturbance is limited, research indicates that recreational activity can cause Mexican spotted owls (*S. o. lucida*) to vacate otherwise suitable habitat (Swarthout and Steidl 2001, p. 314) and helicopter overflights can reduce prey delivery rates to nests (Delaney et al. 1999, p. 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, p. 14; Andersen et al. 1989, p. 296; McGarigal et al. 1991, p. 5).

Although it has not been conclusively demonstrated, it is anticipated that nesting spotted owls may be disturbed by heat and smoke as a result of burning activities during the breeding season.

Conservation Needs of the Spotted Owl

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

Habitat-specific Needs

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

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

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

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

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

Habitat-independent Needs

1. A coordinated research and adaptive management effort to better understand and manage competitive interactions between spotted and barred owls; and

2. Monitoring to understand better the risk that WNV and sudden oak death pose to spotted owls and, for WNV, research into methods that may reduce the likelihood or severity of outbreaks in spotted owl populations.

Conservation Strategy

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

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

Federal Contribution to Recovery

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

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

al. 1991), and the 1993 report of the Scientific Assessment Team (Thomas et. al. 1993). In addition, the 1992 Draft Recovery Plan for the Northern Spotted Owl (USDI FWS 1992b) was based on the ISC report.

The Forest Ecosystem Management Assessment Team predicted, based on expert opinion, the spotted owl population would decline in the Matrix land use allocation over time, while the population would stabilize and eventually increase within LSRs as habitat conditions improved over the next 50 to 100 years (Thomas and Raphael 1993, p. II-31; USDA FS/USDI BLM 1994a, 1994b, p. 3&4-229). Based on the results of the first decade of monitoring, Lint (2005, p. 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, p. 18; Noon and Blakesley 2006, p. 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, p. 6-34). The Revised Recovery Plan builds on the NWFP and recommends continued implementation of the NWFP and its standards and guides (USDI FWS 2011, p. I-1).

Under the NWFP, the agencies anticipated a decline of spotted owl populations during the first decade of implementation. Recent reports (Courtney et al. 2004; Anthony et al. 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, p. 9-12; Lint 2005, p. 87). Even with the population decline, Courtney et al (2004, p. 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 FWS 2004, p. 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.

On June 28, 2011 the Service published the Revised Recovery Plan for the Northern Spotted Owl (USDI FWS 2011). The recovery plan identifies threats from competition with barred owls, ongoing loss of northern spotted owl habitat as a result of timber harvest, loss or modification of northern spotted owl habitat from uncharacteristic wildfire, and loss of amount and distribution of northern spotted owl habitat as a result of past activities and disturbances (USDI FWS 2011, p. II-2 and Appendix B). To address these threats, the current recovery strategy identifies five main steps: 1) development of a range-wide habitat modeling framework; 2) barred owl management; 3) monitoring and research; 4) adaptive management; and 5) habitat conservation and active forest restoration (USDI FWS 2011, p. II-2). The recovery plan lists recovery actions that address each of these items, some of

which were retained from the 2008 recovery plan. The Managed Owl Conservation Areas and Conservation Support Areas recommended in the 2008 recovery plan are not a part of the recovery strategy outlined in the Revised Recovery Plan. The Service completed a range-wide, multi-step habitat modeling process to help evaluate and inform management decisions and critical habitat development (USDI FWS 2011, Appendix C).

The final recovery plan (USDI FWS 2011) recommended implementing a robust monitoring and research program for the spotted owl. The recovery plan encourages these efforts by laying out the following primary elements to evaluate progress toward meeting recovery criteria: monitoring spotted owl population trends, comprehensive barred owl research and monitoring, continued habitat monitoring; inventory of spotted owl distribution, and; explicit consideration for climate change mitigation goals consistent with recovery actions (USDI FWS 2011, p. II-5). The Revised Recovery Plan also strongly encourages land managers to be aggressive in the implementation of recovery actions. In other words, land managers should not be so conservative that, to avoid risk, they forego actions that are necessary to conserve the forest ecosystems that are necessary to the long-term conservation of the spotted owl. But they should also not be so aggressive that they subject spotted owls and their habitat to treatments where the long-term benefits do not clearly outweigh the short-term risks. Finding the appropriate balance to this dichotomy will remain an ongoing challenge for all who are engaged in spotted owl conservation (USDI FWS 2011, p. II-12). The Revised Recovery Plan estimates that recovery of the spotted owl could be achieved in approximately 30 years (USDI FWS 2011, p. II-3).

Spotted Owl Recovery Units

The 2011 Final Revised Recovery Plan for the Northern Spotted Owl determined that the 12 existing physiographic provinces meet the criteria for use as recovery units (USDI FWS 2011, p. III 1-2). Recovery criteria, as described in the 2011 Final Revised Recovery Plan (p. 11-3), are measurable and achievable goals that are believed to result through implementation of the recovery actions described in the recovery plan. Achievement of the recovery criteria will take time and are intended to be measured over the life of the plan, not on a short-term basis. The criteria are the same for all 12 identified recovery units. The four recovery criterion are: 1) stable population trend, 2) adequate population distribution, 3) continued maintenance and recruitment of northern spotted owl habitat, and 4) post-delisting monitoring (USDI FWS 2011, p III-3).

Conservation Efforts on Non-Federal Lands

In the report from the Interagency Scientific Committee (Thomas et al. 1990, p. 3, p. 272), the draft recovery plan (USDI FWS 1992b), and the report from the Forest Ecosystem Management Assessment Team (Thomas and Raphael 1993, p. 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 range-wide goal of achieving conservation and recovery of the spotted owl. The Service's primary expectations for private lands are for their contributions to demographic support (pair or cluster protection) to Federal lands, or their connectivity with Federal lands. 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 and ongoing conservation plans (CPs) including Habitat Conservation Plans (HCPs) and Safe Harbor Agreements (SHAs) that have incidental take permits issued for northern spotted owls—eight in Washington, three in Oregon, and six in California (USDI FWS 2011, p. A-15). The CPs range in size from 76 acres to more than 1.8 million acres, although not all acres are included

in the mitigation for northern spotted owls. In total, the CPs cover approximately 3 million acres (9.4 percent) of the 32 million acres of non-Federal forest lands in the range of the northern spotted owl. The period of time that the HCPs will be in place ranges from 20 to 100 years. While each CP 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 nesting habitat
- Forest harvest that maintains or develops foraging 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, p. 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, p. 9). Spotted owl-related HCPs in Washington generally were intended to provide demographic or connectivity support (USDI FWS 1992b, p. 272). There are over 2.1 million acres of land in six HCPs and two SHAs (USDI FWS 2011, p. A-15). Some of these CPs focus on providing nesting/roosting habitat throughout the area or in strategic locations; while others focus on providing connectivity through foraging habitat and/or dispersal habitat. In addition, there is a long term habitat management agreement covering 13,000 acres in which authorization of take was provided through an incidental take statement (section 7) associated with a Federal land exchange (USDI FWS 2011, p. A-15).

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, p. 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 FWS 2011, p. A-16). On July 27, 2010, the Service completed a programmatic SHA with the Oregon Department of Forestry that will enroll up to 50,000 acres of non-federal lands within the State over 50 years. The primary intent of this programmatic SHA is to increase time between harvests and to lightly to moderately thin younger forest stands that are currently not habitat to increase tree diameter and stand diversity (USDI FWS 2011, p. A-16).

California. The California State Forest Practice Rules, which govern timber harvest on private lands, require landowners to conduct spotted owl surveys for actions proposed in suitable habitat and to require specified habitat retention requirements around nest sites, core areas, and home ranges (California Department of Forestry and Fire Protection [CAL FIRE] 2007, pp. 85-87). Under the Forest Practice Rules, timber harvest plans cannot be approved if they are determined to likely result in incidental take of federally listed species, unless the take is authorized by a Federal incidental take permit (CAL FIRE 2007, pp. 85-87). Currently CAL FIRE is responsible for those determinations unless Service technical assistance is specifically requested. Three industrial timberland owners or managers operate under spotted owl management plans that have been reviewed by the U.S. Fish and Wildlife Service or CAL FIRE that outline basic measures for spotted owl protection specific to their

ownership, in accordance with state forest practice rules, and other state and Federal laws. One Habitat Conservation Plan (HCP) was recently approved for approximately 152,200 acres in the California Klamath and Southern Cascades ecological provinces of Northern California (Fruit Growers Supply Company). Elsewhere in the range, four HCPs and two Safe Harbor Agreements authorizing take of spotted owls have been approved; these agreements cover more than 622,000 acres of non-Federal lands. Implementation of these plans is intended to provide for spotted owl demographic and connectivity support to NWFP lands (USDI FWS 2011, p. A-16).

Rangewide Environmental Baseline

The environmental baseline 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, including all previously consulted on effects (USDI FWS/USDC NMFS 1998, pp. 4-19).

Habitat and Population Trends

Habitat Trends

The Service has used information provided by the USFS, BLM, and National Park Service to update the habitat baseline conditions by tracking relative habitat changes over time on Federal lands for northern spotted owls on several occasions, since the northern spotted owl was listed in 1990 (USDA FS/USDI BLM 1994b, USDI FWS 2001, Lint 2005, Davis et al. 2011). The estimate of 7.4 million acres used for the NWFP in 1994 (USDA FS/USDI BLM 1994b) was believed to be representative of the general amount of northern spotted owl habitat on NWFP lands at that time. The most recent mapping effort (Davis et al. 2011, Appendix D, Table D) indicates approximately 8.85 million acres of spotted owl nesting/roosting habitat existed on Federal lands and 4.19 million acres existed on non-federal lands at the beginning of the NWFP in 1994/1996. Davis et al. (2011, pp. 28-30) further evaluated changes in spotted owl nesting/roosting habitat using data from California that covered 14 years from 1994 to 2007, and data from Oregon and Washington that covered 10 years from 1996 to 2006. Although the spatial resolution of this new habitat map currently makes it unsuitable for tracking habitat effects at the scale of individual projects, the Service has evaluated the map for use in tracking provincial and range-wide habitat trends and now considers these data as the best available information on the distribution and abundance of extant spotted owl habitat within its range as of 2006 for Oregon and Washington, and 2007 for California, when the base imagery was collected.

Periodic range-wide evaluations of habitat, as compared to the Final Supplemental Environmental Impact Statement (FSEIS; USDA FS/USDI BLM 1994b), are necessary to determine if the rate of potential change to northern spotted owl habitat is consistent with the change anticipated in the NWFP: a reduction in suitable habitat of approximately 2.5 percent per decade (USDA FS/USDI BLM 1994a, p. 46). In particular, the Service considers habitat effects that are documented through the section 7 consultation process since 1994. In general, the analytical framework of these consultations focuses on the reserve and connectivity goals established by the NWFP land-use allocations (USDA FS/USDI BLM 1994a), with effects expressed in terms of changes in suitable northern spotted owl habitat within those land-use allocations.

In 2001, the Service conducted the first assessment of habitat baseline conditions since implementation of the NWFP (USDI FWS 2001). The Service determined that actions and effects were consistent with the expectations for implementation of the NWFP from 1994 to June 2001 (USDI FWS 2001). 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 are consistent with expected habitat

changes under the NWFP.

In February 2013, the Service adopted the 2006/07 satellite imagery data on spotted owl habitat as the new range-wide habitat baseline for Federal lands which effectively resets the timeframe for establishing changes in the distribution and abundance of spotted owl habitat. On that basis, the assessment of local, provincial and range-wide spotted owl habitat status in this and future Opinions as well as Biological Assessments will rely on these 2006/07 habitat data to characterize changes in the status of spotted owl habitat.

Service's Consultation Database

To update information considered in 2001 (USDI FWS 2001), the Service designed the Consultation Effects Tracking System database in 2002, which recorded impacts to northern spotted owls and their habitat at different spatial and temporal scales. In 2011, the Service replaced the Consultation Effects Tracking System with the Consulted on Effects Database located in the Service's Environmental Conservation Online System (ECOS). The ECOS Database corrected technical issues with the Consultation Effects Tracking System. Data are currently entered into the ECOS Database under various categories including; land management agency, land-use allocation, physiographic province, and type of habitat affected.

Range-wide Consultation Effects: 1994 to May 29, 2014

Between 1994 and May 29, 2014, the Service has consulted on the proposed removal/downgrade of approximately 686,092 acres or 7.8 percent of the 8.854 million acres of northern spotted owl nesting/roosting habitat estimated by Davis et al. (2011) to have occurred on Federal lands (Table B-1). These changes in suitable northern spotted owl habitat are consistent with the expectations for implementation of the NWFP, which anticipated a rate of habitat harvested at 2.5 percent per decade (USDA FS/USDI BLM 1994a).

The Service tracks habitat changes on non-NWFP lands through consultations for long-term Habitat Conservation Plans, Safe Harbor Agreements, or Tribal Forest Management Plans. Service consultations conducted since 1992 have documented the eventual loss of over 483,382 acres of habitat on non-NWFP lands. Most of these losses have yet to be realized because they are part of long-term HCPs. However, the NWFP 15 year monitoring report documented habitat losses on non-federal lands associated with timber harvest continues to occur at a rate of approximately 2 percent per year in Oregon and Washington, and at a lesser rate in California (Davis et al. 2011, pp. 123-124).

Table B-1. Range-wide Aggregate of Changes to NRF[1] Habitat Acres from Activities Subject to Section 7 Consultations and Other Causes (1994 to May 29, 2014). Thu May 29 10:18:19 MDT 2014

Land Ownership	Consulted On Habitat Changes[2]		Other Habitat Changes[3]	
	Removed/ Downgraded	Maintained/ Improved	Removed/ Downgraded	Maintained/ Improved
NWFP (FS,BLM,NPS)	202,710	545,477	249,794	39,720
Bureau of Indian Affairs / Tribes	111,662	28,372	2,398	0
Habitat Conservation Plans/Safe Harbor Agreements	303,007	14,539	N/A	N/A
Other Federal, State, County, Private Lands	68,713	28,447	2,392	0
Total Changes	**686,092**	**616,835**	**254,584**	**39,720**

Notes:

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

Range-wide Consultation Effects: 2006/2007 to May 29, 2014

The Service updated the ECOS Database to reflect the 2006/2007 habitat baseline developed for the NWFP 15-year monitoring report (Davis et al. 2011). This mapping effort accounted for habitat loss due to wildfire, harvest, insects and disease, and indicates approximately 8.555 million acres of spotted owl nesting/roosting habitat existed on Federal lands in 2006/2007. Because the data developed for the NWFP monitoring program is only current through 2006/2007, the Service continues to rely on information compiled in the spotted owl consultation database to summarize current owl habitat trends at provincial and range-wide scales.

Table B-2 summarizes the habitat impacts on Federal lands that have occurred since 2006/2007.

Habitat loss from Federal lands since 2006/2007 due to land management activities and natural events has varied among the individual provinces with most of the impacts concentrated within the 'Non-Reserves' land-use allocations relative to the 'Reserve' land-use allocations. When habitat loss is evaluated as a proportion of the affected acres range-wide, the most pronounced losses have occurred within Oregon (over 50 percent; especially within its Cascades West and Cascades East provinces, followed by California with the majority within the Klamath Province. In contrast, much smaller habitat losses have occurred in Washington. When habitat loss is evaluated as a proportion of provincial baselines, the Oregon Cascades East, and the California Klamath provinces have proportional losses greater than the loss of habitat across all provinces.

Table B-2. Summary of northern spotted owl suitable habitat (NRF) acres removed or downgraded as documented through Section 7 consultations on all Federal Lands within the Northwest Forest Plan area. Environmental baseline and summary of effects by State, Physiographic Province, and Land Use Function from 2006 to present. Thu May 29 16:38:38 MDT 2014

State	Physiographic Province[2]	Evaluation Baseline (2006/2007)[3]			Habitat Removed/Downgraded[4]							% Provincial Baseline Affected	% Range-wide Effects
					Land Management Effects			Habitat Loss from Natural Events			Total NRF removed/ downgraded		
		Nesting/ Roosting Acres in Reserves	Nesting/ Roosting Acres in Non-Reserves	Total Nesting Roosting Acres	Reserves[5]	Non-Reserves	Total	Reserves	Non-Reserves	Total			
WA	Eastern Cascades	462,400	181,100	643,500	2,700	2,238	4,938	1,559	132	1,691	6,629	1.03	6.17
	Olympic Peninsula	729,000	33,400	762,400	6	0	6	0	1	1	7	0	0.01
	Western Cascades	1,031,600	246,600	1,278,200	529	831	1,360	3	0	3	1,363	0.11	1.27
	Western Lowlands	24,300	0	24,300	0	0	0	0	0	0	0	0	0
OR	Cascades East	248,500	128,400	376,900	2,994	7,484	10,478	7,639	1,981	9,620	20,098	5.33	18.7
	Cascades West	1,275,200	939,600	2,214,800	1,183	22,995	24,178	0	0	0	24,178	1.09	22.5
	Coast Range	494,400	113,400	607,800	184	1,228	1,412	0	0	0	1,412	0.23	1.31
	Klamath Mountains	549,400	334,900	884,300	2,617	4,996	7,613	1,468	3,696	5,164	12,777	1.44	11.89
	Willamette Valley	700	2,600	3,300	0	0	0	0	0	0	0	0	0
CA	Cascades	101,700	102,900	204,600	10	1	11	325	0	325	336	0.16	0.31
	Coast	132,900	10,100	143,000	274	1	275	0	175	175	450	0.31	0.42
	Klamath	910,900	501,200	1,412,100	75	646	721	19,072	20,409	39,481	40,202	2.85	37.41
Total		**5,961,000**	**2,594,200**	**8,555,200**	**10,572**	**40,420**	**50,992**	**30,066**	**26,394**	**56,460**	**107,452**	**1.26**	**100**

Notes:

1. Nesting, roosting, foraging (NRF) habitat. In WA/OR, the values for Nesting/Roosting habitat generally represent the distribution of suitable owl habitat, including foraging habitat. In CA, foraging habitat occurs in a much broader range of forest types than what is represented by nesting/roosting habitat. Baseline information for foraging habitat as a separate category in CA is currently not available at a provincial scale.
2. Defined in the Revised Recovery Plan for the Northern Spotted Owl (USDI FWS 2011) as Recovery Units as depicted on page A-3.
3. Spotted owl nesting and roosting habitat on all Federal lands (includes USFS, BLM, NPS, DoD, USFWS, etc.) as reported by Davis et al. 2011 for the the Northwest Forest Plan 15-Year Monitoring Report (PNW-GTR-80, Appendix D). NR habitat acres are approximate values based on 2006 (OR/WA) and 2007 (CA) satellite imagery.
4. Estimated NRF habitat removed or downgraded from land management (timber sales) or natural events (wildfires) as documented through section 7 consultation or technical assistance. Effects reported here include all acres removed or downgraded from 2006 to present. Effects in California reported here only include effects to Nesting/Roosting habitat. Foraging habitat removed or downgraded in California is not summarized in this table.
5. Reserve land use allocations under the NWFP intended to provide demographic support for spotted owls include LSR, MLSA, and CRA. Non-reserve allocations under the NWFP intended to provide dispersal connectivity between reserves include AWA, AMA, and MX.

Of the total Federal acres consulted on for 'Habitat Removed/Downgraded', approximately 50,992 acres or 0.60 percent of 8.55 million acres of northern spotted owl habitat were removed/downgraded as a result of land management activities (Table B-3). Of these, about 46,498 acres were a result of timber harvest. Northern spotted owl habitat lost due to 'Natural Events' (e.g., wildfires, wind throw, disease) is one of the primary threats to the species. Range-wide, approximately 56,460 acres have been lost, with the California Klamath province contributing the majority (39,481 acres or 77 percent) of habitat lost, followed by the Oregon Cascades East province (9,620 acres or 19 percent).

Table B-3: Summary of northern spotted owl suitable habitat (NRF)1 acres removed or downgraded on Federal lands within the Northwest Forest Plan area through timber harvest, natural disturbance, or other management actions as documented through section 7 consultation and technical assistance. Range-wide changes by land-use function from 2006 to May 29, 2014.
Thu May 29 10:59:47 MDT 2014

Suitable Habitat (NRF) Effects	Reserves (LSR, MLSA, CRA)[3]	Non-reserves (AWA, AMA, Matrix)[3]	Totals
Evaluation Baseline (2006/2007)[2]	5,961,000	2,594,200	8,555,200
Removed/Downgraded (timber harvest only)[4]	8,100	38,398	46,498
Removed/Downgraded (other management activities)[5]	2,472	2,022	4,494
Subtotal	10,572	40,420	50,992
Removed/Downgraded (natural disturbance)[6]	28,598	22,698	51,296
Total Net Change	39,170	63,118	102,288
Baseline Balance	**5,921,830**	**2,531,082**	**8,452,912**
Habitat Maintained[7]	37,136	60,373	97,509

Notes:

1. Nesting, roosting, foraging (NRF) habitat. In WA/OR, the values for Nesting/Roosting habitat generally represent the distribution of suitable owl habitat, including foraging habitat. In CA, foraging habitat occurs in a much broader range of forest types than what is represented by nesting/roosting habitat. Baseline information for foraging habitat as a separate category in CA is currently not available at a provincial scale. Effects to spotted owl habitat in California reported here include effects to Nesting/Roosting habitat only. Foraging habitat removed or downgraded in California is not summarized in this table.
2. Spotted owl nesting and roosting habitat on all Federal lands (includes USFS, BLM, NPS, DoD, USFWS, etc.) as reported by Davis et al. 2011 for the the Northwest Forest Plan 15-Year Monitoring Report (PNW-GTR-80, Appendix D). NR habitat acres are approximate values based on 2006 (OR/WA) and 2007 (CA) imagery.
3. Reserve land use allocations under the NWFP intended to provide demographic support for spotted owls include LSR, MLSA, and CRA. Non-reserve allocations under the NWFP intended to provide dispersal connectivity between reserves include AWA, AMA, and MX.
4. NRF habitat removed or downgraded from timber harvest on Federal lands.
5. NRF habitat removed or downgraded from recreation, roads, minerals, or other non-timber programs.
6. NRF habitat losses resulting from wildfires, insect and disease, windthrow or other natural causes.
7. Habitat maintained means that stands have been modified by management, but the habitat function remains the same.

Other Habitat Trend Assessments

In 2005, the Washington Department of Wildlife released the report, "An Assessment of Spotted Owl Habitat on Non-Federal Lands in Washington between 1996 and 2004" (Pierce et al. 2005). This study

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

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

In 2011, Davis et al. produced the second in a series of monitoring reports on northern spotted owl population and habitat trends on Northwest Forest Plan administered lands. They summarized demographic analyses from Forsman et al. (2011) discussed below under trends in numbers, distribution and reproduction, and reported on a new effort using remotely sensed data from 1994 to 2007 to develop “habitat suitability” models, and ultimately suitable habitat maps for the entire range of the northern spotted owl for each of these time periods. They also created change-detection maps and reported on the cause of habitat change during this time period. The authors suggest that because of improvements in remotely sensed vegetation, and change-detection mapping, their habitat maps represent the best available information and should replace the baseline versions used for the first monitoring report. Davis et al. (2011) estimated 8.9 million acres of suitable habitat for the 1994 baseline map, as compared to 7.4 million acres estimated by FEMAT in 1994, and 10.3 million acres estimated by Davis and Lint (2005) for the 10-year report.

Davis et al. (2011) were not able to report on gains in nesting/roosting habitat suitability due to issues with current technology, and the need for additional time to capture the slow process of forest succession. However, they were able to report on gains in recruitment of younger forests or dispersal

habitat. They estimated a gain of about 1.26 million ac of dispersal habitat, with the greatest increases in non-reserves than reserves. The largest increase in dispersal habitat was in the Oregon Coast Range province.

Davis et al. (2011) estimated that nesting/roosting habitat declined by 3.4 percent (298,600 ac) rangewide on federal lands since 1994, which is less than the anticipated rate of habitat loss under the NWFP of 5 percent per decade. Most of the loss (79 percent) occurred within reserves and was the result of wildfires. Wildfires also were responsible for about half of the loss in non-reserves. Timber harvest accounted for about 45 percent (37,400 ac) in non-reserves, and 7 percent (16,000 ac) in reserves. The Oregon Klamath province lost the most nesting/roosting habitat (93,730 ac) due to the Biscuit Fire in 2002. They estimated a range-wide loss of about 417,000 ac of dispersal habitat, but like nesting/roosting habitat, most of the loss of dispersal habitat was due to wildfire.

Davis et al. (2011) created a wildfire suitability (likelihood) map for large fires throughout the range of the northern spotted owl. Their goal was to identify landscape-scale areas where large wildfires are more probable. They report that the California Klamath province has the most owl habitat in fire-prone landscapes, followed by the Oregon Western Cascades and Oregon Klamath provinces.

Population Trends and Distribution

There are no estimates of the historical population size and distribution of spotted owls, although they are believed to have inhabited most old-growth forests throughout the Pacific Northwest prior to modern settlement (mid-1800s), including northwestern California (USDI FWS 1989, pp. 2-17).

The current range of the spotted owl extends from southwest British Columbia through the Cascade Mountains, coastal ranges, and intervening forested lands in Washington, Oregon, and California, as far south as Marin County (USDI FWS 1990a, p. 26114). The range of the spotted owl is partitioned into 12 physiographic provinces (Figure 1) based on recognized landscape subdivisions exhibiting different physical and environmental features (USDI FWS 1992a, p. 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 FWS 1995, p. 9495). The actual number of currently occupied spotted owl locations across the range is unknown because many areas remain unsurveyed (USDI FWS 2011, p. A-2). 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 above represent the cumulative number of locations recorded in the three states, not population estimates.

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

In January 2009, two meta-analyses modeled rates of population change for up to 24 years using the re-parameterized Jolly-Seber method (λ_{RJS}). One meta-analysis modeled the 11 long-term study areas (Table B-4), while the other modeled the eight study areas that are part of the effectiveness monitoring program of the NWFP (Forsman et al. 2011, pp. 65-67).

Table B-4. Summary of spotted owl population trends from in demographic study areas (Forsman et al. 2011, p. 65).

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

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

Point estimates of λRJS were all below 1.0 and ranged from 0.929 to 0.996 for the 11 long-term study areas. There was strong evidence that populations declined on 7 of the 11 areas (Forsman et al. 2011, p. 65), these areas included Rainier, Olympic, Cle Elum, Coast Range, HJ Andrews, Northwest California and Green Diamond. On other four areas (Tyee, Klamath, Southern Cascades, and Hoopa), populations were either stable, or the precision of the estimates was not sufficient to detect declines.

The weighted mean λRJS for all of the 11 study areas was 0.971 (standard error [SE] = 0.007, 95 percent confidence interval [CI] = 0.960 to 0.983), which indicated an average population decline of 2.9 percent per year from 1985 to 2006. This is a lower rate of decline than the 3.7 percent reported by Anthony et al. (2006, p. 23), but the rates are not directly comparable because Anthony et al. (2006) examined a different series of years and because two of the study areas in their analysis were discontinued and not included in Forsman et al. (2011, p. 65). Forsman et al. (2011, p. 65) explains that

the indication populations were declining was based on the fact that the 95 percent confidence intervals around the estimate of mean lambda did not overlap 1.0 (stable) or barely included 1.0.

The mean λRJS for the eight demographic monitoring areas (Cle Elum, Olympic, Coast Range, HJ Andrews, Tyee, Klamath, Southern Cascades and Northwest California) that are part of the effectiveness monitoring program of the NWFP was 0.972 (SE = 0.006, 95 percent CI = 0.958 to 0.985), which indicated an estimated decline of 2.8 percent per year on Federal lands with the range of the spotted owl (Forsman et al. 2011, p. 67). The weighted mean estimate λRJS for the other three study areas (Rainier, Hoopa and Green Diamond) was 0.969 (SE = 0.016, 95 percent CI = 0.938 to 1.000), yielding an estimated average decline of 3.1 percent per year. These data suggest that demographic rates for spotted owl populations on Federal lands were somewhat better than elsewhere; however, this comparison is confounded by the interspersion of non-Federal land in study areas and the likelihood that spotted owls use habitat on multiple ownerships in some demography study areas.

The number of populations that declined and the rate at which they have declined are noteworthy, particularly the precipitous declines in the Olympic, Cle Elum, and Rainier study areas in Washington and the Coast Range study area in Oregon. Estimates of population declines in these areas ranged from 40 to 60 percent during the study period through 2006 (Forsman et al. 2011, p. 66). Spotted owl populations on the HJ Andrews, Northwest California, and Green Diamond study areas declined by 20-30 percent whereas the Tyee, Klamath, Southern Cascades, and Hoopa study areas showed declines of 5 to 15 percent (Forsman et al. 2011, p. 66).

Decreases in adult apparent survival rates were an important factor contributing to decreasing population trends. Forsman et al. (2011, pp. 65-66) found apparent survival rates were declining on 10 of the study area with the Klamath study area in Oregon being the exception. Estimated declines in adult survival were most precipitous in Washington where apparent survival rates were less than 80 percent in recent years, a rate that may not allow for sustainable populations (Forsman et al. 2011, p. 66). In addition, declines in adult survival for study areas in Oregon have occurred predominately within the last five years and were not observed in the previous analysis by Anthony et al. (2006). Forsman et al. (2011, p. 64) express concern for the decline in adult survival rates across the subspecies range because spotted owl populations are most sensitive to changes in adult survival.

There are few spotted owls remaining in British Columbia. Chutter et al. (2004, p. v) suggested immediate action was required to improve the likelihood of recovering the spotted owl population in British Columbia. In 2007, personnel in British Columbia captured and brought into captivity the remaining 16 known wild spotted owls (USFWS 2011, p. A-6). 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, p. v). The amount of previous interaction between spotted owls in Canada and the United States is unknown.

STATUS OF SPOTTED OWL CRITICAL HABITAT

Legal Status

On January 15, 1992, the Service designated spotted owl critical habitat within 190 critical habitat units which encompassed nearly 6.9 million acres of Federal lands in California, Oregon, and Washington (USDI FWS 1992b). In 2008 the Service revised spotted owl critical habitat into 29 units, comprising 174 sub-units, on approximately 5,312,300 acres of Federal lands in California, Oregon, and

Washington (USDI FWS 2008) in a geographic manner designed to protect clusters of reproductively-capable spotted owls and facilitate demographic interchange. On December 4, 2012, consistent with the best scientific data available, the standards of the Act and applicable regulations, the Service published a final rule (USDI FWS 2012a) designating 9,577,969 ac (Glenn pers. comm.) in 11 units and 60 subunits in California, Oregon, and Washington that meet the definition of critical habitat. The final rule became effective January 3, 2013.

Purpose and Intent

Through designation of revised critical habitat, the Service has encouraged land managers to consider implementation of forest management practices recommended in the Revised Recovery Plan (USDI FWS 2012a) to restore natural ecological processes where they have been disrupted or suppressed (*e.g.*, natural fire regimes), and application of ecological forestry management practices (e.g., Franklin et al. 2007, entire) within critical habitat to reduce the potential for adverse impacts associated with commercial timber harvest when such harvest is planned within or adjacent to critical habitat. In the final rule, the Service encourages land managers to consider the conservation of existing high-quality spotted owl habitat, the restoration of forest ecosystem health, and the ecological forestry management practices recommended in the Revised Recovery Plan that are compatible with both the goals of spotted owl recovery and Standards and Guidelines of the Forest Plan.

The final revised critical habitat designation is based on the current status and recent scientific research on spotted owl populations. The Service used the best scientific information available to identify those specific areas within the geographical area occupied by the species at the time it was listed on which are found those physical or biological features essential to the conservation of the species, and which may require special management considerations or protection. For the spotted owl, these features include particular forest types that are used or likely to be used by spotted owls for nesting, roosting, foraging, or dispersing habitat. In addition, the Service used the best available information to identify those areas that are otherwise determined to be essential to the conservation of the species.

Relying on the recovery criteria set forth in the Revised Recovery Plan to determine what is essential to the conservation of the species the Service identified a habitat network that meets the following criteria:

- Ensures sufficient habitat to support stable, healthy populations across the range, and also within each of the 11 recovery units;
- Ensures distribution of spotted owl populations across the range of habitat conditions used by the species;
- Incorporates uncertainty, including potential effects of barred owls, climate change, and wildfire disturbance risk; and
- Recognizes that these protections are meant to work in concert with other recovery actions, such as barred owl (*Strix varia*) management.

The Service integrated habitat and demographic information relating to occupancy, survival, reproduction, and movement to develop a modeling tool that assesses the distribution of habitat quality and population dynamics across the range, and provides a more accurate picture of where high-quality spotted owl habitat exists. This model synthesized more than 20 years of data from on-the-ground demographic surveys, and allowed for analysis of how spotted owl populations would fare under different habitat conservation scenarios. The Service determined what is essential to recovery of the spotted owl by evaluating the performance of each potential critical habitat scenario considered against the recovery needs of the owl.

Primary Constituent Elements (PCEs)

The PCEs in the final rule (USDI FWS 2012a) are described as: (i) forest types in early-, mid-, or late-seral stages that support the spotted owl across its geographical range, and that occur in concert with (ii) habitat that provides for spotted owl nesting and roosting; or (iii) habitat that provides for spotted owl foraging, which varies widely across the spotted owl's range, in accordance with ecological conditions and disturbance regimes that influence vegetation structure and prey species distributions; or (iv) habitat that supports the transience and colonization phases of spotted owl dispersal, which in all cases would optimally be composed of spotted owl nesting, roosting, or foraging habitat (PCEs ii or iii above), but which may also be composed of other forest types that occur between larger blocks of nesting, roosting, and foraging habitat.

Conservation Role of Critical Habitat

Section 2 of the Act states, "The purposes of this Act are to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved. Although the conservation of the listed species is the specific objective of a critical habitat designation, the essential physical or biological features that serve as the basis of critical habitat are often essential components of the ecosystem upon which the species depends. In such cases, a fundamental goal of critical habitat management is not only to conserve the listed species, but also to conserve the ecosystem upon which that species depends." This is the case with the spotted owl.

An ecosystem is defined as a biological community of interacting organisms and their physical environment, or as the complex of a community of organisms and its environment functioning as an ecological unit (Krebs 1972, pp. 10–11; Ricklefs 1979, pp. 31–32, 869). These ecosystem interactions and functions are often referred to as ecological relationships or processes. Thus, to conserve the spotted owl as directed by the Act, one must also conserve the ecological processes that occur within the ecological landscape inhabited by the species. These processes—such as vegetation succession, forest fire regimes, and nutrient cycling—create and shape the physical or biological features that form the foundation of critical habitat. The spotted owl was initially listed as a threatened species largely due to the loss or degradation of the late-successional forest ecosystems upon which it depends. A complex interaction of physical or biological factors contribute to the development and maintenance of these ecosystems, which in turn provide the spotted owl with the environmental conditions required for its conservation and survival, such as large areas of suitable habitat, nest structures, and sufficient prey to sustain interconnected populations of owls across the landscape. A *fundamental goal of critical habitat management should thus be* to understand, describe, and conserve these processes, which in turn will maintain the physical or biological features essential to the conservation of the species. This ecosystem approach will ultimately have the highest likelihood of conserving listed species such as the spotted owl in the long term (Knight 1998, p. 43).

The current condition of spotted owl critical habitat is described in Table B-5.

Table B-5. Spotted Owl Critical Habitat Environmental Baseline and Summary of Effects by State, Physiographic Province and Land Use Allocation as documented through Section 7 Consultations on Northwest Forest Plan (NWFP) Lands (FWS reference # 01EOFW00-2014-F-0053.

Thu May 29 11:09:45 MDT 2014

Physiographic Province[2]		Evaluation Baseline		Habitat Removed/Downgraded					% Provincial Baseline Affected	% Range-wide Effects
				Land Use Allocations[5]			Habitat Loss to Natural Events	Total		
		Total Designated Critical Habitat Acres[3]	Nesting/Roosting Acres[4]	Reserves	Non-Reserves	Total				
WA	**Eastern Cascades**	1,022,960	416,069	265	0	265	0	265	0.06	2.76
	Olympic Peninsula	507,165	238,390	6	0	6	0	6	0.00	0.06
	Western Cascades	1,387,567	667,173	18	0	18	0	18	0.00	0.19
OR	**Cascades East**	529,652	181,065	887	1,262	2,149	0	2,149	1.19	22.42
	Cascades West	1,965,407	1,161,780	244	2,724	2,968	0	2,968	0.26	30.96
	Coast Range	1,151,874	535,602	1	819	820	0	820	0.15	8.55
	Klamath Mountains	911,681	481,577	1,292	533	1,825	1,535	3,360	0.70	35.05
CA	**Cascades**	243,205	98,243	0	0	0	0	0	0.00	0.00
	Coast	149,044	58,278	0	0	0	0	0	0.00	0.00
	Klamath	1,708,787	752,131	0	0	0	0	0	0.00	0.00
Total		**9,577,342**	**4,590,308**	**2,713**	**5,338**	**8,051**	**1,535**	**9,586**	**0.10%**	**100%**

Notes:

1. Nesting, roosting, foraging (NRF) habitat. In California, suitable habitat is divided into two components; nesting - roosting (NR) habitat, and foraging (F) habitat. The NR component in CA most closely resembles NRF habitat in Oregon and Washington.
2. Defined in the Revised Recovery Plan for the Northern Spotted Owl (USDI FWS 2011) as Recovery Units as depicted on page A-3.
3. Northern spotted owl critical habitat as designated December 4, 2012 (77 FR 71876). Total designated critical habitat acres listed here (9,577,342 acres) are derived from GIS data, and vary slightly from the total acres (9,577,969 acres) listed in the Federal Register (-627 acres).
4. Calculated from GIS data for spotted owl Nesting/Roosting habitat generated by Davis et al. 2011 for the Northwest Forest Plan 15-year Monitoring Report (PNW-GTR-850). NR habitat acres are approximate values based on 2006 (OR/WA) and 2007 (CA) satellite imagery.
5. Reserve land use allocations under the NWFP intended to provide demographic support for spotted owls include LSR, MLSA, and CRA. Non-reserve allocations under the NWFP intended to provide dispersal connectivity between reserves include AWA, AMA, and MX.

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Personal Communication

Glenn, Elizabeth, FWS Biologist, Personal Communication, 2012

APPENDIX C. EFFECTS OF WILDFIRE ON NORTHERN SPOTTED OWL AND ITS HABITAT[1]

The purpose of this Appendix is inform and help evaluate the effects of wildfire on the spotted owl and its habitat because there are many influences on how spotted owls may use post-fire landscapes, and the likely or expected response of the species to post-fire management activities. This approach suggests two steps in which you: 1) update the pre-fire environmental baseline using existing literature to aid in evaluating the effects of fire to the pre-fire spotted owl occupancy, habitat use and habitat availability within the action area; and 2) evaluate the effects of the project on the established post-fire baseline habitat conditions and best available information spotted owl occupancy and habitat use. This framework establishes the assumptions (and uncertainties) on which we base our analysis of the effects. Consistent with habitat-based effects analyses for un-surveyed landscapes, where surveys of spotted owl habitat in the Action Area are not current, potentially occupancy of an area should consider the extent of patches of habitat of sufficient size, and amount and quality that may confer occupancy (see Spotted Owl Resource Use or Status of the Species sections of the Opinion). As always, site specific conditions, in as much as possible, should be used to inform spotted owl occupancy, habitat use, and potential effects to the species.

Fire Effects on Spotted Owls

Research on all three spotted owl subspecies (northern, California, and Mexican) indicates variability and a high level of uncertainty in the degree to which spotted owls use post-fire landscapes. Comprehensive analyses of the effects of fire on northern spotted owl use and occupancy within a landscape, especially the small scale effects to pairs or individuals, are largely absent or inconclusive. This is due, in part, to the stochastic nature of wildfire and the difficulty of empirically testing hypotheses regarding pre and post fire responses of forests and organisms of interest including spotted owls. The studies that have been undertaken are constrained by small sample sizes and must often use comparative assumptions to look at post-fire habitat use. Few case studies have been able to compare pre- and post-fire habitat use and these studies are not directly comparable to each other. Large differences in landscapes and high degrees of variability exist between studies; spatial arrangement of suitable habitat, locations of activity centers, burn severities and scales, pre-fire forest management, post-fire forest management, and myriad other factors combine to reduce the certainty or applicability of site-specific results of observational studies to projects being proposed.

For purposes of this analysis we rely on general patterns observed and reported in the literature to base our understanding of spotted owl use of burned landscapes, and to assess the likely effects of post-fire management activities, such as salvage, fuels reductions, or hazard tree mitigation on spotted owls.

One characteristic shared by most, if not all of the studies published on spotted owl use of burned areas is they suffer from low sample size issues. Due to this, results from research into the effects of wildfire on all three subspecies of spotted owls are often combined in order to achieve sufficient sample size and statistical power to detect differences between paired analyses (pre- and post-fire, unburned versus burned) (Bond et al. 2002, Lee et al. 2012). To increase statistical power the factors evaluated have also been lumped into increasingly broader categories (i.e. burned vs. unburned, occupied vs. unoccupied, logged versus unlogged). While this may increase statistical power in data analysis, our

ability to evaluate project-level effects at fine scales is somewhat limited by the small number of studies, which all suffer from low sample sizes. However, the Service must consider and weigh best available information in evaluating effects to the species.

Population level effects

Responses such as shifts in home ranges or disproportional use of variably burned areas in some cases can be difficult to predict and the uncertainty is compounded by the wide array of post-fire treatments that may be applied. While Bond et al. (2002) and Lee et al. (2012) suggest similar occupancy, survival, and extinction rates between burned and unburned territories, or pre- and post-fire use of known territories, the detail in how and why spotted owls used the post-fire landscapes was not discernible in those studies. For instance, Lee et al. (2012) only required one nighttime observation 1 to 3 years post-fire within the general area of a Primary Activity Center (PAC) to classify an Activity Center as "occupied." While this study suggests some site fidelity and habitat suitability 1-3 years post-fire, the methodology cannot determine if spotted owls shifted their use to unburned areas within the PAC, nor was it long enough in duration to determine if spotted owls would avoid burned areas in subsequent years. Important questions regarding persistence, reproductive success or fitness of spotted owls occupying burned habitats remain somewhat unanswered (but see references to Clark below).

Research at more localized scales has had variable results that were again influenced by small sample sizes and a wide variety of forest management practices in pre- and post-fire landscape (Bond et al. 2009, Clark 2007, Clark et al. 2011, Clark et al. 2013, Elliott 1985, Gaines et al. 1995, Jenness et al. 2004, King et al. 1998, Roberts et al. 2011). In southwest Oregon, lower spotted owl occupancy and survival rates of were observed in burned areas compared to unburned, but the results were confounded by prior management and post-fire harvest (Clark 2007, Clark et al. 2011, Clark et al. 2013). Jenness et al. (2004) found decreased occupancy by Mexican spotted owls in burned areas compared to unburned areas; however the authors considered the results statistically weak. Roberts et al. (2011) similarly found no significant difference in occupancy of California spotted owls between burned and unburned areas in Yosemite National Park; however their models suggested slightly lower occupancy and density in burned areas. Additionally, while Roberts et al. (2011) presented that spotted owls may occupy areas that burned at generally low-to-moderate severity 2-14 years prior; the study design did not allow them to determine whether any shifts in use occurred over time. The results produced by Roberts et al. (2011) were also confounded by low sample sizes and the inability to separate the effects of different fire types that influenced the fire size and intensity (prescribed fire, wilderness fire for resource benefit, and uncontrolled wildfire).

None the less, in general, these studies in combination suggest a negative influence of high severity wildfire on spotted owl occupancy and survival, results that may be compounded by prior forest management or post-fire management activities (Clark et al. 2011, Clark et al. 2013, Jenness et al. 2004, and Roberts et al. 2011).

Effects to pairs and individuals

Our assumptions about likely effects of fire and post-fire forest management on spotted owls are based on conditions and scenarios described in literature compared to the site-specific conditions for projects being evaluated. Studies have detected highly variable responses to fire-caused habitat changes with apparent habitat value declining with burn severity (Bond et al. 2009, Clark 2007, Clark et al. 2011,

Clark et al. 2013, Gaines et al. 1995, King et al. 1998). Research that is conducted pre- and post-fire appears to offer more insight into the immediate effects of wildfire to individuals compared to research conducted post-fire only. Additionally, temporal aspects of several studies also influenced observations. As the time since the wildfire increases and vegetation recovers, prey abundance likely increases, woodrats in particular, and thereby potentially influences observed habitat selection. Thus, our assumptions about likely effects of fire and post-fire forest management on spotted owls are based on conditions and scenarios described in literature compared to the site-specific conditions for projects being evaluated.

Radio-telemetry based studies provide greater detail than occupancy-based studies when describing spotted owl use of burned landscapes and habitat selection. Based on a large number of observations radio-telemetry studies can accurately evaluate habitat types that individuals are selecting or avoiding and quantify the post-fire habitat use in core use areas and home ranges of northern spotted owls. Occupancy-based studies essentially base their conclusions on whether a given area is occupied before and after the fire. These studies only require one observation to determine occupancy and therefore have limited ability to evaluate habitat selection or small scale movements. Our understanding of post-fire habitat selection is essential to our evaluation of proposed projects in burned areas and results from telemetry studies likely provide the strongest basis for predicting potential effects to northern spotted owls and their habitat.

Activity Center Occupancy

Because the habitat conditions evaluated in the literature were highly variable, not adequately described, and not directly comparable to one another, these studies *cannot be used to determine a single threshold value for determining post-fire occupancy*. Therefore the determination of occupancy by northern spotted owls in a post-fire landscape is based on professional judgment and the interpretation of the best available data, including pre- and post-fire habitat conditions, literature on spotted owl habitat use and occupancy following both fire and post fire forest management practices, and other site-specific information. In addition to pre and post fire habitat conditions, abiotic factors such as distance to streams, slope position, elevation, and aspect also influence site selection (Forsman et al. 1984, Irwin et al. 2007, USDI 2009). Site fidelity, or continued use of an area over time, is considered in determining spotted owl use of burned areas that were previously suitable (Bond et al. 2009, Clark 2007, Lee et al. 2012).

Several radio-telemetry studies detected a positive correlation between higher amounts of suitable habitat remaining post-fire and the probability of post-fire site occupancy by northern spotted owls (Bond et al. 2009, Clark 2007, Gaines et al. 1995). Areas that were not habitat pre-fire, such as brush fields or meadows, were not used to a greater extent post-fire and are not expected to contribute towards territory occupancy (Clark 2007). Therefore, just as in landscapes having escaped recent fire, the amount and condition of nesting and roosting habitat following fires is likely the most powerful predictor of the probability of spotted owl occupancy and potential reproduction (Clark et al. 2013 and Comfort 2013).

Nesting and Roosting

Sites selected by northern spotted owls for nesting and roosting in post-fire landscapes generally experience either no fire or low- to moderate- severity fire (Bond et al. 2009, Clark 2007, Clark et al. 2011, Clark et al. 2013, King et al. 1998). Additionally, where vegetation was measured, sites selected consistently had high canopy closure (Bond et al. 2009). High-severity burns were generally not used

by spotted owls for nesting or roosting (Bond et al. 2009, Clark 2007, Clark et al. 2011, Clark et al. 2013, King et al. 1998) presumably because the live canopy is essentially consumed in the fire. This would suggest that low- to moderate-severity fires that retain adequate canopy can function for nesting or roosting and thus allow the continued use of spotted owl activity centers, while territories that burned at high-severity no longer supported nesting spotted owls. It is expected that within mixed severity burns, spotted owls will select the best available post-fire suitable habitat and Activity Centers at these locations may persist into the future.

The effects of wildfire on spotted owl Activity Center occupancy is categorized two ways, either as shifts or as losses.

Shifts

Where activity centers were affected by fire (any range of severities) but sufficient habitat remains in the home range and immediately adjacent area, site fidelity may cause spotted owls to increase the size of their home ranges or shifted locations to encompass the best available habitats rather than vacate the burned site (King et al. 1998, Clark 2007, Clark et al. 2011, 2013). Thus, a ***shift*** is defined as the condition where the area is presumably still functional and considered occupied, but the core use area may move to the best available habitat immediately adjacent to the prior activity center or to another location in suitable habitat within the immediate area, presumably within the pre-fire home range.

Losses

When high-severity fire affects a significant portion of the suitable habitat in the core and home range, available literature suggests that Activity Centers are no longer functional and the spotted owls were either killed during the fire, move significantly, or perish soon after the fire (Clark 2007, Gaines et al. 1995, King et al. 1998). In some instances spotted owls were observed temporarily returning to these territories, though the territory no longer functioned to support spotted owl occupancy into the future (Clark 2007). Essentially site fidelity was over ridden by the lack of suitable habitat remaining within the historic use area. Thus a ***loss*** is defined as the condition where the activity center is presumably no longer functional due to habitat alteration from high-severity fire, and there is insufficient habitat immediately nearby to allow the birds to shift. Such an activity center would be considered unoccupied for this analysis and may not be functional to support spotted owls for several decades. It is important to recognize that post-fire management in burned but functional habitat may exacerbate the reduced habitat value following fire and result in losses where shifts might have otherwise occurred.

Post-Fire Habitat Use

Once a spotted owl Activity Center and territory is presumed to be occupied, we must predict how spotted owls use the post-fire landscape in order to determine the effects to spotted owls from a proposed project. The use of burned landscapes by spotted owls may depend both on severity and the distance from the activity center (Bond et al. 2009, Clark 2007, Clark et al. 2011, and Clark et al. 2013). Because spotted owls exhibit site fidelity and are central-place foragers (Rosenberg and McKelvey 1999), spotted owls may continue to use the post-fire landscape depending on the remaining post-fire habitat conditions (sufficient habitat) in the area (Clark 2007, Clark et al. 2011, Clark et al. 2013, Gaines et al. 1995, King et al. 1998). Site selection for nesting and roosting, described above, would therefore also influence the areas used for foraging. The reverse is also true, as nest site selection may be influenced by the proximity to sufficient foraging habitat.

Foraging

It is important to note that while high-severity burn areas do not meet standard definitions of foraging habitat, and are therefore characterized as non-habitat for purposes of tracking the classic green environmental baseline, spotted owl use of these burned areas is well documented (Bond et al 2002, Bond et al. 2009, Clark 2007, Clark et al. 2011, Clark et al. 2013, Gaines et al. 1995, Jenness et al. 2004, King et al. 1998, Lee et al. 2012, Roberts et al. 2011). Areas that were not habitat pre-fire were not used to a greater extent post-fire, so this discussion focuses on areas that were suitable habitat before the fire but may not meet standard spotted owl foraging habitat definitions post-fire (Clark 2007).

Clark (2007) found that northern spotted owls used the best available habitat, which largely consisted of areas of nesting/roosting or foraging habitats that were unburned or were burned at low-to-moderate-severity. He noted that spotted owls occasionally traveled large distances to forage in unburned areas. While severely burned areas were used, observations indicated that spotted owls selected the edges near less severely burned areas. Clark (2007) also described that within salvaged areas, 60 percent of locations were associated with 'leave islands', riparian reserves, and stands of thinned trees. However, he was unable to evaluate the difference in effect between high severity burn areas with or without subsequent salvage. Utilizing Clark's data, Comfort (2014) found that spotted owls generally used habitat characterized by higher suitability, lower disturbance severity, lower amounts of hard edge and higher amounts of diffused edge, but these results varied by scale of measurement. Spotted owls avoided large, contiguous patch of high-severity disturbance but can benefit from small patches of high severity fire that are surrounded by moderate to low-severity fire (Comfort 2014). Diffuse edges are likely to be good habitat for woodrats (Clark 2007), which are more likely to occur at high densities in early seral (brushy/sapling to pole-sized trees) and old-growth forests (Sakai and Noon 1993).

Similarly, King et al. (1998) described observational studies where spotted owl use shifted away from burned areas, although only 20 percent of the locations were nighttime foraging. Four years post-fire, Bond et al. (2009) found that California spotted owls were foraging in all burn severities, with a stronger selection for the edges of high-severity burns, presumably taking advantage of an increase in prey (particularly woodrats) during a period of abundant regrowth of shrub and herbaceous vegetation.

Based on the evidence that these studies provide, we make the following assumptions regarding spotted owl use of post-fire landscapes: 1) Spotted owls select for unburned or low-severity burned suitable habitat for nesting and roosting, 2) that as distance from cover increases, spotted owl foraging use declines such that limited use of the interior of high-severity burns is expected. The maximum distance from cover that spotted owls will forage remains unknown; however, spotted owls seem to select for the edges of high-severity burns rather than the interior; and 3) spotted owls use multiple fundamentally different fire created edges at different spatial scales (see Comfort 2014).

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[1] - This Appendix is based on previous work as summarized by the Yreka Fish & Wildlife Office of the U.S. Fish and Wildlife Service.

APPENDIX D. MONITORING FORM

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

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

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

Section II: Ownership and Location Identifier Information[1]

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

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

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

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

[3]California only.

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

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

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

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

Section II & III: General Note and Comments

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