Intra-Service Biological and Conference Opinion

For the Issuance of an Enhancement of Survival Permit for the SDS Company LLC (dba Stevenson Land Company) and Broughton Lumber Company Northern Spotted Owl Safe Harbor Agreement

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U.S. Department of the Interior
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For Ken S. Berg, Manager
Washington Fish and Wildlife Office

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LIST OF ACRONYMS AND ABBREVIATIONS

Applicants	SDS Company LLC and the Broughton Lumber Company
BLC	Broughton Lumber Company
CHU	Critical Habitat Units
dbh	diameter at breast height
EA	Environmental Assessment
ECN	East Cascades North
ESA	Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*)
GIS	Geographic Information System
HCP	Habitat Conservation Plan
IA	draft Implementation Agreement
MOCA	managed owl conservation areas
NWFP	Northwest Forest Plan
Opinion	Biological Opinion
PCE	Primary Constituent Element
Permits	Enhancement of Survival Permits
SDS	SDS Company LLC
Service	U.S. Fish and Wildlife Office
SHA	Safe Harbor Agreement
SOSEA	Spotted Owl Special Emphasis Area
SM	Sub-mature Habitat
Spotted owl	Northern Spotted Owl
SSA	special set aside areas
USFS	U.S. Forest Service
WCC	West Cascades Central
WDNR	Washington Department of Natural Resources
YFM	Young Forest Marginal Habitat

INTRODUCTION

This document transmits the U.S. Fish and Wildlife Service's (Service) Biological Opinion (Opinion) based on our review of the proposed issuance of Enhancement of Survival Permits (Permits) for the SDS Company LLC and Broughton Lumber Company Northern Spotted Owl Safe Harbor Agreement (SHA) located in Klickitat and Skamania Counties in Washington State, and Wasco and Hood River Counties in Oregon State. This Opinion evaluates the effect of the proposed issuance of Permits on the threatened northern spotted owl (*Strix occidentalis caurina*) (spotted owl), designated, and proposed critical habitat for spotted owls in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*) (ESA). The Service determined that no other listed, proposed, or candidate resources would be affected by the issuance of these Permits.

This Opinion is based primarily on information provided in the document entitled: SDS Company LLC and Broughton Lumber Company Northern Spotted Owl Safe Harbor Agreement (August 2012) and the other sources cited herein. A complete record of this consultation is on file at the Service's Washington Fish and Wildlife Office in Lacey, Washington.

CONSULTATION HISTORY

From May 2011 to August 2012, the Service met with and provided technical and policy assistance to SDS Company LLC and Broughton Lumber Company in the development of the SHA. The application for an Enhancement of Survival Permit (Permit) was received on July 5, 2012; an updated application was later filed on September 19, 2012. The draft SHA, draft Implementation Agreement (IA), and draft Environmental Assessment (EA) (USFWS 2012a) were made available for a 30-day public comment period on August 21, 2012 (73 FR 76680). At the same time, a news release was sent to State and Federal elected officials, State and Federal agencies, Native American Tribes, non-governmental organizations, and the media. The Service initiated internal consultation on September 4, 2012.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

The Service proposes to issue two Permits in accordance with their authority and responsibility under section 10(a)(1)(A) of the ESA. The permit applicants are the SDS Company LLC (SDS) and the Broughton Lumber Company (BLC) (collectively referred to as Applicants). They have prepared and submitted applications based upon the document Northern Spotted Owl Safe Harbor Agreement, August 2012.

Safe Harbor Agreements (SHA) are voluntary agreements between the Service and cooperating non-Federal landowners. They are designed to benefit federally endangered and threatened species by having landowners implement voluntary conservation measures that are reasonably expected to provide a net conservation benefit to the species. SHAs provide assurances to non-Federal landowners interested in using their lands to benefit ESA-listed species, but who also want to avoid future restrictions on land use, in particular for ESA-listed species.

In a SHA, the landowner agrees to maintain, create, restore, or improve habitat for endangered or threatened species. The Service, working with the landowner, establishes a baseline condition for each species and determines whether the proposed actions are reasonably expected to result in a net conservation benefit (64 FR 32717). The Safe Harbor Agreement Policy defines the "baseline condition" as "population estimates and distribution and/or habitat characteristics and determined area of the enrolled property that sustain seasonal or permanent use by the covered species at the time the Safe Harbor Agreement is executed." Thus, only those areas occupied by the species at the outset of the SHA contribute to the baseline. The negotiated baseline can exceed the current condition in some cases. SHAs also allow two categories of incidental take (50 CFR 17.32(c)(1)(ii)): one is a result of management activities and the other is a result of returning the lands to baseline. For this SHA, the negotiated baseline is called the "Elevated Baseline."

This SHA involves an area in the Cascade Mountains of Washington and Oregon in the vicinity of White Salmon, Washington, and Hood River, Oregon (SHA Figure 2-1). These lands are composed of parcels varying size, which total approximately 81,587 acres. Some of the SHA area occurs in the Columbia River Gorge National Scenic Area.

The SDS and BLC SHA is for the spotted owl only; no other ESA species are being considered for an ESA section 10 Permit. If approved, the SHA would replace existing Washington State Forest Practices Rules for spotted owls on the SHA area. It is important to note that only implementation of forest practices for spotted owls would potentially change; all other Forest Practices Rules would remain the same. For example, riparian zones would continue to be managed under the Washington State Forest Practice Habitat Conservation Plan (HCP); no change to riparian zone management would occur.

The SHA area borders National Forest lands (both in Washington and Oregon), State lands managed by the Washington Department of Natural Resources (WDNR), and private lands (SHA

Figure 2-1). The SHA area consists of a variety of forest ages, depending upon past management practices. There are 20,751 acres less than 39 years, 12,111 acres 40 to 59 years, 18,646 acres 60 to 79 years, and 18,478 acres over 79 years old (EA Table 2-1). Approximately 96 percent of the SHA area is in the Eastern Cascades Provinces of Washington and Oregon.

Issuance of the Permits removes the section 9 take prohibition within the 0.7-mile and 1.8-mile (WA) and 1.2-mile (OR) estimated annual median home range circles (spotted owl circles) on the covered lands. For purposes of this opinion, "covered lands" represents all existing Applicant ownership, as it may be modified in accordance with the terms of the IA. Washington State law requiring retention of 100 percent and 40 percent habitat, respectively, within these owl circles will be replaced with the SHA requirements for spotted owl conservation. Spotted owl circles are referred to as "spotted owl management circles" in the SHA and "median home range circles" in the Washington State Forest Practices regulations. For the purpose of our analyses in this opinion, we refer to these simply as "spotted owl circles." There are still habitat thresholds at the 0.7-mile scale and in the White Salmon Spotted Owl Special Emphasis Area (SOSEA), but there are no specific habitat thresholds within the 1.8-mile radius circle for any owl sites on the covered lands.

The covered activities include timber harvest, pre-commercial thinning, log transportation, road construction, road maintenance and decommissioning, small rock pits, site preparation and slash abatement, tree planting, fertilization, silvicultural thinning, experimental silviculture, snag creation, wildfire suppression, monitoring pursuant to Section 4.3 of the SHA, and management, harvest, and sale of minor forest products. The application of pesticides is not a covered activity.

One Safe Harbor Agreement for both Companies

SDS and BLC are two separate companies and will jointly implement the single SHA. BLC has been in business since 1923 and SDS since 1946. Both companies have close business and familial affiliations and utilize joint resources. The SHA has been written for both companies to implement.

Currently, SDS has 69,186 acres and BLC has 12,401 acres in the SHA (SHA Table 3-1). SDS has ownership in Oregon and Washington; BLC has no ownership in Oregon or in the Columbia Gorge SOSEA.

The Applicants are expecting to implement the SHA for the full 60-year permit term. However, if one company withdraws from the SHA, the other company is expected to continue to comply with the SHA (IA 13.1 and 13.2). The IA describes the process for early withdrawal, and what SHA standards are required if one company terminates or relinquishes its Permit, and the other continues to implement the Permit. Our effects analysis, below, considers different termination scenarios that could occur in the future and what the effects could be to the spotted owl.

Features of the Safe Harbor Agreement

The SHA is the document that guides the Applicants' future management for spotted owls on the SHA area over the 60-year permit term. The SHA has specified conservation measures that are

intended to benefit spotted owl habitat, and consequently spotted owls. It also provides incentives for the Applicants to delay harvest of spotted owl habitat across the SHA area.

The SHA does not establish when and where timber harvest will occur over the 60-year permit term. This is left to the Applicants to determine. While doing this though, they need to satisfactorily implement the conservation measures detailed in section 4 of the SHA, intended to provide benefits to spotted owls. The following is a summary of important features of the SHA.

- Two areas are being proposed for harvest deferrals for the duration of the SHA. The SHA calls these special set aside areas (SSA's). The Little White Salmon SSA contains 411 acres (SHA Fig 4-1, section 4). Most of the acres are the equivalent of young forest marginal habitat (YFM) or sub-mature (SM) habitat, but there are also some small openings interspersed where rock outcrops occur. The Gilmer SSA is 240 acres and occurs around the spotted owl site center #753. This SSA includes 90 acres of YFM habitat and about 150 acres of mixed Oregon white oak (*Quercus garryana*) and conifer. Both of these SSAs will, over time, likely provide suitable nesting habitat, if they are not lost to natural disturbance.

- The SHA extends the harvest rotation from 45 years to, on average, 60 years (SHA section 4.1.4). Future timber stands that reach the age of 50 to 70 are expected to be harvested.

- The SHA proposes to conduct commercial thinning using silvicultural methods to achieve YFM habitat on the SHA area in Oregon and Washington (SHA 4.1.6). A minimum of 500 acres will be commercially thinned in the first decade of the SHA in the White Salmon SOSEA (SHA 4.1.7).

- The SHA has a proposed snag and wildlife trees prescription intended to facilitate development of YFM and dispersal habitat (SHA 4.1.11). Commercial thinning units have three prescription options: 1) retain two defective trees/acre that are greater than 10 inches in diameter at breast height (dbh); 2) retain one defective tree/acre and create one snag/acre; or 3) create two snags/acre. Regeneration harvests have two prescription options: 1) create 20 snags/100 acres and retain six green recruitment trees/acre, or 2) retain two snags/acre (either residual or created) and supplement the forest practice rules requirement with one green tree/acre. In some situations, snags will be created independently of commercial thinning for enhancement purposes to achieve YFM habitat (SHA 4.1.12).

- The SHA will maintain at least 33 percent of the SHA area in the White Salmon SOSEA as spotted owl habitat. Within this 33 percent habitat in the White Salmon SOSEA, Applicants will maintain 1,054 acres of SM habitat. After subtracting 1,054 acres of required SM habitat from the total required habitat, the remainder will be evenly provided in YFM and Dispersal habitat (currently 4,185 acres of YFM and 4,185 acres of Dispersal). Both Applicants will meet this target.

The Elevated Baseline is a concept developed for this SHA, and represents a different amount, quality, and spatial arrangement of habitat in comparison to the existing Baseline Conditions. In Washington, the baseline conditions reflect current spotted owl management under the Washington Forest Practices Rules. There are 4,697 acres of YFM habitat and SM habitat within 1.8-mile radius owl circles under the existing Baseline Conditions (See SHA Table 4-1 in the SHA). In Oregon, there are no spotted owls on the covered lands, or regulatory owl circles which overlap their lands, which results in no habitat requirements under Oregon Forest Practices Rules. Hence, under the Safe Harbor Policy's definition, the baseline condition on the Oregon lands is zero.

The Elevated Baseline reflects a multiple set of habitat requirements at different spatial scales within the White Salmon SOSEA. The application of the Elevated Baseline is expected to provide more sustainable spotted owl habitat within the White Salmon SOSEA over a 60-year time frame than would occur without the SHA.

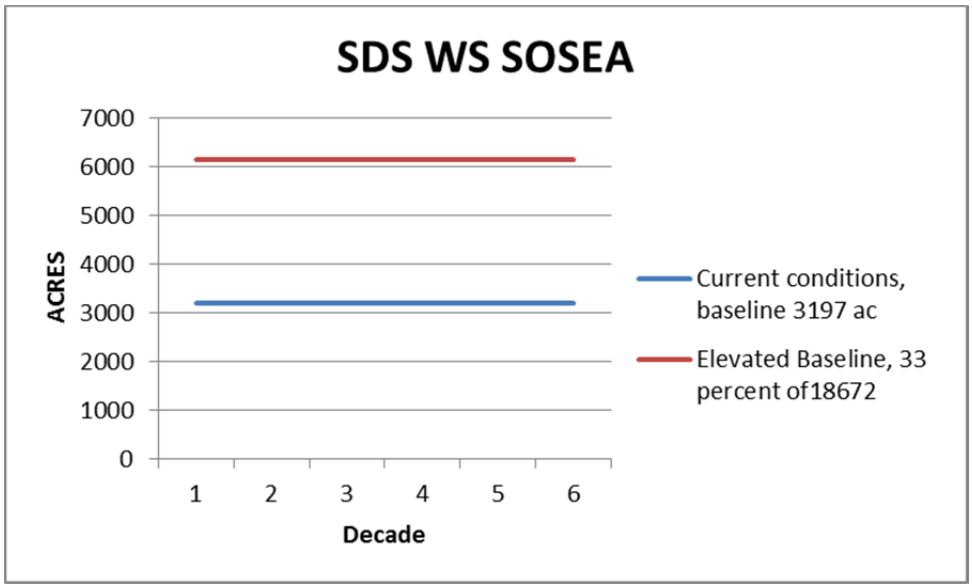

Figure 1. SDS White Salmon SOSEA habitat requirements.

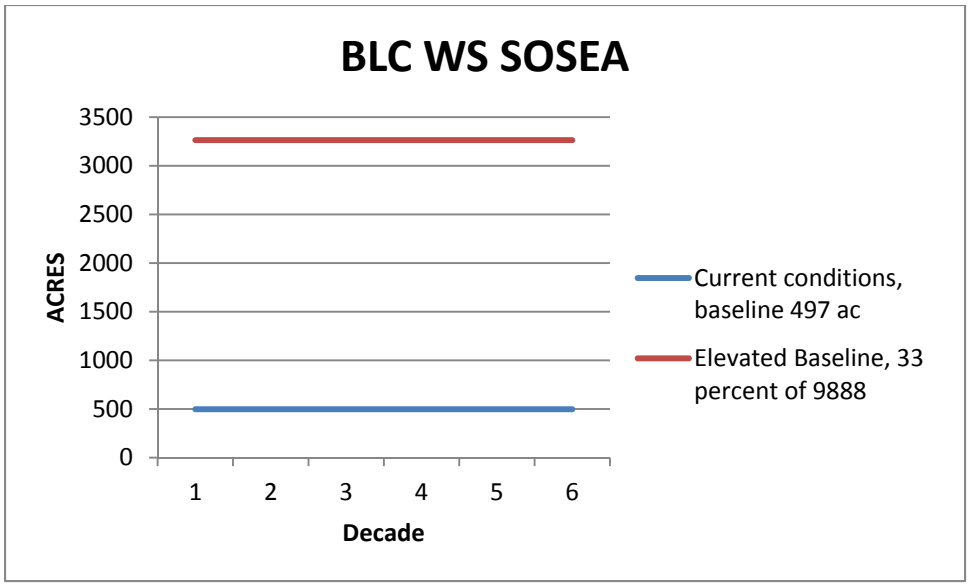

Figure 2: BLC White Salmon SOSEA habitat requirements.

- The SHA requires that the Applicants maintain 33 percent of their land within 0.7-mile radius circles as YFM (SHA 4.4.1 SHA Table 4-1). Dispersal habitat is not part of this threshold, unlike the broader scale of the White Salmon SOSEA. The SHA also defers harvest of spotted owl habitat within the 0.7-mile radius circle for 10 years for the following four owl sites: #753, #1116, #1003, and # 734 (SHA 4.1.13 and Table 4-1). During this time frame, approximately 490 acres of non-habitat will be allowed to develop into habitat (SHA 4.3.2). In addition, though not a SHA threshold, 8,382 acres will be allowed to become habitat within the 0.7- to 1.8-mile radius circles (SHA 4.3.2).

- The SHA commercial thinning prescription is designed to develop YFM habitat (SHA 4.1.6). The thinning prescription: 1) retains some smaller sub-merchantable trees, especially shade-tolerant and hardwood species where they exist; 2) retains some intermediate trees where they exist with the objective of creating areas within the stand with 2 or more canopy layers for vertical diversity 3) retains a variable diameter distribution of leave trees where they exist; and 4) targets total canopy closure of greater than or equal to 70 percent. Target canopy closure can be reduced to 50 percent if 3 snags/acre greater than 20 inches dbh are created (SHA 4.1.6).

The SHA has provisions if new spotted owl nest sites are found. For a detailed description of the implementation process for the different situations, see the SHA section 4.1.14.

- New owl site inside the White Salmon SOSEA: The Applicants will protect whatever portion of this 70 acre core is on their lands. No harvest will occur within this 70 acre core for at least three years after the new nest is discovered. In the first year the new nest site is discovered, the Applicants will establish a nest box cluster to provide replacement nesting opportunity in the nearest and highest quality spotted owl habitat available of sufficient size for nesting. After five years, if the spotted owls have not moved to the nest box cluster, the Applicants, in discussion with the Service, will make the natural nest

tree temporarily unusable for up to three additional years in an attempt to encourage relocation of the owls to the nest box cluster site. Techniques may include blocking of the nest entrance if it's a cavity nest, or filling the nest with natural debris if it's a platform nest. After this eight year period (or earlier if the owls have moved to the nest boxes), and the owls have moved to the nest box cluster, the Applicants will be able to harvest the 70 acre core, outside of the nesting and breeding season, leaving the nest tree and several trees surrounding it to provide a future nesting site.

- Existing spotted owl sites where nest trees have shifted to the SHA area in the White Salmon SOSEA: A nest site shift is defined as a movement of the nest tree up to 0.25 mile from the original site center. If more than this movement, the pair will be determined to represent a new owl site (see preceding section). The Applicants will protect whatever portion of 70 acres is on their lands. The 0.25 mile distance was selected because active spotted owl nest sites have occurred as close as 0.50 mile from each other in eastern Washington (S. Sovern, pers. comm.). No harvest will occur within this 70 acre core for up to 30 years or until the end of the SHA period, whichever is shorter.
- New owl site outside the White Salmon SOSEA: No harvest of the 70-acre core would take place for 3 years. After 3 years, the 70-acre core can be harvested, leaving the nest tree and several trees surrounding it.

The SHA does not allow SDS or BLC to pursue decertification of spotted owl sites (SHA 4.1). The SHA assumes that spotted owls are persisting even though barred owls (*Strix varia*) are commonly observed and spotted owls may go undetected.

The SHA includes the following monitoring activities:

- Conduct periodic forest inventories to monitor changes in the amount and distribution of forest stand characteristics on the covered area;
- Map all SSAs and leave-tree areas containing snags and defective trees following regeneration harvest;
- Monitor the snag and leave-tree prescriptions employed during commercial thinning and regeneration harvest;
- Monitor any new nest sites of owls located in the SHA area; and
- Monitor nest box clusters used by spotted owls or barred owls.
- Develop a monitoring plan to evaluate relationships between thinning prescriptions, snag treatments, stand age, and YFM habitat characteristics during the first 10 years of the SHA (see SHA Section 4.5 Monitoring). The goal of this monitoring is to develop thinning/snag prescriptions to most effectively recruit YFM habitat and to refine the age at which YFM is first observed.

The SHA includes the following reporting requirements:

- forest management activities, including thinning operations and regeneration harvests that have occurred;
- the amount (percentage) of functional dispersal and YFM and better habitat on the SHA area;
- Elevated Baseline habitat status;
- maps of the locations of dispersal, YFM and higher quality habitats on the SHA area;
- maps showing the location of SSAs;
- the snag and leave tree prescriptions employed during commercial thinning and regeneration harvest;
- information on marked snags and defective trees retained to improve the quality of owl dispersal habitat;
- any new data on covered species occurrences and/or habitat use
- reports will be provided on a biennial basis for the first 10 years of the SHA, and every 5 years for the remainder of the SHA term.

Action Area

The action area is defined as all areas to be affected directly or indirectly by the Federal action, including interrelated and interdependent actions, and not merely the immediate area involved in the action (50 CR 402.02). Subsequent analyses of the environmental baseline, effects of the action, cumulative effects, and levels of incidental take are based upon the action area as determined by the Service. In delineating the action area, we evaluated the farthest reaching physical, chemical, and biotic effects of the action on the environment.

The SHA describes a "land addition boundary" that encompasses existing Applicants' ownership and describes an area within which the Applicants may acquire additional land over the life of the SHA (Figure 3). In addition, physical (e.g. wind throw) and biotic (e.g., edge) effects of covered activities may emanate as far as 200 feet from the Applicants' ownership where timber harvest may occur. We are therefore defining the action area as the "land addition boundary" plus a 200-foot buffer around that boundary to account for indirect effects on adjacent lands from management activities on SHA lands.

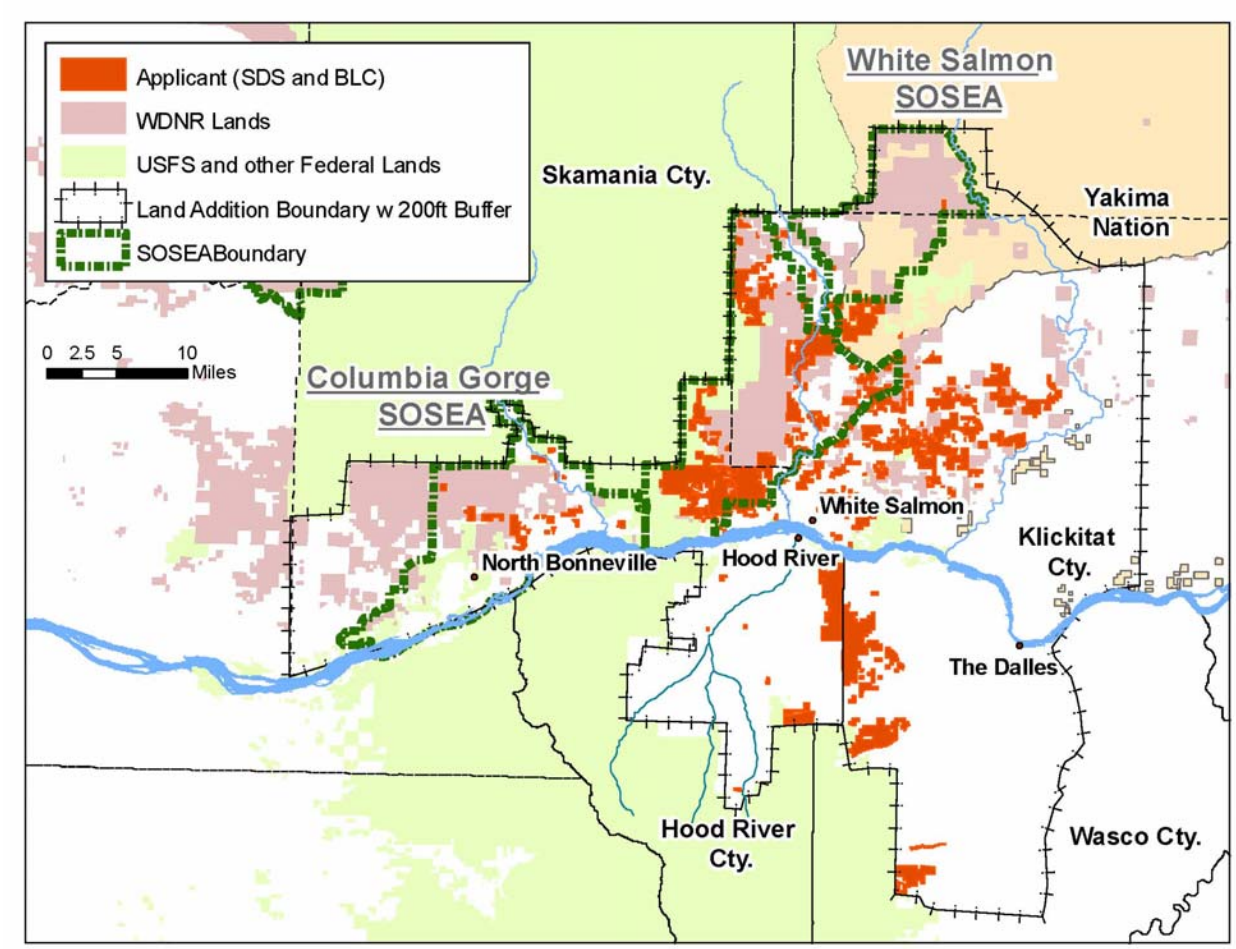

Figure 3. Action Area, identified as Land Addition Boundary with 200-foot buffer.

The action area encompasses a patchwork of ownerships in Skamania, Klickitat and Yakima Counties in Washington State and Hood River and Wasco Counties in Oregon State, situated on either side of the Columbia Gorge.

ANALYTICAL FRAMEWORK FOR THE JEOPARDY AND ADVERSE MODIFICATION DETERMINATIONS

Jeopardy Determination

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

The jeopardy analysis in this Biological Opinion places an emphasis on the role of the action area in the survival and recovery of the spotted owl range-wide as the context for evaluating the significance of the effects of the proposed Federal action, taken together with cumulative effects.

Adverse Modification Determination

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

In accordance with policy and regulation, the adverse modification analysis in this Biological Opinion relies on four components: (1) the *Status of Critical Habitat*, which evaluates the 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 and how that will influence the recovery role of affected critical habitat units; and (4) *Cumulative Effects*, which evaluates the effects of future, non-Federal activities in the action area on the PCEs and how that will influence the recovery role of affected critical habitat units.

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

The analysis in this Biological Opinion places an emphasis on using the intended 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.

STATUS OF THE SPECIES: Spotted Owl

The Status of the Species for the northern spotted owl is provided in Appendix A.

ENVIRONMENTAL BASELINE: Spotted Owl

Regulations implementing the ESA (50 CFR 402.02) define the environmental baseline as the past and present impacts of all Federal, State, or private actions and other human activities in the action area. Also included in the environmental baseline are the anticipated impacts of all proposed Federal projects in the action area that have undergone section 7 consultation, and the impacts of State and private actions which are contemporaneous with the consultation in progress. Thus, for purposes of consultation under section 7, the "baseline" is defined more broadly than it is under the Safe Harbor Policy, which limits "baseline conditions" to those areas that sustain seasonal or permanent use by the species at the time the SHA is executed.

Setting and Land Use

The action area lies within four largely rural counties with a predominant land use of forest and agricultural production: Skamania and Klickitat Counties in Washington State and Hood River and Wasco Counties in Oregon. The area contains Federal, State, municipal and private land ownerships. Federal lands include large tracts of the Gifford Pinchot and the Mount Hood National Forests, and smaller tracts that include the Columbia Gorge National Scenic Area, Mt. St. Helen's National Volcanic Monument, fish hatcheries, and a wildlife refuge. State-owned lands include large tracts managed under the Washington State Department of Natural Resources HCP, which includes conservation strategies for spotted owls and smaller ownership of Washington State Department of Fish and Wildlife, wildlife areas. Municipal lands include large tracts of land in Hood River and Wasco County, Oregon which are natural areas. Numerous private ownerships are interspersed throughout the action area on both sides of the Columbia River.

The Applicants' lands in Washington are situated near the Columbia River Gorge, within the Wind, Little White Salmon, and White Salmon River watersheds. The Applicants' lands in Oregon lie within the lower Hood River, Mosier Creek, and Rock Creek watersheds. The Applicants' lands have been actively managed for over a century, most of it being roaded and first harvested in the early 1900's with second harvest activities occurring on the lands since the mid 1900's (J. Spadaro, pers comm.). Small pockets of older forest (greater than 100 years) are scattered in some portions of the SHA lands as a result of the 1989 land exchange with the U.S.

Forest Service (USFS) and the Columbia Gorge National Scenic Area Act. Some smaller fires have occurred on the Applicants' lands, but no large scale fires have occurred (J. Spadaro, pers. comm.).

Vegetation

Descriptions of the SOSEAs can be broadly applied to the action area. Western portions of the action area, mostly within the Columbia Gorge SOSEA, are within wetter portions of the Cascades rain shadow, receiving approximately 75 inches of rain per year and support western hemlock (*Tsuga heterophylla*)/Douglas fir (*Pseudotsuga menziesii*) forest.

Farther east, the western portions of the White Salmon SOSEA receive approximately 40 inches of precipitation per year, with Douglas fir as the dominant forest tree, and with western red cedar (*Thuja plicata*) and grand fir (*Abies grandis*) also occurring. In the eastern portions of the White Salmon SOSEA and lands to the east, annual precipitation is approximately 30 inches and rain shadow effects diminish the overall dominance of Douglas fir, where it now co-occurs with increasing numbers of ponderosa pine, grand fir, and other dry forest species. Bigleaf maple (*Acer macrophyllum*) and some red alder (*Alnus rubra*) are important deciduous species in many stands in the western portions of the Applicants' ownership. Oregon white oak (*Quercus garryana*) becomes the dominant deciduous species in eastern portions of the ownership, where it can form almost pure stands in some areas.

Applicants' lands in Oregon are very similar in forest conditions to the eastern portions of the White Salmon SOSEA and lands to the east of the White Salmon SOSEA, with annual precipitation approximately 30 inches. Douglas fir is the dominant species with grand fir, ponderosa pine (*Pinus ponderosa*), and Oregon white oak as secondary species.

Conservation Role of the Action Area

The 2011 Revised Recovery Plan for the Northern Spotted Owl (Spotted Owl Recovery Plan) recommends conserving occupied sites and unoccupied, high-value spotted owl habitat on State and private lands wherever possible (USFWS 2011 p III-51). The Service's primary expectation for private lands is their contribution to demographic support (pair or cluster protection) to Federal lands and their connectivity with Federal lands. Spotted owl-related conservation plans are intended to promote recovery by providing high quality habitat and retention of spotted owl sites, or foraging and dispersal opportunities to make important contributions to spotted owl recovery (USFWS 2011 p III-52).

In the context of the SHA analysis area, the high-quality old forest habitats in this landscape that are essential for demographic support of spotted owls are primarily provided by adjacent Federal and State lands and to some extent by SM forest habitat on SHA lands located in spotted owl circles in SOSEAs. Existing forest habitats on the SHA lands play a minor role for spotted owl demographic support because the covered lands currently contain only small, isolated patches of older, multi-layered forests. The primary conservation role of the SHA lands is to provide foraging and dispersal habitat for improved connectivity for spotted owls dispersing across the landscape, including improved dispersal connectivity along the Columbia River Gorge.

Washington Forest Practices Rules

In Washington State, 10 SOSEAs were established under Washington Forest Practices Rules (WAC 222-16-086) to provide for the conservation needs of the spotted owl. Each SOSEA includes land area goals for spotted owl demographic and dispersal support. Different SOSEAs have different biological goals for spotted owls depending on the geographic location of the SOSEA and the conservation needs of the spotted owl.

Within SOSEAs, spotted owl site centers are assumed to be occupied, based on historical data. The Washington Forest Practices Rules maintain the viability of each spotted owl site center by protecting: (a) all suitable spotted owl habitat within 0.7 mile of each spotted owl site center; and (b) a total of 2,605 acres of suitable spotted owl habitat within the median home range circle with a radius of 1.8 miles. Under the rules, proposed forest practices likely to adversely affect spotted owl habitat in either category (a) or (b) above are likely to have significant adverse impacts to the spotted owl, and such activities would require a Class IV special forest practices permit and an environmental impact statement per the State Environmental Policy Act. Given our assumption that these sites are reasonably certain to be occupied, such an action would likely require an incidental take permit under section 10(a)(1)(B) of the ESA.

Outside SOSEAs, the Washington Forest Practices Rules protect 70 acres of the highest quality suitable spotted owl habitat only during the nesting season (WAC 222-10-041 (5)). State law provides exceptions to the standard Forest Practices Rules if private landowners conduct forest management operations under a Service-approved Habitat Conservation Plan and an incidental take permit authorized under section 10(a)(1)(B) of the ESA or a SHA and a Permit authorized under section 10(a)(1)(A) of the ESA.

Approximately 34,064 acres, or 42 percent, of the Applicants' lands in Washington occur within the White Salmon and Columbia Gorge SOSEAs. Both the Columbia Gorge and White Salmon SOSEAs have a goal of providing a combination of dispersal support and demographic support, where either suitable spotted owl habitat should be maintained to protect the viability of the owl(s) associated with each spotted owl site center or a variety of habitat conditions should be provided which in total are more than dispersal support and less than demographic support.

All private landowners in Washington State are required to follow the Washington Forest Practices Rules and obtain a permit for forest harvest.

Oregon Forest Practice Rules

In Oregon, the Oregon Forest Protection Act protects resource sites through a notification process, but the State Forester does not issue permits or approvals. The Oregon Forest Protection Act protects active spotted owl nesting sites or activity centers occupied by a pair of adult owls capable of breeding by providing for a 70-acre core habitat area around the nest site. The State Forester is required to maintain an inventory of protected resource sites that are used by threatened and endangered species, including the spotted owl. A written plan is required when the State Forester determines a proposed forest management operation will conflict with

the protection of a spotted owl nesting site or when the forest management operation is 300 feet from the nesting site of any threatened or endangered species. Oregon does not have an equivalent to SOSEAs.

Northern Spotted Owl Sites in SOSEAs

There are 30 historical spotted owl sites in Washington where some portion of the Applicants' lands overlap the spotted owl circles associated with these sites. Eighteen of these sites are located inside SOSEAs and are shown in Table 1. Sites with either the site center located entirely outside of the SOSEA boundary (i.e., on Federal land) or a limited amount of habitat on the Applicants' lands were excluded.

Table 1. Eighteen spotted owl sites in SOSEAs with the Applicants' lands in Washington. All sites in this list contain some SDS/BLC land within a 1.8-mile radius of the mapped site center.

Site No.	Site Name	Last Year[1]	Historic Status	Status[2]	SOSEA	Site Center
284	Monte Cristo	1994	PAIR OR REPROD	1	WS	USFS
289	Moss Creek	1991	PAIR OR REPROD	1	WS	USFS
302	Budweiser Creek	1991	PAIR OR REPROD	1	CG	WDNR
647	Carson Ridge	1994	PAIR OR REPROD	1	CG	WDNR
667	Steep Creek	1996	PAIR OR REPROD	1	CG	WDNR
734	Dry Cr, White Salmon River	1998	PAIR OR REPROD	1	WS	PVT
753	Gilmer Creek South	1997	PAIR OR REPROD	1	WS	PVT-SDS
765	Red Bluffs	1996	PAIR OR REPROD	1	CG	USFS
824	Little Wind River Upper	1990	PAIR OR REPROD	1	WS	USFS
828	Bear Cr, Trout Lake Cr	1992	PAIR OR REPROD	1	WS	WDNR
852	Cave Cr –Trout Lk Valley	1995	PAIR OR REPROD	1	WS	WDNR
874	Phelps Creek	1991	PAIR OR REPROD	1	WS	WDNR
875	White Salmon River	1995	PAIR OR REPROD	1	WS	WDNR
970	Berry Creek	1998	PAIR OR REPROD	1	WS	USFS
991	Mill Creek-White Salmon	1998	PAIR OR REPROD	1	WS	WDNR
1003	Moss Cr Campground	1999	PAIR OR REPROD	1	WS	USFS
1048	Rattlesnake Cr-Mill Cr	1993	RESIDENT SINGLE	3	WS	WDNR
1116	Wieberg Creek	1998	PAIR OR REPROD	1	WS	WDNR

[1] - Last Year = year the historical site status was established; does not reflect subsequent surveys
[2] - Status: 1 = Reproductive pair; Status 2 = Pair; Status 3 = Resident Single

Fourteen site centers occur within the White Salmon SOSEA; of these, twelve are either on USFS or WDNR land, and two are on private lands. One of the sites on private lands, #753, is in SDS ownership. Four site centers occur within the Columbia Gorge SOSEA; all of these site centers are located on USFS or WDNR ownership, and none are on SHA lands.

Of the 18 spotted owl sites inside SOSEAs in proximity to the Applicants' lands, we have recent survey data (i.e., surveyed within the past 5 years) for eight sites (Table 2). Most of these sites have multiple detections of barred owls and few detections of spotted owls. Despite the limited responses of spotted owls at these surveyed sites, the survey data below indicate that spotted

owls are reasonably certain to be detected after years with no spotted owl responses (e.g., Mill Creek-White Salmon #991, below). For the purpose of this analysis, we assume that the 18 spotted owl sites within the SOSEAs listed in Table 1 (above) are either currently occupied or are reasonably certain to be re-occupied in the future. This assumption is based on a review by Buchanan and Swedeen (2005, pp. 47) which found that of 38 spotted owl sites in Washington that were classified as unoccupied for three or more years, 25 (66 percent) of them were reoccupied and supported pairs or had multiple detections of a single owls. In addition, it is reasonably certain that regulatory restrictions within the SOSEAs will increase the likelihood of future occupancy.

Table 2. Summary of spotted owl surveys (2006-2010) for owl sites in SOSEAs associated with SDS/BLC lands in Washington.

Site #	Name	SOSEA	Center on USFS lands?	2010 Survey	2009 Survey	2008 Survey	2007 Survey	2006 Survey
734	Dry Creek - White Salmon R.	WS	N	na	P - BO	P-BO	M-BO	P-BO
828	Bear Creek – Trout Lake Creek	WS	N	na	ND	P-BO	P-BO	ND
874	Phelps Creek	WS	N	na	ND	M-BO	**M-NSO** M-BO	M-BO
875	White Salmon River	WS	N	na	ND	M-BO	P-BO	P-BO
970	Berry Creek	WS	N	na	NA	M- BO	P- BO	M- BO
991	Mill Creek – White Salmon	WS	N	**M-NSO**	ND	P- BO	ND	P- BO
1003	Moss Creek Campground	WS	Y	BO?	M - BO	M- BO	ND	M- BO
1116	Wieberg Creek	WS	N	na	M- BO	M- BO	M- BO	M- BO

Abbreviations: M-NSO (Male spotted owl); P-BO (pair barred owls); ND - surveyed, no owls detected; na – Not Applicable. Compiled from unpublished spotted owl demography survey information provided to WDNR by NCASI, Raedeke Associates, and Turnstone Environmental.

Northern Spotted Owl Sites Outside SOSEAs in WA

Six spotted owl sites overlap SDS' lands outside the SOSEAs; three are on WDNR land and three are on private land. None of the 70-acre core areas fall on SDS land. Because spotted owl sites outside of SOSEAs have minimal regulatory protection and low levels of habitat, we cannot be reasonably certain that they are currently occupied. For these same reasons, we cannot be reasonably certain that they will be re-occupied in the future. Additional information, for instance, recent survey data, changes to regulatory frameworks, ecological disturbance, barred-owl management, etc., may lead to different conclusions on other lands in the future.

Spotted Owl Sites in Oregon

Six spotted owl sites have been identified on the Mt. Hood National Forest adjacent to the southern part of SDS ownership. None of the 70-acre core areas fall on SDS land. No spotted owls or activity centers have been identified on SDS land in Oregon, and the Oregon Forest Practices Rules place no harvest restrictions on their lands in Oregon. Due to minimal regulatory protection and low levels of habitat, we cannot be reasonably certain that habitat on SDS land is receiving seasonal or permanent use. Additional information, for instance, recent survey data, changes to regulatory frameworks, ecological disturbance, barred-owl management, etc., may lead to different conclusions on other lands in the future.

Spotted Owl Habitat Definitions

For the purposes of this Opinion, and to be consistent with the SHA and the Environmental Assessment, spotted owl habitat will be characterized according to definitions in the Washington Forest Practice Rules (WAC 222-16-085). These Rules have characterized spotted owl habitat into four types: old forest habitat, SM habitat, YFM habitat, and dispersal habitat. All but dispersal habitat are considered suitable habitat.

Old forest habitat means habitat that provides for all the characteristics needed by spotted owls for nesting, roosting, foraging, and dispersal, described as stands with:

- A canopy closure of 60 percent or more and a layered, multispecies canopy where 50 percent or more of the canopy closure is provided by large overstory trees (typically, there should be at least 75 trees greater than 20 inches dbh per acre, or at least 35 trees 30 inches dbh or larger per acre;
- Three or more snags or trees 20 inches dbh or larger and 16 feet or more in height per acre with various deformities such as large cavities, broken tops, dwarf mistletoe infections, and other indications of decadence;
- More than two fallen trees 20 inches dbh or greater per acre and other woody debris on the ground

Sub-mature habitat provides all of the characteristics needed by spotted owls for roosting, foraging and dispersal. In eastern Washington it will include the following:

- Greater than or equal to 40 percent fir;
- 110-260 trees/acre (greater than or equal to 4 inches dbh, with dominants and co-dominants greater than or equal to 90 feet high OR dominants and co-dominants greater than or equal to 90 feet high with 2 or more layers and 25 to 50 percent intermediate trees
- Greater than or equal to 70 percent canopy closure
- Greater than or equal to 3 snags/cavity trees/acre (greater than 20 inches dbh and 16 feet in height); or instead, high or moderate mistletoe infection;

- Greater than or equal to 5 percent of the ground covered with 4 inch diameter or larger wood

Young forest marginal habitat (YFM) provides some of the characteristics needed by spotted owls for roosting, foraging, and dispersal. It is classified as to whether it is closed canopy or open canopy. Closed canopy includes the following:

- Greater than or equal to 40 percent fir
- 100 to 300 trees/acre (greater than or equal to 4 inches dbh)
- Dominants/co-dominants equal to or greater than 70 feet high; 2 or more layers; and 25 percent to 50 percent intermediate trees
- Greater than or equal to 70 percent canopy closure

Open canopy YFM includes the following:

- Greater than or equal to 40 percent fir;
- 100 to 300 trees/acre (greater than or equal to 4 inches dbh)
- Dominants/co-dominants equal to or greater than 70 feet high
- 2 or more layers
- 25 percent to 50 percent intermediate trees
- Greater than or equal to 50 percent canopy closure
- 2 snags/cavity trees acre or more(greater than or equal to 20 inches dbh and 16 feet high)
- High or moderate in mistletoe infection

Spotted owl dispersal habitat refers to habitat stands that provide the characteristics needed by spotted owls for dispersal. Such habitat provides protection from weather and predation, roosting opportunities, and clear space below the forest canopy for flying. For eastern Washington timber stands with 5 acres or more that includes the following:

- 50 percent or more canopy closure; and
- A minimum of 50 conifer trees/acre with a dbh of 6 inches or more in even age stands or 4 inches or more in uneven-aged stands, and an average tree height of 65 feet or more; and;
- A minimum of 20 feet between the top of the understory vegetation and the bottom of the live canopy, with the lower boles relatively clear of dead limbs; or instead, conifer stands with a quadratic mean diameter of 9 inches or more and a relative density of 33 or more or a canopy closure of 55 percent or more.

Habitat Quality on the Applicants' Lands

The condition of the Applicant's forest lands is unique among forest industry ownerships. Throughout much of the mid-1900s, the Applicants' forest management strategy was to practice long-rotation forestry, harvesting minimally to maintain forest health and allowing forest values to increase. The Applicants were obtaining logs for their mill from sources other than their own lands. As a result of this strategy, the Applicant's lands carry an inventory that is dominated by older forest age classes and larger diameter logs. The Applicants' current SHA lands in Oregon are in similar age class conditions to those in Washington. The Applicants' combined commercial forest acreage with stands over 40 years of age is approximately 50,000 acres, or 60 percent of the total.

Very little old forest habitat that is suitable for spotted owl nesting occurs on the SHA lands. Spotted owl nest sites in the eastern Cascades have been reported in stands from 54 to 700 years old (Buchanan et al 1995). Most sites regenerated from fire, but 23 percent received partial timber harvest more than 40 years ago. Buchanan (1993) reported that 55 percent of observed nests were in abandoned accipiter nests and 25 percent used mistletoe brooms. Nesting spotted owls in eastern Washington use younger and smaller trees than in western Washington (Buchanan 1993).

SDS estimated that are 140 acres of forest that are 150 years old or older located in small, scattered patches within their ownership, including 102 acres inside the WS SOSEA and 38 acres outside of SOSEAs. Most of this old forest habitat occurs along the White Salmon River and is considered commercial forest land that is eligible for timber harvest outside of riparian buffers. These 140 acres could potentially provide spotted owl nesting habitat. We are uncertain if these specific acres received any previous spotted owl surveys, but in the 1990's there were spotted owl surveys taking place within the action area.

In addition, the lower elevations found on most of the Applicants' ownership allow forest stands useful for spotted owl roosting, foraging, and dispersal, to develop in shorter time frames than is typical for mid- to high elevation sites in the southern Cascades of Washington. As shown by recent surveys to identify stands in the Washington portions of the covered area that meet the Washington State definitions of Eastside YFM Habitat, this habitat can occur as young as 38 years, but more commonly after age 45, and almost assuredly after age 60 (Raedeke Associates 2012: p 2).

In some cases, 40-year-old stands on the Applicants' ownership may have the characteristics and function to be useful for spotted owls as foraging and roosting habitat, but they do not precisely meet every component of the definition of Eastside YFM Habitat. The most typical missing component is usually sufficient numbers of intermediate trees to meet the definition of Eastside YFM-Closed Canopy habitat. These stands had developed in such a fashion that the smaller intermediate trees had been suppressed by the time the stand had reached age 40, and the overall vigor of the stands and lack of disturbances that could have opened light gaps, prevented the growth of an intermediate tree layer. While some of these stands may be missing this intermediate tree component of the Eastside YFM-Closed Canopy habitat definition, they may still be used by spotted owls as foraging and roosting habitat. In almost all cases, 40-year stands

function as spotted owl dispersal habitat, and are capable of meeting the definitions of Eastside Dispersal Habitat.

The Applicants' lands are also unique among large private forestlands in Washington in the abundance of Oregon white oak habitat on their ownership. Spotted owl use of this habitat is poorly studied in the State. We canvassed local biologists with some knowledge of this habitat type and its use by spotted owls (including data from telemetry studies), and all of them stated that spotted owls will use stands of oaks, particularly at night for foraging. Some commented that owls would even use this type for roosting during the daytime, particularly if there are patches of Douglas fir large enough to provide secure roosting sites (T. Fleming, M. Neutzmann, D. Rock; pers. comm.). Oregon white oaks produce acorns that are undoubtedly important food for major prey species of spotted owls (e.g., northern flying squirrels (*Glaucomys sabrinus*) and bushy-tailed wood rats (*Neotoma cinerea*)), which likely increases the value of this habitat for foraging by spotted owls.

Habitat Quantity on the Applicants' Lands

Within spotted owl circles in the SOSEAs, WDNR has characterized YFM and SM habitat using ortho photos and field inspections. Where this information is available, we will use it in our analysis to quantify acres of habitat.

We will also use age of stands as a surrogate of habitat characteristics outside of spotted owl circles. Stands on the Applicants' were surveyed to determine at what age they met the YFM habitat definition in the Forest Practices Rules (WAC 222-16-085) (Raedeke Associates 2012:p. 1). Results are provided in Appendix C of the SHA. Given the sampling of habitat characteristics observed and the habitat enhancement methods described in the SHA, this study determined that stands 40 years old will meet the Washington Forest Practices Rules definition of dispersal habitat. The study also determined that stands older than 60 years will likely meet the Washington Forest Practices Rules definition of YFM. Stands 50 to 60 years of age may also qualify as YFM habitat if enhancement activities, such as commercial thinning and snag creation and/or retention, have been applied to create intermediate tree growth and snags to provide den sites for squirrels.

While the Service recognizes that the age of a forest stand may not be the most precise method for determining the quality and quantity of spotted owl habitat, we believe that this is a reasonable approach, given the forest inventory information available for this landowner. Because the habitat was typed so differently inside and outside spotted owl circles, we consider the estimates of habitat used below, as approximations.

We have quantified the amount of habitat as follows: 1) spotted owl habitat within spotted owl circles within the two SOSEA's; 2) spotted owl habitat within the two SOSEAs but outside of spotted owl circles; and 3) spotted owl habitat outside of SOSEAs (see Table 3).

Table 3. Environmental baseline for spotted owl habitat on the Applicants' current commercial forest lands.

SHA Area and Habitat Types		SM+	YFM	SM+YFM	Dispersal	Non-habitat	Commercial Forest SHA Acres
Restricted Habitat in Spotted Owl Circles in SOSEAs	White Salmon SOSEA	741	2,953	3,694	1,999	nc	nc
	Columbia Gorge SOSEA	313	690	1,003	nc	nc	nc
Restricted Habitat Baseline Subtotals		**1,054**	**3,643**	**4,697**	nc	nc	nc
Unrestricted Habitat in White Salmon SOSEA		5,144	3,732	8,866	4,169	nc	nc
White Salmon SOSEA SHA Baseline Subtotals (restricted habitat in circles + unrestricted habitat)		**5,885**	**6,685**	**12,570**	**6,168**	**9,822**	**28,560**
Unrestricted Habitat Outside of White Salmon SOSEA	WA	9,395	6,278	15,673	4,976	8,636	29,285
	OR	2,885	4,993	7,878	967	3,269	12,141
Unrestricted Habitat Outside White Salmon SOSEA Baseline Subtotals		**12,280**	**11,271**	**23,551**	**5,952**	**11,905**	**-**
SHA Lands Totals		**18,478**	**18,646**	**37,124**	**12,111**	**20,751**	**69,986**

Sources: SHA Table 3.1 (p. 10), SHA Table 4.1 (p. 45), EA Table 2-1 (p. 9), and J. Spadaro, pers. comm. Sept. 5, 2012 (habitat information for SHA lands in OR). Notes: Restricted habitat is acreage of SDS/BLC ownership within the best 2,605 acres of habitat within a 1.8 mile radius spotted owl circle located in a SOSEA. Unrestricted habitat is either surplus habitat in a spotted owl circle, or habitat located outside of owl circles in a SOSEA, and all habitat located outside of SOSEAs. nc = not calculated.

Habitat Within SOSEAs, Inside Spotted Owl Circles

As explained earlier, WDNR has determined the amount of spotted owl habitat within 0.7 and 1.8 mile radius spotted owl circles inside the White Salmon and Columbia Gorge SOSEAs. In this process, the WDNR designated all suitable spotted owl habitat within the 0.7 mile radius circles and the highest quality habitat within the 1.8 mile radius circle.

Although WDNR identified the highest quality 2,605 acres for each spotted owl site in the White Salmon SOSEA, they have not done so for each spotted owl site center in the Columbia Gorge SOSEA. The WDNR has identified 313 acres of SM habitat and 690 acres of young forest marginal habitat occurring in the SHA lands within 1.8 miles of the four spotted owl site centers in the Columbia Gorge SOSEA. Therefore for the purposes of this SHA, we are considering 1,003 acres of land within spotted owl circles in the Columbia Gorge SOSEA to be "highest-quality habitat." Within spotted owl circles in the White Salmon SOSEA, 3,694 acres of "highest-quality" habitat (740 acres SM and 2,953 acres young forest marginal habitat)

exist on the Applicants' land and are restricted from harvest. In summary, 4,697 acres of Applicants' lands within spotted owl circles in the SOSEAs are "highest quality" (SM or YFM) and restricted from harvest.

The Applicants are minority landowners in the SOSEAs. Of the spotted owl sites on USFS land in proximity to SHA lands, none of the 70-acre cores intersect SHA lands.

Table 4 shows spotted owl circles within the SOSEAs, and Table 5 shows acreage of ownership and habitat in the White Salmon SOSEA. For each of the spotted owl 1.8-mile home range radii within the SOSEAs, the highest quality 2,605 acres of suitable habitat is excluded from harvest. Given the ownership patterns surrounding these site centers, a total of 4,697 acres of Applicants' lands are restricted from harvest. This acreage includes all suitable spotted owl habitat within 0.7 mile of each site center, and that portion of the Applicants' ownership identified as part of the highest quality 2,605 acres of habitat between 0.7 and 1.8 miles of each site center.

Table 4. Ownership by Percentage within Spotted Owl Circles in the SOSEA's.

		Within 0.7 mile radius circle			
SOSEA	**Site Name and Number**	**SDS & BLC**	**Other Pvt**	**State**	**Federal**
White Salmon	Bear Creek #828	0%	1%	98%	1%
White Salmon	Cave Creek #852	8%	22%	65%	5%
White Salmon	White Salmon River #875	2%	19%	17%	62%
White Salmon	Dry Creek WSR #734	36%	0%	64%	0%
White Salmon	Phelps Creek #874	0%	0%	87%	13%
White Salmon	Weiberg Creek #1116	18%	14%	68%	0%
White Salmon	Monte Cristo #284	0%	0%	0%	100%
White Salmon	Rattlesnake Creek #1048	9%	5%	86%	0%
White Salmon	Gilmer Creek South #753	56%	37%	7%	0%
White Salmon	Mill Creek #991	13%	0%	87%	0%
White Salmon	Moss Creek Campground # 1003	30%	9%	37%	24%
White Salmon	Moss Creek #289	0%	0%	0%	100%
White Salmon	Little Wind River- upper #824	0%	0%	0%	100%
White Salmon	Berry Creek #970	0%	0%	0%	100%
Columbia Gorge	Carson Ridge #647	0%	34%	66%	0%
Columbia Gorge	Red Bluffs #765	0%	9%	35%	56%
Columbia Gorge	Budweiser Creek #302	0%	0%	100%	0%
Columbia Gorge	Steep Creek #667	0%	0%	2%	98%
		Outside 0.7 radius and within 1.8 mile radius circle			
SOSEA	**Site Name and Number**	**SDS & BLC**	**Other Pvt**	**State**	**Federal**
White Salmon	Bear Creek #828	16%	12%	65%	7%
White Salmon	Cave Creek #852	15%	42%	33%	10%
White Salmon	White Salmon River #875	16%	28%	45%	12%
White Salmon	Dry Creek WSR #734	37%	6%	52%	5%
White Salmon	Phelps Creek #874	4%	0%	58%	38%
White Salmon	Weiberg Creek #1116	24%	9%	67%	0%
White Salmon	Monte Cristo #284	3%	0%	21%	76%
White Salmon	Rattlesnake Creek #1048	41%	13%	46%	0%

SOSEA	Site Name and Number	Within 0.7 mile radius circle			
		SDS & BLC	Other Pvt	State	Federal
White Salmon	Gilmer Creek South #753	17%	65%	18%	0%
White Salmon	Mill Creek #991	22%	3%	75%	0%
White Salmon	Moss Creek Campground # 1003	39%	3%	42%	17%
White Salmon	Moss Creek #289	16%	7%	4%	73%
White Salmon	Little Wind River- upper #824	17%	5%	1%	76%
White Salmon	Berry Creek #970	9%	0%	0%	91%
Columbia Gorge	Carson Ridge #647	8%	63%	29%	0%
Columbia Gorge	Red Bluffs #765	12%	27%	55%	6%
Columbia Gorge	Budweiser Creek #302	7%	6%	87%	1%
Columbia Gorge	Steep Creek #667	9%	6%	83%	2%

Table 5. Land ownership and spotted owl habitat in the White Salmon SOSEA.

Owner	NRF Habitat	Dispersal Habitat	Non-Habitat	Totals
WDNR HCP	32,667	27,916	10,228	70,811
Federal	16,458	2,170	4,849	23,477
SDS-BLC	16,641	8,978	5,817	31,436
Other	10,360	22,384	15,900	48,644
TOTALS	76,126 (44 %)	61,448 (35%)	36,794 (21%)	174,368 (100%)

Spotted owl habitat information is based on the Northwest Forest Plan spotted owl 15-year review habitat map and represents conditions circa 2006/2007 (Davis et al. 2011). All acre figures are approximate values that are not directly comparable to SDS habitat estimates because SDS did not calculate habitat values lands other than commercial forest lands.

Habitat on the Applicants' Lands within SOSEAs, Outside of Spotted Owl Circles

Within the White Salmon SOSEA, but outside of spotted owl circles, there is an estimated 8,866 acres of owl habitat (5,144 acres SM and 3,732 acres YFM). Approximately 4,169 acres are dispersal habitat. Approximately 102 acres of old forest habitat exists inside the White Salmon SOSEA, mostly along the White Salmon River. This habitat is considered "commercial forest" eligible for some harvest outside of riparian buffers.

Within the Columbia Gorge SOSEA, outside of the owl management circle, the Applicants own 423 acres of forest greater than 60 years (SM and YFM).

Habitat on Applicants' Land Outside the SOSEAs in Washington and in Oregon

Table 6 shows acres of habitat outside of the SOSEAs in Washington. This Table also includes all acres of habitat in Oregon.

Table 6. Habitat acres on the Applicants' lands outside of SOSEAs in Washington and Oregon

Outside SOSEAs	Sub mature (80+)	Young Forest Marginal (60-79 yrs)	Dispersal (40-59 yrs)
• Washington	9,395	6,278	4,976
• Oregon	2,885	4,993	967

Barred Owls

As described in the Status of the Species (Appendix A), the threat to spotted owls from barred owls is pressing and complex. Demographic surveys for spotted owls conducted from 2001-2009 detected barred owls at numerous locations within the SHA lands (Table 2, above spotted owl surveys). It is likely that barred owls now inhabit all forested areas throughout the SHA lands wherever nesting opportunities exist, with the possible exception of some of the driest forest types and in areas with steep slopes. In the eastern Cascades in Washington, both barred owls and spotted owls use forests with similar structural characteristics; however barred owls appear to be more closely associated with moist forests on gentle slopes in valley bottoms than spotted owls are (Singleton et al. 2010, p. 292). A recent study of barred owl and spotted owl habitat use in Oregon found similar results, emphasizing the importance of old-forest, large hardwood trees, and moist, riparian forests for barred owls (Wiens 2012, p. 66).

Washington State Department of Natural Resources Trust Lands HCP and Amendment

WDNR is a major landowner in the Action area, with approximately 158,000 acres managed under its HCP. In April 2004, the WDNR amended its HCP in the Klickitat Planning Unit, which covers a major portion of the Applicants' land in the White Salmon SOSEA. The amendment has the goal of meeting or exceeding the conservation commitment of the original HCP, while reducing risk of catastrophic habitat loss and increasing the quality of habitat.

In the White Salmon SOSEA, large tracts of the Applicants' lands lie adjacent to the Husum and Trout Lake Sub Landscape units, which were included in the amendment and have specific targets for the conservation of spotted owls. Both of these Sub Landscapes have objectives of promoting and maintaining NRF habitat by:

- First, in areas adjacent to known occupied and unoccupied owl nest sites,
- Second, in areas that appear to have avoided stand-replacing fires in the past, and
- Third, in areas that are the most sustainable as older mature forests.

The Husum Sub Landscape, which borders the Gifford Pinchot National Forest on the east, has 3,812 acres of existing NRF habitat and will be managed over time to grow and maintain one third of the landscape (8,701 acres) in NRF. The WDNR has also developed spotted owl nest site protection plans for occupied owl nest sites in core areas (#991, #1116, and #734).

The Trout Lake Sub Landscape area also borders the Gifford Pinchot NF and has 5,257acres designated as NRF habitat. The objective is to maintain 50 percent in NRF habitat. The WDNR has developed an unoccupied nest site plan for site #828, the only nest site within the Trout Lake Sub Landscape.

In the Columbia Gorge SOSEA, scattered parcels of the Applicants' land lie adjacent to a WDNR NRF management area. WDNR is managing for 50 percent NRF habitat in this area. This NRF management area includes spotted owl sites #666, 945, 648, 667, 302, 665, and 647. This SOSEA is adjacent to the Gifford Pinchot National Forest to the north. Spotted owl site #180 is on the Gifford Pinchot National Forest.

EFFECTS OF THE ACTION: Spotted Owl

The SHA describes voluntary conservation actions that are expected to lead to net conservation benefits to northern spotted owls. To issue an enhancement of survival permit under section 10(a)(1)(A) of the ESA, there needs to be a reasonable expectation of net conservation benefits that contribute directly, or indirectly, to the recovery of the covered species (64 FR 32717). There can also be adverse effects associated with implementation of the SHA. Adverse effects are primarily anticipated from timber harvest of suitable spotted owl habitat, but are not limited exclusively to timber harvest.

Landscape Assessment

In this analysis of landscape-level habitat conditions, we analyze the differences between the landscape conditions with and without the SHAs in place to determine the effects of the proposed Federal action. To the extent possible, we distinguish between effects that would occur because of the Permits and effects that would occur regardless of the Permits. We also consider the benefits of the Permits when compared to the effects that would only occur in the absence of the Permits. More certainty will exist regarding landscape conditions with the Permits; and less certainty will exist without the Permits. We also analyze the resulting landscape conditions to determine the effect of those conditions on the spotted owl population. In this analysis, we assume that all commercial forestlands which can be managed feasibly and for which management is allowed under the SHAs and under regulations would be managed in order to meet commitments and objectives.

<u>Habitat in Spotted Owl Circles in SOSEAs</u>

Current Conditions and Conditions Anticipated in the Absence of Permits

There are 3,694 acres of spotted owl suitable habitat (YFM and SM habitat) within 1.8-mile owl circles restricted from harvest under the Washington State Forest Practices Rules in the White Salmon SOSEA and 1,003 acres in the Columbia Gorge SOSEA. Therefore, for purposes of this analysis, a total of 4,697 acres are identified as currently restricted from harvest on the Applicants' lands within 1.8-mile owl circles in the White Salmon and Columbia Gorge SOSEAs. Of these restricted acres, 1,054 acres are currently SM habitat or better and 3,643 acres are eastside YFM habitat. In the White Salmon SOSEA, the 3,694 acres of suitable habitat

currently restricted includes 741 acres of SM habitat (2.6 percent of the SHA ownership that is capable of producing habitat (habitat-capable ownership) in the entire SOSEA) and 2,953 acres of YFM habitat (10.3 percent of the habitat-capable ownership in the entire SOSEA).

Without the Permits, the Applicants are reasonably certain to implement a 45-year rotation on unrestricted acreage (the industry standard) and it is unlikely that additional forest lands would grow older and become suitable habitat, with the possible exception of regulated riparian areas, unstable slopes, or other isolated areas that are otherwise restricted or constrained from harvest. For instance, 140 acres of the 411 acre Little White Salmon SSA is either precluded from harvest or limited to no more than 30 percent removal during a 10-year period. Much of this SSA already consists of forests older than 80 years of age with YFM and possibly SM habitat. Over time, some of the restricted YFM habitat might grow into SM habitat, but the total amount of suitable habitat available to spotted owls would not increase. In fact, as suitable habitat might be destroyed by stochastic events such as insects, disease, wind-throw, and/or fire, it would not be replaced and therefore would become a smaller portion of the area inside owl circles within SOSEAs. There is also a possibility, without the Permits, that the Applicants would seek decertification of site centers, although that scenario has an uncertain outcome. It is reasonable to assume that, without the Permit, only about 10 percent of the managed lands would become dispersal habitat.

Management Under the Permits

Between the 0.7-mile and 1.8-mile circles of eight owl site centers in the White Salmon SOSEA, and inside the 1.8-mile circles surrounding other owl site centers in either of the SOSEAs, the management regime under the Permits would be the same as outside circles in those SOSEAs (please see the next section, *Habitat outside circles in SOSEAs* for an assessment of these areas). The Applicants do not own any land or habitat within 0.7-mile circles within the Columbia Gorge SOSEA; so much of the remainder of this discussion will focus on the White Salmon SOSEA and inside 0.7-mile owl circles.

With the Permits, the Applicants would provide 1,054 acres of SM habitat in the White Salmon SOSEA. Some of these 1,054 acres may be inside 0.7-mile circles, but this is not a specific requirement of the elevated baseline. Inside the 0.7-mile circles of eight spotted owl site centers, there are currently 386 acres of SM habitat. The elevated baseline within each of the eight circles would be equivalent to 33 percent of the habitat-capable ownership inside these 0.7-mile circles in the White Salmon SOSEA. Unlike the scenario without the Permits, these acres could be replaced over time through a combination of in-growth and harvest. With replacement, it is possible that older and higher quality habitat may be replaced with younger and less complex habitat. SSAs inside 0.7-mile circles will also provide habitat. For instance, of the 240-acre Gilmer SSA, 90 acres is currently classified as SM habitat.

The terms of the SHA require maintenance of 33 percent of habitat capable lands in YFM or better habitat (age 60 and over) in 0.7 mile circles. Stochastic events could temporarily reduce the amount of suitable habitat, but the Applicants would continue to manage forest lands to equal or exceed the elevated baseline. Therefore, there is more certainty under the Permits than the

scenario without Permits, because habitat loss due to natural disturbance would not be replaced without the SHA.

Suitable Habitat – Submature or Better

Without the Permits, some restricted areas (either restricted for spotted owls or restricted for other reasons) would be SM habitat and other areas might grow into SM habitat. Over time, if stochastic events removed SM habitat it would not be replaced. The resulting amount of SM habitat is uncertain, but would be unlikely to significantly increase beyond 1,054 acres for the SHAs; 741 acres within 1.8-mile circles of the White Salmon SOSEA and 313 acres within 1.8-mile circles in the Columbia Gorge SOSEA.

With the Permits, the amount of SM habitat could be replaced through a combination of in-growth and harvest over time. In addition, the portion of the elevated baseline would be a commitment; and, therefore, stochastic events would be less likely to reduce the amount of SM habitat on the landscape over time. Initially, due to the commitment to retain 1,054 acres of SM habitat (386 acres are currently within 0.7-mile circles in the White Salmon SOSEA) and due to the 10-year harvest deferral with four owl circles, 262 acres of SM habitat would be retained for the first 10 years. Over time, to meet the overall commitments of the elevated baseline, and as a result of the lengthened rotation, about 11 percent of areas within the White Salmon SOSEA 0.7-mile circles may be in SM habitat.

The locations where nesting habitat currently occurs in the SHA area, or would be most likely to develop in the future, will be the SSAs that are protected for the life of the permit. Up to 140 acres of forest older than 150 years is estimated to occur in small pockets of forest. Potentially, some of this could be providing spotted owl nesting habitat.

Suitable Habitat – Young Forest Marginal

Without the Permits, the Applicants would have 3,643 acres of restricted YFM habitat; 2,953 acres within the White Salmon SOSEA and 690 acres within the Columbia Gorge SOSEA. When combined with the SM habitat discussed above, the suitable habitat that would be YFM or better habitat would comprise 3,694 acres within the White Salmon SOSEA and 1,003 acres within the Columbia Gorge SOSEA or 4,697 acres for the two SOSEAs combined.

With the Permits, the Applicants would provide 616 acres of YFM or better habitat within eight White Salmon SOSEA 0.7-mile circles (33 percent of the habitat-capable ownership in these circles). These 616 acres (33 percent) will include 262 acres of SM habitat for the first 10 years. Over time, the amount of YFM habitat might decrease to about 22 percent as SM habitat may increase to 11 percent as a result of lengthened rotations, still comprising in combination at least 33 percent of the ownership inside the 0.7-mile circles within the White Salmon SOSEA.

Dispersal Habitat

Without the Permits, it is anticipated that about 10 percent of the managed areas within 1.8-mile circles in the SOSEAs may obtain dispersal condition as a by-product of the 45-year rotation.

Forestry practices may change over time and there would be little certainty that this habitat would be provided. Together with the suitable habitat amounts described above as a result of restricted acres, the habitat that would be dispersal habitat or better would be composed of the combination of restricted acres (12.9 percent of habitat-capable ownership in the entire SOSEA) and the 10 percent amount of dispersal habitat produced as a by-product of the 45-year rotation.

With the Permits, it is anticipated that 33 percent of the Columbia Gorge SOSEA within 1.8-mile radius owl circles may obtain dispersal condition as a by-product of the 60-year rotation commitment. Due to the White Salmon SOSEA elevated baseline, lands between 0.7 mile and 1.8 miles of eight site centers would be managed similarly to other lands in the White Salmon SOSEA and expected to produce between 16.5 percent and 27 percent in dispersal habitat.

Within the White Salmon SOSEA, within the 0.7-mile radius of eight owl site centers, about 22 percent of the area would be in dispersal condition in order to meet the elevated baseline targets of 33 percent YFM or better. Combined with the 33 percent YFM or better habitat, a total of 50 to 55 percent of the habitat-capable ownership within the 0.7-mile circles in the White Salmon SOSEA would be dispersal or suitable habitat.

Other Considerations

There are 262 acres of SM and 609 acres of YFM habitat for a total of 871 acres of suitable spotted owl habitat in four 0.7-mile radius circles in the White Salmon SOSEA for which the Applicants will defer harvest for 10 years. This deferral of harvest will result in a distribution of habitat that has concentrations of habitat within 0.7 mile of these four site centers. An elevated baseline commitment will still apply within the 0.7-mile circles surrounding the eight site centers discussed above and will also contribute to a clumping of habitat within 0.7-mile circles. These are the locations with the highest likelihood of occupancy across the Applicants' lands.

Habitat Outside Spotted Owl Circles in SOSEAs

Current Conditions and Conditions Anticipated in the Absence of Permits

Without the Permits, the only suitable habitat would be in areas that are either restricted by regulations or by operability constraints. The Applicants would manage on a 45-year rotation, although some individual stands may not be harvested until age 55. Dispersal habitat may develop on 10 percent of the habitat-capable lands as a by-product of the 45-year rotation.

Management Under the Permits

With the Permits, in the Columbia Gorge SOSEA, conditions may be degraded compared to conditions without the Permits. Under the assumed 60-year rotation, it is anticipated that about 33 percent of these areas could become dispersal habitat, but the SHAs would not provide SM or YFM habitat unless it was a result of otherwise restricted acres. Of the 651 acres in SSAs, approximately 430 acres may have potential to remain in, or grow into, SM habitat. For instance, much of the 411 acres in the Little White Salmon SSA are already over 80 years of age.

About 271 acres of this area would not otherwise be restricted, but will be restricted by the SHAs.

With the Permits, the Applicants would provide 1,054 acres of SM habitat in the White Salmon SOSEA as part of the elevated baseline. In addition, the elevated baseline for the White Salmon SOSEA would require 4,185 acres of YFM and 4,185 acres of dispersal habitat for a total amount of 9,424 acres (equivalent to 33 percent of the habitat-capable ownership within the White Salmon SOSEA). Unlike the scenario without the Permits, these acres could be replaced over time through a combination of in-growth and harvest. Therefore, there would unlikely be much increase in the amount or quality of the existing SM habitat over time.

Stochastic events could only temporarily reduce the amount of suitable habitat as the Applicants continue to manage SHA lands to equal or exceed the elevated baseline. Therefore, there is more certainty under the Permit scenario within the White Salmon SOSEA. Within the Columbia Gorge SOSEA, there will be additional dispersal habitat provided but less suitable habitat, and the level of certainty is not significantly increased due to the Permits.

Suitable Habitat – Submature or Better

Without the Permits, the only SM or better habitat would be provided in inoperable areas, either due to lack of feasibility or constraint due to regulations. Similarly, with the Permits inside the Columbia Gorge SOSEA, the only SM or better habitat would be provided in inoperable areas, either due to lack of feasibility or constraint due to regulations. However, within the White Salmon SOSEA, approximately 3 to 4 percent of the habitat-capable ownership would be provided in SM habitat due to the elevated baseline.

Suitable Habitat – Young Forest Marginal

Without the Permits, the only YFM or better habitat would be provided in inoperable areas, either due to lack of feasibility or constraint due to regulations. Similarly, with the Permits, inside the Columbia Gorge SOSEA, the only YFM or better habitat would be provided in inoperable areas, either due to lack of feasibility or constraint due to regulations. However, within the White Salmon SOSEA, approximately 16.5 percent of the habitat-capable ownership would be provided in YFM or better habitat due to the elevated baseline (this may be provided in a combination with half of the required SM habitat or about1.5 to 2 percent of the habitat-capable ownership, and 14 to 15 percent YFM habitat).

Dispersal Habitat

About10 percent dispersal habitat may develop as a by-product of the 45-year rotation without the Permits. With the Permits, about 33 percent of habitat-capable ownership in the Columbia Gorge SOSEA could become dispersal habitat due to the 60-year rotation. In the White Salmon SOSEA, with the Permits, 16.5 percent dispersal habitat is expected as a result of the elevated baseline; however, up to 25 to 27 percent of the habitat-capable ownership in the White Salmon SOSEA may be provided as a by-product of the rotation age needed to provide the YFM habitat.

Spotted Owl Habitat outside of SOSEAs

Current Conditions and Conditions Anticipated in the Absence of Permits

Without the Permits, suitable habitat would only remain in areas that are either minimally restricted by regulations or by operability constraints. The Applicants would manage on a 45-year rotation. Some individual stands may not be harvested to age 55. About 10 percent of habitat-capable ownership may develop into dispersal habitat as a by-product of the 45-year rotation. There are 12 historic spotted owl circles that overlap the Applicants' lands outside of the two SOSEAs. These owl circles do not receive protection under Washington or Oregon Forest Practices Rules other than protection of the best 70 acres during the nesting season. Outside of the nesting season, these 70-acre patches can be harvested in accordance with the Forest Practices Rules. Because spotted owl sites in Oregon and outside of SOSEAs in Washington have minimal regulatory protection and low levels of habitat, we cannot be reasonably certain that they are currently occupied. For these same reasons, we cannot be reasonably certain that they will be re-occupied in the future.

Management Under the Permits

With the Permits, habitat conditions may decline over time, but are expected to be better than would occur without the Permits. Under the assumed 60-year rotation, it is anticipated that about 33 percent of these areas could become dispersal habitat, but the SHAs would not provide SM or YFM habitat unless it was a result of otherwise restricted acres. Because there is no elevated baseline outside the SOSEA, the same level of certainty is not provided as exists in the White Salmon SOSEA. Some dispersal habitat (33 percent is anticipated as a result of lengthened rotations (60 years).

Suitable Habitat – Submature or Better

Under any scenario, the only SM or better habitat would be provided in inoperable areas, either due to lack of feasibility or constraint due to regulations.

Suitable Habitat – Young Forest Marginal

Under any scenario, the only YFM or better habitat would be provided in inoperable areas, either due to lack of feasibility or constraint due to regulations, of possibly in some isolated cases where individual stands were carried beyond the rotation age. That situation would be relatively infrequent and any habitat benefits derived would be ephemeral.

Dispersal Habitat

About 10 percent dispersal habitat may develop as a by-product of the 45-year rotation without the Permits. With the Permits, under the assumed 60-year rotation (with harvest of some stands delayed until 70 years), it is anticipated that about 33 percent of these areas could become dispersal habitat.

Landscape Conditions

The result of the Permits would be an increase in certainty regarding amounts of habitat provided through time. Without the Permits, future amounts of habitat would depend on a static approach and the degree of forest health, as well as the frequency and intensity of stochastic events. The total amounts of suitable habitat would generally decrease over time without the Permits.

Transition

Immediately following approval of Permits, harvest actions will result in little change to landscapes. Meaningful changes will occur relatively gradually over long periods of time. For this reason, the assessments below focus on landscape conditions expected following a transition period and with a relatively even-flow expectation. Landscape conditions during interim periods would be anticipated to be between the current conditions and equilibrium conditions.

Distribution and Amount of Habitat

Within the eight 0.7-mile circles in the White Salmon SOSEA, elevated-baseline commitments require that 33 percent of the habitat-capable ownership be in YFM or better habitat. In the White Salmon SOSEA as a whole, the requirements of the elevated baseline would result in about 4 percent SM habitat and an additional 14.5 percent YFM habitat for a total of about 18.5 percent suitable habitat. Together, these would comprise between 35 percent and 45 percent of the habitat-capable ownership in dispersal or better habitat.

Outside the White Salmon SOSEA, we anticipate that suitable habitat will only be provided as a result of restrictions for riparian reserves or unstable slopes, or otherwise inoperable areas. These areas would likely be restricted under all scenarios. We also assume that the required 60-year rotation would provide about 33 percent of the habitat-capable ownership within dispersal habitat, but would not provide any suitable habitat except in certain infrequent situations. In some cases, isolated stands carried beyond rotation may provide suitable habitat for short periods of time.

Contribution to Demographic Support

Concentrations of owl suitable habitat, especially habitat that can support nesting, is anticipated to occur primarily on Federal and State lands in or adjacent to the White Salmon SOSEA, and to some extent on SHA lands and other private ownerships inside the SOSEA. As explained in this analysis, concentrations of suitable habitat under the SHA are anticipated to focus on key sites within the White Salmon SOSEA. This analysis compares amounts of habitat required at a landscape level with that amount provided by the SHA.

Bart and Forsman (1992) and Bart (1995; p. 944) found a statistically significant relationship between amount of suitable habitat and survival and reproduction. Currently, the White Salmon SOSEA contains about 76,000 acres of suitable habitat (44.8 percent) on all ownerships (Federal, State, and private). Without the Permits, assuming no change in ownership, the amount of suitable habitat on all ownerships would decrease to 35.5 percent. With the implementation of

the SHA, it would only drop to 38.1 percent of all ownerships. Under a reasonable worst-case scenario without the Permits (i.e., maintenance of Federal and State habitat, but loss of all habitat on other ownerships), the amount of suitable habitat would be 29.4 percent of all ownerships. Under a reasonable worst-case scenario with the Permits, suitable habitat would only decrease to 32.0 percent of all ownerships. Distribution across the SHA landscape will not be even. There will be additional habitat on SHA lands within or adjacent to SSAs as well as within the eight 0.7-mile owl circles. Additional habitat will be retained within four owl sites due to the 10-year harvest deferral. It is anticipated that these provisions will assist in the conservation of owl sites that depend on Federal and State lands (See analysis below regarding individual spotted owls).

Contribution to Dispersal and Connectivity

Currently, the White Salmon SOSEA contains about 76,126 acres of suitable habitat and 22,384 acres of dispersal or better habitat (totaling 81 percent) on all ownerships. Without the Permit, assuming no change on other ownerships, the amount of dispersal or better habitat would decrease to 68.1 percent. With the implementation of the SHAs, it would only drop to 71.8 to 73.6 percent of all ownerships. Under a worst-case scenario (maintenance of Federal and State habitat, but loss of all habitat on other ownerships), the amount of dispersal and better habitat without the Permits would be 48.8 percent, and 52.5 to 54.3 percent with the Permits.

Whether habitat is distributed sufficiently to provide connectivity depends on the species, their home range, mobility, and other habitat needs. Fragmentation depends on whether the species utilizes interior conditions or edge habitat. Moreover, as the amount of continuous natural habitat decreases below 60 to 80 percent of the landscape, connectivity between the remaining habitat patches becomes increasingly important for many species (McComb 1999, p. 296).

A review of published literature suggests connectivity begins to deteriorate once late-successional habitat is fragmented and constitutes less than 50 percent of the landscape (USDA 1997). The early theoretical work in the field of habitat fragmentation was largely based on island biogeography theory, which emphasized perceptions of "islands" of suitable habitat in a "hostile sea" of non-habitat. Concepts of habitat corridors providing linear connections through this "hostile sea" developed from the application of island biogeography theory to conservation problems. However, not all non-habitat functions as a hostile sea (Bunnell 1999).

Dispersal failure could lead to population declines. Juvenile spotted owls dispersing across clear-cuts or open canopy forest move shorter distances and have an increased probability of mortality (Miller et al. 1997). Herter and Hicks (1995) also found dispersal distances of successful dispersers to be farther than those of unsuccessful dispersers (18.8 vs. 15.3 miles). Decreasing dispersal can decrease local populations while habitat loss simultaneously reduces population viability and exacerbates the effects of stochastic events. These factors, when combined, may increase the risk of local extirpations. Extirpations increase in probability for isolated and smaller populations. The success of juvenile dispersal in a fragmented landscape is likely a primary factor determining the future existence of spotted owls in the Pacific Northwest (Meyer et al. 1998). However, Carey et al. (1992) found that landscape indices of fragmentation were poor predictors of areas traversed by spotted owl pairs.

In the White Salmon SOSEA, with the implementation of the SHAs, dispersal or better habitat would comprise about 70 percent or more of all ownerships. Under a worst-case scenario, the amount of dispersal and better habitat would not fall below 50 percent of all ownerships. In order to make an effective connection across landscapes, more than dispersal habitat is needed. Foraging and roosting habitats play crucial roles for dispersing owls. The combination of dispersal and YFM habitat on the SHA lands should provide for foraging and roosting opportunities.

Distribution of suitable habitat across the SHA landscape would be focused on areas within or adjacent to SSAs, as well as within the eight 0.7-mile owl circles. Additional habitat will be retained within four owl sites due to the 10-year harvest deferral. It is anticipated this arrangement of habitat will be the most effective for supporting dispersing owls and will also help support nesting owls that may occur on Federal or State lands. A key component of connectivity is interspersed or adjacent areas of productivity to produce young owls that will disperse and provide the opportunity for such owls to cross these landscapes. The combination of Federal and State lands, supported by the SHA lands, would be expected to fill this function.

Effects to Spotted Owls from Habitat Loss in SOSEAs

Spotted owls in Washington use large annual home range areas that vary from less than 3,000 to more than 30,000 acres (Hanson et al. 1993, p. 19). Because the actual configuration of a home range is rarely known, a circle centered on a spotted owl activity center is used to identify the area approximating the median annual home range. The median annual home range for a spotted owl pair in the Washington Cascades is represented by a 1.8-mile radius circle (6,512 acres).

Timber harvest can directly affect spotted owls by reducing the total amount of suitable habitat within a spotted owl's home range. The result may be that the spotted owls continue to persist at the territory, but marginal habitat conditions in the territory compromise the spotted owls' ability to survive and successfully reproduce. Habitat loss within the home range also increases the potential for negative competitive interactions with barred owls (Dugger et al. 2011), or spotted owls may abandon a territory and seek out habitat elsewhere that may be marginal or occupied by other spotted owls or barred owls that compete for the same resources.

As described in the Environmental Baseline, there are 18 historic spotted owl sites within SOSEAs that are reasonably certain to be occupied and overlap the SHA lands. For the purpose of this analysis, we assume that these historic owl sites provide a reasonable representation of the current and future distribution of spotted owls in the SHA landscape. To evaluate the effects of the SHA to individual spotted owls, we evaluated the total amount of suitable owl habitat (old forest, SM, and YFM combined) within these 18 spotted owl circles.

The Service uses 40 percent as a minimum viability threshold for suitable habitat within the median home range circle (USFWS et al. 2008, p. 17). In the Washington Cascades, 40 percent of a 1.8-mile circle is 2,605 acres. The 40 percent suitable habitat threshold is a guideline that the Service employs for analysis purposes. We recognize that there are many examples of spotted owl sites that have persisted with habitat below 40 percent, that home ranges are not circular, and that the 40 percent threshold is not an absolute indicator of viability. We use the 40 percent threshold for our section 7 consultation analyses because it is supported by numerous

studies that indicate that spotted owls commonly have between 30 to 50 percent suitable habitat within a home range (e.g., Hanson et al. 1993; Bart 1995; Dugger et al. 2005). The Service also uses a 0.7-mile radius circle in Washington to identify the core habitat around a spotted owl nesting/roosting site. We use a suitable habitat threshold of 500 acres within the 0.7-mile radius circle as an additional viability indicator for this species (USFWS et al. 2008, p. 11). In Oregon, we use similar thresholds, but the median circles are smaller: 1.2 mile-radius and 0.5 mile-radius, with minimum habitat thresholds of 1,142 acres (40 percent) and 250 acres (50 percent), respectively (USFWS et al. 2008, p. 11).

We consider the loss of any suitable habitat within a spotted owl home range to be an adverse effect, because the loss of habitat reduces the total area available to the spotted owls for foraging, particularly in landscapes where competition with barred owls reduces habitat availability for spotted owls (e.g., Weins 2012, p. 36). However, only management actions that reduce habitat below the aforementioned thresholds can be reasonably expected to result in a significant impairment of spotted owl life history functions (i.e., breeding, feeding, and sheltering).

For each occupied spotted owl circle in the SOSEAs, we evaluated the existing suitable habitat on all ownerships and on the SHA lands. The analysis only considers the current habitat conditions in the circles and does not account for habitat-capable lands that may develop into habitat in the future, except in certain areas where, the under the terms of the SHA, 33 percent of habitat-capable lands within 0.7-mile circles will be maintained as YFM habitat. For example, spotted owl site #734 (Dry Creek-White Salmon) contains approximately 785 acres of suitable habitat on all ownerships in the 0.7-mile circle, including 253 acres of habitat on SHA lands. Under the SHA, all 253 acres are available to be harvested eventually, but 120 acres in the 0.7-mile circle would be maintained as YFM habitat as part of the "elevated baseline," resulting in a net loss of 133 acres. Over the term of the SHA, we would expect a reduction of total habitat from 785 acres to 652 acres in the 0.7-mile circle (Appendix B).

Our estimates of potential habitat loss in circles only account for effects associated with implementation of the SHA, and do not reflect habitat loss that may occur as a result of other consulted-upon actions such as the WDNR HCP, or future habitat in-growth that may occur over the term of the SHA. Additionally, the suitable habitat estimates in circles may include riparian areas or other SHA lands that are not considered to be part of the commercial forest land base, but accounting for these non-commercial forest lands was beyond the scope of this analysis.

Habitat in circles was evaluated using WDNR habitat typing for the White Salmon SOSEA, representing approximately 2009 conditions. All values derived from these sources are estimates based on the available data for the purpose of this analysis, and are not considered to be absolute values. The analysis of habitat in spotted owl circles is summarized in Appendix B.

Effects to Spotted Owl Circles in the White Salmon SOSEA

All of the 14 spotted owl circles affected by SHA management are currently above habitat thresholds in both the 0.7- and 1.8-mile circles (Appendix B). Most of the habitat in these circles is SM or YFM habitat, with little old-forest habitat. Eight sites will have management within 0.7-mile circles, but none of these circles are expected to drop below a minimum habitat

threshold of 500 acres. Estimated habitat losses ranges from 1 acre to 1,401 acres depending on the circle. A total of 12 circles will have habitat losses of greater than 250 acres. Three spotted owl circles (site numbers 753, 1048, 824) are likely to have significant habitat losses, dropping below the minimum habitat threshold of 40 percent (2,605 acres) and can be reasonably expected to incur a significant impairment of spotted owl life history functions (i.e., breeding, feeding, and sheltering). Habitat levels in these circles will remain near threshold levels (37 to 39 percent).

Effects to Spotted Owl Circles in the Columbia Gorge SOSEA

Of the 4 spotted owl circles affected in the Columbia Gorge SOSEA, only 1 site is currently below habitat thresholds (Appendix B). Site number 765 (Red Bluffs) is currently at 20.5 percent habitat. SHA management will further reduce habitat in the 1.8-mile circle by 43 acres to 19.8 percent. Site #647 will have habitat losses of greater than 250 acres, but is expected to remain above minimum habitat thresholds. All other sites are expected to remain above minimum habitat thresholds in the 1.8-mile circles.

Effects of Habitat Loss Outside of Spotted Owl Circles within SOSEAs

Suitable habitat that occurs outside of the known spotted owl circles is also important for supporting spotted owls because territories are not circular but vary in size and configuration (Forsman et al. 1984). Many spotted owl circles have low amounts of suitable habitat, suggesting that habitat located outside of the circle boundary may also be important for supporting territorial spotted owls (Buchanan and Swedeen 2005). Suitable habitat that occurs outside of known circles is also important for the successful dispersal of spotted owls across landscapes, and is ultimately important for species recovery because dispersing spotted owls are more likely to successfully colonize suitable habitat adjacent to occupied territories than random locations on the landscape (Lahaye et al. 2001).

There are an estimated 37,124 acres of suitable owl habitat on the SHA commercial forest lands, but only 4,697 acres of this habitat (13 percent) is currently considered to be “restricted” due to its location within spotted owl circles in SOSEAs. Under the SHA, a minimum of 5,239 acres of suitable habitat (SM and YFM) would be maintained over time within the White Salmon SOSEA. The remaining habitat acres would eventually be harvested and the configuration of suitable habitat, dispersal habitat, and non-habitat will shift over time as some areas are harvested and other young forest areas transition into dispersal or YFM habitat. The existing habitat acres that are on the SOSEA landscape likely provide roosting, foraging, and dispersal habitat to both established nesting pairs of spotted owls present in spotted owl circles and transient, non-territorial “floaters” dispersing across the landscape. The likelihood of additional nesting spotted owls on this landscape is generally considered to be low, due to the low amounts of old-forest habitat on the SHA lands. With or without the SHA, the majority of these existing habitat acres are likely to be harvested over the next 60 years, and the effects to spotted owls in the larger landscape are similar.

Although it is possible that currently undetected or undocumented spotted owls may be present in these areas, we have relied on our analysis of historic spotted owl circles to represent the effects of habitat loss from SHA management that are reasonably certain to occur to individual

spotted owls. The primary effect of habitat loss outside of owl circles is the increased potential for negative interactions between spotted owls and barred owls in the habitat reserves that remain within and adjacent to the SHA landscape. If barred owl densities continue to increase in Washington, the competition for available habitat between the two species is very likely to result in further declines to spotted owls in Washington, including spotted owl populations in Late-Successional Reserves and other reserved landscapes.

Effects to Spotted Owls from Habitat Loss in Oregon and outside of SOSEAs in Washington

In Oregon and outside of SOSEAs in Washington, there are no timber harvest restrictions within spotted owl territories except during the nesting season (March 1 through August 31) under the Washington Forest Practices Rules. Outside the nesting season, there are no restrictions, and habitat surrounding a spotted owl site may be harvested, including the 70-acre nest patch. We acknowledge that habitat loss in these "unregulated" circles would likely occur with or without the SHA.

Summary of Effects to Spotted Owls from Habitat Loss

The Applicants' commercial forest lands currently contain over 37,000 acres of spotted owl habitat. Only a portion of this habitat is known to be associated with historical spotted owl circles. We used the spotted owl circle analysis to evaluate the potential effects to individual spotted owls in the SHA landscape. Because the SHA lands are interspersed across a landscape that contains substantial State, Federal and other private ownerships, the effects of SHA management are somewhat attenuated by the fact that SHA lands provide relatively low amounts of existing suitable habitat in many of the spotted owl circles analyzed.

Effects to spotted owls are not associated solely with the loss of habitat within historic owl sites, but also from habitat loss across the larger SHA landscape. We use the circle analysis here to represent the potential landscape-level effects to individual spotted owls. Of the 18 spotted owl circles in SOSEAs that overlap the Applicants' lands in Washington, we expect habitat in three spotted owl circles will be reduced to below-habitat thresholds, and 1 additional spotted owl circle that is currently below habitat thresholds will have additional habitat loss resulting from the SHA (Table 7).

Table 7. Summary of occupied spotted owl circles where SHA management will remove habitat below minimum habitat thresholds (40 percent habitat). The potential effects displayed here account for habitat retained in 0.7-mile circles as part of the "elevated baseline."

Area	**Site No. and Name**	**Total acres of habitat in 1.8-mile circle (all ownerships)**	**Percent habitat in 1.8-or mile circle**	**Total SHA acres of habitat in 1.8- -mile circle**	**Estimated habitat remaining in 1.8- mile circle**	**Percent of habitat remaining in 1.8- mile circle**
White Salmon SOSEA	#753 – Gilmer Creek South	2,999	46.0%	781	2,458	37.7%
	#1048 – Rattlesnake – Mill Creek	3,893	59.8%	1,401	2,521	38.7%

Area	Site No. and Name	Total acres of habitat in 1.8-mile circle (all ownerships)	Percent habitat in 1.8-or mile circle	Total SHA acres of habitat in 1.8- -mile circle	Estimated habitat remaining in 1.8- mile circle	Percent of habitat remaining in 1.8- mile circle
	#824 – Little Wind River Upper	3,347	51.4%	799	2,548	39.1%
Columbia Gorge SOSEA	#765 Red Bluffs	1,333	20.5%	43	1,290	19.8%

Management with the SHA will result in habitat loss below 2,605 acres (40 percent) at three spotted owl circles and further reduce habitat in one spotted owl circle located within SOSEAs that would otherwise not occur without the SHA and, could reasonably be expected to result in a significant impairment of spotted owl life history functions (i.e., breeding, feeding, and sheltering). This is not unexpected because the intent of the SHA is to balance potential effects of habitat loss in spotted owl circles with some increased retention of habitat outside of circles within the White Salmon SOSEA landscape.

Effects to Spotted Owls Associated with New Owl Sites

There is a possibility that new owl sites could become established, however we don't believe this is reasonably certain to occur. If a new spotted owl site is discovered on SHA lands within the White Salmon SOSEA, the terms of the SHA will allow for the best 70 acres of habitat around the nest site to be protected for a period of 8 years. If a site center within an existing spotted owl circle shifts, the new activity center (70 acres) will be protected for 30 years or the remainder of the SHA term, whichever is less. If a new spotted owl site is discovered on SHA lands outside of the White Salmon SOSEA, the terms of the SHA will protect a 70-acre nest patch for 3 years. In all cases, after the term of protection has passed, the 70-acre nest patch could be harvested.

In the unlikely event that a new nest site on SHA lands is discovered, it would not trigger the establishment of a new spotted owl circle with minimum habitat thresholds for the Applicants. Therefore, there is a low likelihood that any territory outside of an existing spotted owl circle in the White Salmon SOSEA will have habitat above thresholds or the potential for long-term persistence. The spotted owl single or pair in question would be forced to disperse away from the site, either due to marginal habitat conditions in the surrounding landscape, or due to the direct loss of the 70-acre nest patch. It is important to note that the SHA provides conservation measures to ensure that benefits are accrued prior to harvest occurring.

Barred Owls

Because barred owls compete with spotted owls for habitat and resources for breeding, feeding and sheltering, ongoing loss of habitat has the potential to intensify the competition by reducing the total amount of these resources available to the spotted owl and bringing barred owls into closer proximity with the spotted owl (USFWS 2011, p. I-9). A recent study in Oregon found

that both species use patches of older conifer forest for roosting and foraging, both species relied on similar prey associated with these forest types, and the survival of both species was associated with the amount of old forest in their home ranges (Weins 2012, p. 64). These findings highlight the significance of old forest as a potential limiting factor in the competitive relationship between the two species. In order to reduce or not increase this potential competitive pressure while the threat from barred owls is being addressed, the Spotted Owl Recovery Plan now recommends conserving and restoring older, multi-layered forests across the range of the spotted owl (USFWS 2011, p. I-8).

In the context of the SHA analysis area, the older forests in this landscape that are essential for demographic support of spotted owls are provided primarily by adjacent Federal and State lands, and to some extent by SM forest habitat on SHA and other private lands located in spotted owl circles in SOSEAs. There is little or no habitat that would be classified as "high quality" old forest habitat on the SHA lands. The near-term effects of the SHA (10 to 20 years) may result in some increased competition between barred owls and spotted owls associated with the loss of suitable habitat both within and outside of spotted owl circles in SOSEAs, particularly in areas where suitable habitat is removed within core areas. Dugger and others (2011, p. 2463) found that the amount of old forest habitat at the core of spotted owl home ranges most strongly influenced the probability of spotted owl occupancy over time. The likelihood that a site would be abandoned by spotted owls increased with decreasing amounts of old forest at the core, and this effect was compounded where barred owls were detected, indicating that as suitable habitat decreases within a home range, the likelihood for negative competitive interactions between the two species increases (Dugger et al. 2011, p. 2463).

As described above, none of the anticipated effects of habitat loss in 0.7-mile circles within the White Salmon SOSEA are expected to result in a loss of habitat below the 500-acre viability threshold, and most spotted owl circles (14 out of 18 sites) are expected to remain well above minimum habitat thresholds in the 1.8-mile circles (Appendix B). As the amount of suitable habitat on the landscape decreases over time, it is reasonable to expect that the potential for competition within remaining habitat areas is likely to increase. However, considering the amount of suitable habitat retained and developed on the SHA lands is higher than would occur without the Permits, the risk to spotted owls from competition with barred owls as a result of the Permits is expected to be minimal.

Over the long-term (20 to 50 years), as more of the SHA lands outside of spotted owl circles transition to dispersal or YFM habitats, the effects of the SHA to barred owl–spotted owl interactions are likely to be neutral, because such habitats are not likely to support resident, territorial spotted owls or barred owls. Although both owl species are known to use younger, less structurally complex forests for limited foraging and roosting opportunities, such forests are not a significant factor in either adult survival or reproductive rates for either spotted owls or barred owls (Dugger et al., 2005, p. 863, Wiens 2012, pp. 60-61).

<u>Effects to Spotted Owls from Disturbance and Habitat Loss within 0.7-mile Spotted Owl Circles</u>

In previous analyses of the potential for disturbance to spotted owls (e.g., USFWS 2003, pp. 265-285; USFWS 2006, entire), we concluded that the noise and activity associated with the use of

excavators, chainsaws, and other motorized equipment can disrupt normal spotted owl nesting behaviors in some situations. In these analyses, we concluded that significant disturbance (disruption of nesting behaviors) can occur when noise or project activity occurs within close proximity (i.e. from 65 yards to 0.25 mile depending on the activity) to an active spotted owl nest during the early nesting season (March 15 to July 15). Early nesting season behavior includes nest site selection, egg laying, incubation, and brooding of nestlings to the point of fledging (Forsman et al. 1984, pp. 32-38). Disruption of normal nesting behaviors during the early nesting season is significant due to the potential for reduced hatching success, fitness, or survival of nestlings.

Noise and visual disturbance associated with forest management activities during the early spotted owl nesting season could result in flushing a spotted owl adult or juvenile away from a nest. Flushing from a nest site is considered a significant disruption of normal behavior because flushing a nesting owl increases the risk of predation to the eggs or nestlings. The greatest risk to spotted owls from disturbance is causing a pre-fledged juvenile to flush. It is common for pre-fledged owlets to leave the nest and perch on adjacent branches before they can fly (Forsman et al. 1984, p. 36). Owlets in this stage of development are vulnerable because if they fall to the ground before they are able to fly they have a higher risk of mortality. Forsman et al. (1984, p. 36) notes that seven of nine owlets that fell or jumped from the nest prematurely were killed by the fall or disappeared before reaching the flying stage.

A flush response creates the likelihood of injury by increasing the risk of predation through the advertisement of the nest's location, advertisement of the adult and juvenile, or the premature departure of a nestling from a nest. Predation mortality of juvenile spotted owls is common, and is the leading cause of death of fledglings (Forman et al. 2002, p. 18). Spotted owls are preyed upon by great horned owls (*Bubo virginianus*) (Forsman et al. 1984, p. 38; 2002, p. 18), and they presumably are preyed upon by northern goshawks (*Accipiter gentilis*), and red-tailed hawks (*Buteo jamaicensis*) (Forsman et al. 2002, p. 27). It is likely that flushing a spotted owl from its nest or causing a nestling to flush from the nest prematurely would increase the chances of juveniles being predated. However, adult spotted owls are protective and have been observed defending themselves and their young from potential avian predators (e.g. hawks and ravens) (Forsman et al. 1984, p. 36). Female spotted owls exposed to disturbance are reluctant to leave the nest during the early stages of the breeding cycle (Delaney et al. 1999, p. 71; Delaney and Grubb 2003, p. 22), so the risk of causing an incubating spotted owl to abandon a nest is considered to be discountable.

SHA management activities such as commercial thinning, road construction or timber harvest are reasonably certain to cause sound and visual disturbance to spotted owls nesting in adjacent areas. These effects could occur anywhere in the SHA-covered area although it is most likely to occur within close proximity to current or historic spotted owl activity centers in SOSEAs. Because spotted owls do occasionally choose alternate nest locations within their core areas (Forsman et al. 1984, p. 32), we used the 0.7-mile spotted owl circles in SOSEAs with SHA ownership to represent the areas where noise and visual disturbance to spotted owls is most likely to occur. There are a total of eight 0.7-mile spotted owl circles with Applicants' lands in the White Salmon SOSEA (Table 4, above). These include spotted owl site numbers 734, 753, 852, 875, 991, 1003, 1116, and 1048. The SHA does not require implementation of timing

restrictions to avoid forest management during the early nesting season, so the behavior of spotted owl nestlings in close proximity to these activities is reasonably certain to be significantly disrupted.

In addition to the potential for noise or visual disturbance, the loss of foraging habitat within a 0.7-mile core area reduces prey availability to spotted owls during their critical summer nesting period, when they are most dependent upon the core area for foraging (Forsman et al. 1984, p. 21). Even in circles where habitat levels remain above viability thresholds, habitat removal during the nesting season from within core areas will likely disrupt normal foraging behaviors during year that timber harvest activities occur, although not significantly.

Due the limited number of acres expected to be harvested in core areas (i.e., all sites are currently expected to remain above habitat thresholds in the 0.7-mile circles), and the fact that known spotted owl site centers (except site #753) do not occur on the Applicants lands, we do not expect noise or visual disturbance to result in an outright nest failure, the abandonment of a nest by the adult pair of spotted owls, or reduced fitness or survival of adult spotted owls. However, reducing foraging habitat at the core area scale during the nesting season could indirectly affect juvenile owl development through missed feedings or delayed development, which creates a potential for reduced fitness of individual owlets for dispersal away from the nest site in the fall.

Indirect Effects to Habitat On and Adjacent to SHA Lands

Indirect effects to suitable spotted owl habitat from windthrow are anticipated when regeneration timber harvest creates new openings in or adjacent to stands of suitable habitat. For this analysis, we assume such affects are likely to occur within 200 feet of a clearcut boundary.

Windthrow is a natural phenomenon affecting forests throughout the Pacific Northwest. Every year hundreds of acres of trees are blown over in natural stands and along clearcut boundaries and road corridors (Stathers et al. 1994). The factors that influence windthrow include individual tree characteristics, stand characteristics, root zone soil characteristics, topographic exposure characteristics, and meteorological conditions (Stathers et al. 1994; Harris 1999). Windthrow usually occurs in the first few years after harvesting, particularly where more susceptible trees are exposed to stronger winds as a result of harvesting. Trees can become more windfirm after a few years of exposure as they develop reaction wood in response to swaying (Stathers et al. 1994). Timber harvesting can increase the windthrow hazard by increasing the wind speed and turbulence along the downwind edge of clearcut boundaries. Windthrow damage can extend into adjacent stands for hundreds of feet, although most damage is usually concentrated within the first 30 to 60 feet of the cutting boundary edge (Stathers et al. 1994).

Edge effects associated with clearcut timber harvest on the SHA lands could result in an increased risk of windthrow, resulting in the removal of individual trees and scattered patches of trees in existing suitable and dispersal habitat in and adjacent to SHA lands. We are not able to predict a more precise extent to which windthrow may occur, but acknowledge that this is an adverse effect that is likely to occur. The Service anticipates that the scattered loss of individual trees or patches of trees from windthrow could occur for distances up to 200 feet into adjacent stands of habitat that would otherwise not occur without the permit (e.g., harvest of habitat

within spotted owl circles in SOSEAs). Windthrow is likely to result in the loss or degradation of minor amounts of suitable habitat along new clearcut edges within owl circles in SOSEAs. In most cases, the loss of individual trees or small groups of trees would result in a only minor degradation of habitat at the site scale. Windthrow is not expected to result in a significant loss of suitable habitat at the scale of the SHA landscape.

Effects of Future Land Acquisitions within the SHA Area

The SHA includes a "land addition boundary" that encompasses the existing Applicants' ownership (81,587 acres) and also includes an area within which the Applicants may acquire additional lands over the 60-year term the SHA. The land addition boundary encompasses a large landscape (~1,000,000 acres) with multiple public and private ownerships in Skamania, Klickitat and Yakima counties in Washington and Hood River and Wasco counties in Oregon, situated on either side of the Columbia River. The land addition boundary includes the entire White Salmon and Columbia Gorge SOSEAs. We have no estimate at this time as to which parcels may be acquired and incorporated into SHA management, or whether future land acquisitions will contain suitable owl habitat.

We used the White Salmon SOSEA as an example landscape to represent the potential effects of future land acquisitions. As described in the environmental baseline (Table 5), the White Salmon SOSEA encompasses over 174,000 acres, including over 80,000 acres of private lands (46 percent). Remaining lands within the SOSEA are under Federal or WDNR management (54 percent). SDS and BLC lands within the White Salmon SOSEA currently comprise approximately 18 percent of the landscape. Over time, the Applicants could acquire additional private lands, but the maximum area under SHA management would be approximately 46 percent. Under SHA management, these additional lands would be managed for an average 60-year harvest rotation, providing dispersal and YFM habitat. The terms of the SHA require the Applicants to maintain 33 percent of their habitat-capable commercial forest lands in the White Salmon SOSEA in dispersal habitat (16.5 percent) and YFM or better habitat (16.5 percent). This requirement applies to any future land acquisitions within the SOSEA, so the "elevated baseline" (currently estimated at 9,424 acres) would adjust accordingly with additional land acquisitions. We expect the requirement to maintain a minimum of 33 percent of SHA lands in dispersal habitat or better will maintain a high level of dispersal connectivity and foraging opportunities for spotted owls in the White Salmon SOSEA landscape.

There are 18 historic spotted owl site centers located within the White Salmon SOSEA. Applicant lands currently occur within 14 of the 18 spotted owl circles centered in the SOSEA. There is a potential that private lands with existing spotted owl habitat that is currently restricted from harvest under the Washington Forest Practices Rules due to their location within spotted owl circles could be acquired by the Applicants and harvested under the terms of the SHA. As described above under the effects to spotted owls, timber harvest could reduce habitat levels within spotted owl circles below minimum viability thresholds, reducing the capability of the spotted owl circles in SOSEAs (both White Salmon and Columbia Gorge) to support nesting spotted owls over the long-term. However, at this time, there is insufficient information to indicate that such events are reasonably certain to occur.

Of the 14 spotted owl circles that currently contain Applicant lands, we determined that management under the SHA is likely to reduce habitat levels in three spotted owl circles to below viability thresholds. With future land acquisition, it is possible that additional spotted owl circles would be reduced below viability threshold levels. The terms of the SHA that require maintenance of 33 percent of the habitat-capable lands within 0.7 mile circles as dispersal and YFM habitat in the White Salmon SOSEA will apply to any future land acquisitions, as well as a 10-year deferral of timber harvest of habitat within 0.7 mile circles where SHA ownership equals 15 percent or more of the circle. This requirement will likely limit potential habitat loss in 0.7-mile spotted owl circles, and may be sufficient to maintain habitat viability thresholds in some spotted owl circles. As described in the environmental baseline (Table 4, above) there are other private lands associated with 15 of the 18 spotted owl circles analyzed, with total private ownership ranging from less than 5 percent to more than 60 percent of the spotted owl circle. Habitat that is now managed as small "fixed reserves" associated with spotted owl circles is likely to decrease over time as a result of the SHA, but this potential loss of habitat in spotted owl circles on private lands is balanced by existing SM and old-forest habitat that will be maintained on adjacent Federal and WDNR lands, as well as the SHA requirement to maintain a minimum of 33 percent of the landscape in dispersal habitat or better. Although the Applicants may acquire additional lands over time, we cannot predict with reasonable certainty that future land acquisitions will lead to additional habitat losses within spotted owl circles in SOSEAs.

Outside of White Salmon SOSEA, the effects of additional land acquisition are similar in nature to the effects described above under *Summary of Effects to Spotted Owls from Habitat Loss*. In the context of the broader landscape in Washington and Oregon, the extended harvest rotations on SHA lands will continue to provide dispersal and foraging opportunities for spotted owls. The amount and configuration of suitable habitat, dispersal habitat, and non-habitat will shift over time as some areas are harvested and other young forest areas transition into dispersal or YFM habitat. The primary conservation role of the SHA lands is to provide foraging and dispersal habitat for improved connectivity for spotted owls dispersing across the landscape, including improved dispersal connectivity along the Columbia River Gorge. We expect that management of future SHA lands acquired within the land addition boundary will contribute to improved connectivity in the SHA landscape.

Effects of Early Termination and Return to Baseline

Safe Harbor Agreements allow landowners to return their lands to baseline. The Applicants can implement the SHA for its full 60-year term and then return to baseline, or either or both Applicants can decide to terminate the SHA at any time and return to baseline. Depending on where there were during the permit term, there could be different amounts of habitat in the SHA area. As long as they have at least the minimum amount of habitat to meet the elevated baseline, they are in compliance with that aspect of the SHA. If they go below the specified elevated baselines, they are not in compliance with the SHA. We assume that they will always be at or above the Elevated Baseline conditions specified in the SHA.

The elevated baseline is measured as a percentage of the applicants ownership, both within the 0.7-mile radius circle and at the broader scale of the White Salmon SOSEA. The amount of acreage will change as lands are added or excised from the SHA which is very likely to happen with implementation of the SHA. The elevated baseline by individual company in the White

Salmon SOSEA was described in the Description of the Action section above. Currently for SDS, it is 6,161 acres of habitat and for BLC it is 3,263 acres (1/2 in dispersal and the other 1/2 in YFM or better). Combined this is 9,424 acres.

Only spotted owl site #753 occurs in the SHA area, and is part of the 240-acre set aside in the elevated baseline. Thus, even if the applicants return to baseline, it will not include harvest of that site center, or the 240 acres in association with it. Instead, that site and the 240 acres would then be regulated by Washington State Forest Practices Rules at the time, and ESA rules that prohibit take without a section 10 permit.

If either of the Applicants return to baseline, not only would they leave the SSAs and the elevated habitat acres at the 0.7-mile radius circles and White Salmon SOSEA, but they would also be obliged to comply with Washington State Forest Practices Rules. For example, if there was still habitat within the 1.8- mile radius owl circle that they had not harvested and they returned to baseline, they would be obligated to comply with current Forest Practices Rules. It is important to note that the elevated baseline includes dispersal habitat, and under Forest Practices Rules – if there was a return to baseline - there would be no requirement to restrict harvest on those dispersal habitat acreages.

In Oregon, there are no habitat set asides or elevated habitat baseline thresholds. No spotted owl site centers occur in the SHA area. A return to baseline in Oregon would result in following Oregon State Forest Practices Rules for spotted owls. As described previously, there are no substantive spotted owl conservation measures in Oregon on private lands that would be prompted.

There are over 37,000 acres of suitable owl habitat estimated on the SHA lands, but only 4,697 acres of this habitat (13 percent) is currently considered to be "restricted" due to its location within spotted owl circles in SOSEAs. With the SHA, we expect that the removal of spotted owl circle management will result in the removal of suitable habitat in four spotted owl circles that would otherwise not occur under existing regulatory mechanisms. This habitat loss will result in long-term effects. Under a worst-case scenario, these acres would be harvested during the early portion of the SHA, and then the SHA would be terminated, resulting in a loss of habitat in spotted owl circles in SOSEAs that would not have occurred but for the SHA. With termination, SHA land acres within 0.7-mile circles would be restricted again and eventually transition back to habitat. Outside the 0.7-mile circles, the burden to maintain the best 2,605 acres would have shifted to other landowners within the SOSEA spotted owl circles, but the regulatory guidelines to maintain a minimum of 2,605 acres of habitat would remain. With or without the SHA, the majority of these existing habitat acres outside of SOSEA circles are likely to be harvested over the next 60 years, and the effects to spotted owls in the larger landscape would be similar. Therefore, early termination of the SHA by either party is not likely to result in significantly different effects to spotted owls than those considered for the life of the SHA.

The Safe Harbor Agreement specifies voluntary conservation actions that lead to net conservation benefits. There are other requirements already in place under the Forest Practices Habitat Conservation Plan (HCP) that will not be changed with this Safe Harbor Agreement. An important example of this is the riparian prescriptions implemented under the Forest Practices

HCP. The riparian prescriptions will not be modified by the proposed Safe Harbor Agreement, and we are not analyzing those riparian management zones as part of the requirement to achieve a net conservation benefit. However, we acknowledge there will be some habitat contributions to the owl from riparian management zones, particularly later in the permit term.

Beneficial Effects of the SHA and Consistency with the Spotted Owl Recovery Plan

Approximately 96 percent of the SHA area occurs in the East Cascades Physiographic Provinces in Washington and Oregon for spotted owls. The SHA applies to an area that is important for dispersal and demographic support for spotted owls and it is expected to contribute to those landscape roles more effectively than what would be reasonably certain to occur in the absence of the Permits. Implementation of the SHA is expected to provide more sustainable spotted owl habitat within the White Salmon SOSEA over a 60-year time frame than would occur without the SHA. While individual owl sites will be impacted over time, additional habitat will remain on the landscape than would otherwise be expected in a no-Permits scenario. This enhancement of habitat quantity and quality on a landscape scale within the action area is expected to contribute to the conservation needs of spotted owls in the Cascades Provinces.

<u>Consistency with the Revised 2011 Spotted Owl Recovery Plan</u>

Recovery Action 14 (USFWS 2011, p.III-52) - *Encourage applicants to develop Habitat Conservation Plans and Safe Harbor Agreements that are consistent with the recovery objectives*.

The applicants are entering into this SHA voluntarily to receive long-term regulatory assurances for management of their forest lands (EA p. 1). They are interested in a sustainable forest management regime (SHA 1.1) and the ability to supply their mill with timber. They developed the SHA with the goal of integrating their economic needs while at the same time providing a net conservation benefit to the spotted owl. Spotted owl habitat in the SHA currently supports both occupied and historic spotted owl territories. Many areas on the SHA lands support large blocks of dispersal, YFM, and SM habitat that are contiguous with adjacent habitat on State lands managed under the WDNR HCP and Federal Lands managed under the Northwest Forest Plan, and are considered to be important for both spotted owl demographic support and dispersal connectivity in the Columbia River Gorge and in the southeast Washington Cascades. The SHA is consistent with Recovery Action 14 because the SHA will provide habitat for spotted owl foraging and dispersal that is complimentary to existing conservation strategies in the area provided by the Northwest Forest Plan and the WDNR State Lands HCP.

Habitat Management in Dry Forests (USFWS 2011, pp.III-20 to III-33)

Approximately 96 percent of the SHA area occurs in the East Cascades Physiographic Provinces in Washington and Oregon for spotted owls. The Spotted Owl Recovery Plan supports active forest management to promote resilient forests on the east side of the Cascades. There is much to be learned about accomplishing this in the face of climate change, the declining owl populations, and other ecological influences. The SHA uses active forest management to achieve YFM and dispersal habitat through commercial thinning that encourages tree species diversity and structure along with retaining and creating snags. The SHA incorporates active

forest management that should reduce the risk of catastrophic fire and loss to disease, and still provide habitat for foraging and dispersing spotted owls.

CUMULATIVE EFFECTS: Spotted Owl

Cumulative effects include the effects of future State, Tribal, local, or private actions that are reasonably certain to occur in the action area considered in this 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. For purposes of this Opinion, we are only interested in those non-Federal actions that could affect northern spotted owl that are reasonably certain to occur within the Action Area within the next 60 years. For purposes of this Opinion, these actions include future forest practices applications and wind projects that have no Federal nexus.

Forest Practices

Non-Federal lands managed for timber production occur throughout the Action Area. These lands include private lands, Washington Department of Natural Resources trust lands managed under a completed HCP and Tribal lands, which are generally funded by the Bureau of Indian Affairs. In the latter two instances the effects have already been addressed through section 7 consultation and are therefore not considered as cumulative effects.

In Washington, private timber harvest in the area must comply with the Washington Forest Practices Act (RCW 76.09) as well as the Washington Administrative Code with respect to the Washington Forest Practices Rules (WAC 222). In the absence of a federally-approved HCP covering spotted owls or a State-approved special wildlife management plan, suitable spotted owl habitat on non-Federal lands is only protected by the Washington Forest Practices Rules in State-designated SOSEAs. Within SOSEAs, the Forest Practices Rules provide protection for suitable spotted owl habitat. However not all suitable spotted owl habitat on non-Federal lands is included within designated SOSEAs.

Many non-Federal lands in the Action Area are located in Oregon or outside of SOSEAs in Washington. With the exception of federally approved HCPs for spotted owls, state rules do not restrict harvest of suitable spotted owl habitat outside of SOSEAs. Therefore, a landowner could harvest timber (habitat) without a pre-harvest survey, potentially resulting in the loss of a spotted owl site center or suitable habitat within an occupied spotted owl territory. With the exception of patches within riparian or other “leave” areas, most of the suitable habitat outside the SOSEAs on private lands in the Action Area either has been harvested, or will be, under current state regulations. The small patches of suitable habitat that remain on these lands are primarily associated with potentially unstable slopes or stream riparian areas, which are protected under the Washington Forest Practices Rules.

Wind projects

Wind projects are the only other activity in the Action Area that could have a potential to affect spotted owls and that often have no Federal nexus. Klickitat County has approved a number of wind projects to the east of the Action Area.

On July 19, 2010, the Service conducted informal Section 7 consultation for the Whistling Ridge Wind Energy Project proposed by SDS and permitted through Bonneville Power Administration. This project, approximately 7 miles northwest of the city of White Salmon on SDS land, would consist of nine turbines proposed within the home ranges of the Moss Creek Campground and Mill Creek spotted owl home ranges, located on WDNR and USFS lands. The Service concluded that construction, maintenance and operation of the project "may affect but is not likely to adversely affect" spotted owls. On February 15, 2012, the Service sent an additional clarification letter to Bonneville Power Administration. To date, the project has been approved by the Energy Facility Site Evaluation Council but has not been constructed.

Barred owls

As discussed previously in this document, the barred owl poses a large element of uncertainty for the continuing presence of spotted owls. Courtney *et al.* (2004:p 7-5) proposed nine hypotheses regarding the potential consequences of the barred owl invasion into the range of the spotted owl. These potential scenarios are applicable to the Action Area. The consequences range from complete replacement of the spotted owl to varying degrees of range, habitat, or niche partitioning. We do not believe there is enough certainty about barred owl demographics or cause and effect mechanisms to predict or even infer the outcome of this competitive interaction in the Action Area. Although Courtney's hypotheses were categorized as "clearly plausible," "plausible," or "not plausible or not clear," no management recommendations were provided.

Climate Change

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

One of the largest projected effects on Pacific Northwest forests is likely to come from an increase in fire frequency, duration and severity. However, high fuel accumulations and forest densities create the potential for fires of very high intensity and severity when fuels are dry (Mote 2008, p.23). Westerling et al. (2006) looked at a much larger area in the western U.S. including the Pacific Northwest, and found that since the mid-1980s, wildfire frequency in western forests has nearly quadrupled compared to the average of the period 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). Littell et al. (2009, p.2) project that the area burned by fire in the Pacific Northwest will double by the 2040s and triple by the 2080s.

Other Changes

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

INTEGRATION AND SYNTHESIS: Spotted Owl

Many spotted owl populations are declining, especially in the northern parts of the species' range, where populations have declined by as much as 40 to 60 percent since 1990 (Forsman et al. 2011, p. 45). The factors that influence spotted owl demography are not fully understood, but habitat quality and quantity, annual weather patterns, and the presence of barred owls are all factors that affect spotted owl survival, reproduction, and local population trends (Forsman et al. 2011, p. 75).

Over the past decade, it has become apparent that competition with the barred owl poses a significant threat to the spotted owl. Past habitat loss and current habitat loss are also threats to the spotted owl, even though loss of habitat due to timber harvest has been greatly reduced on Federal lands for the past 2 decades (USFWS 2011, p. vi). Conservation strategies for the spotted owl emphasize the importance of maintaining large blocks of suitable habitat to support clusters of spotted owl territories and by providing for demographic exchange (dispersal) between these local populations (USFWS 2011, p. II-3), and reducing impacts associated with barred owl competition (USFWS 2011, p. II-4).

Under the SHA, additional habitat will persist within the SOSEAs than would otherwise occur without the permit. Spotted owl distribution will not be significantly affected by this action, and maintenance of additional dispersal habitat is expected to contribute to improved connectivity for spotted owls dispersing across the Columbia River and in the southeast Washington Cascades. The SHA is also expected to contribute to the conservation needs of the species by providing more sustainable spotted owl habitat within the White Salmon SOSEA over a 60-year time frame. While individual owl sites will be impacted over time, additional habitat will remain on the landscape than would otherwise remain in the absence of the Permits. This enhancement of habitat quantity and quality on a landscape scale within the action area is expected to contribute to the conservation needs of spotted owls in the Washington Cascades and the Oregon East Cascades provinces.

We anticipate likely reductions in spotted owl survival and reproduction associated with habitat loss in a subset of historic spotted owl circles, but these effects are not likely to have an appreciable impact on spotted owl persistence beyond the scale of the local population. Because the SHA lands are interspersed across a landscape that contains substantial State, Federal and

other private ownerships, most of the existing historic spotted owl circles affected by the SHA will remain above minimum habitat thresholds and have the potential to continue to support successful spotted owl reproduction and survival. These adverse effects are not unexpected because the purpose of the SHA is to transition away from managing for small "fixed" habitat reserves associated with spotted owl circles to a broader landscape-scale approach that retains additional habitat over the period of the SHA.

The applicants are entering into this SHA voluntarily to receive long-term regulatory assurances for management of their forest lands (EA p. 1). They are interested in a sustainable forest management regime (SHA 1.1) and the ability to supply their mill with timber. They developed the SHA with the goal of integrating their economic needs while at the same time providing a net conservation benefit to the spotted owl. Spotted owl habitat in the SHA currently supports both occupied and historic spotted owl territories. Many areas on the SHA lands support large blocks of dispersal, YFM, and SM habitat that are contiguous with adjacent habitat on State lands managed under the WDNR HCP and Federal Lands managed under the Northwest Forest Plan, and are considered to be important for both spotted owl demographic support and dispersal connectivity in the Columbia River Gorge and in the southeast Washington Cascades. The SHA is consistent with the Recovery Plan because it will provide habitat for spotted owl roosting, foraging and dispersal that is complementary to existing conservation strategies in the area provided by the Northwest Forest Plan and the WDNR State Lands HCP. We expect that management of future SHA lands acquired within the land addition boundary will contribute to improved connectivity in the SHA landscape.

Approximately 96 percent of the Applicants' current ownership occurs in the East Cascades Physiographic Provinces in Washington and Oregon for spotted owls. The Spotted Owl Recovery Plan supports active forest management to promote resilient forests on the east side of the Cascades. The SHA uses active forest management to achieve YFM and dispersal habitat through commercial thinning that encourages tree species diversity and structure along with retaining and creating snags. Implementation of the SHA should reduce the risk of catastrophic fire and loss to disease, while providing habitat for foraging and dispersing spotted owls.

The SHA provides a complementary conservation approach to the adjacent WDNR HCP lands. The WDNR HCP for state trust lands (WDNR 1997) provides nesting, roosting, and foraging habitat in specific areas of Klickitat and Skamania Counties, Washington. Areas designated for this habitat are called NRF management areas. The Administrative Amendment to the Northern Spotted Owl Conservation Strategy for the Klickitat HCP Planning Unit (WDNR 2004) specifically provides habitat on WDNR lands for many of the spotted owl site centers associated with the SHA-covered lands in Washington. Furthermore, the SHA provides owl habitat within the White Salmon SOSEA that will facilitate dispersal and demographic support to resident owls. In Oregon, some of the covered lands border the Mt. Hood National Forest. Implementation of the SHA is also expected to provide supplemental conservation to National Forest lands in Oregon. Given these factors, which include consistency with the Spotted Owl Recovery Plan, we conclude that implementation of the SHA will not appreciably reduce the likelihood of survival and recovery at the scale of the populations in the Washington Cascades provinces, the Oregon East Cascades province, or range-wide.

CONCLUSION: Spotted Owl

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 proposed issuance of the SHA is not likely to jeopardize the continued existence of the spotted owl.

STATUS OF THE SPOTTED OWL CRITICAL HABITAT (2008)

Legal Status

On January 15, 1992, the Service designated spotted owl critical habitat within 190 Critical Habitat Units (CHUs) which encompassed nearly 6.9 million acres of Federal lands in California, Oregon, and Washington (57 FR 1796-1838). On August 13, 2008, the Service revised spotted owl critical habitat into 29 units, comprised of 174 subunits, on approximately 5,312,300 acres of Federal lands in California, Oregon, and Washington (73 FR 47326-47522). Northern spotted owl critical habitat was designated on publically owned, but not private lands, in the August 13, 2008 revised final rule (50 CFR Part 17).

Primary Constituent Elements

Primary constituent elements (PCEs) are the physical and biological features of critical habitat essential to a species' conservation. PCEs identified in the spotted owl critical habitat final rule include forest types that support the spotted owl across its geographic range when they occur in concert with a) nesting, roosting, foraging, and/or dispersal habitat, or b) lands capable of developing one or more of these habitats in the future (73 FR 47347-47348).

Forests

Forest types that support the spotted owl across its geographic range are primarily Sitka spruce (*Picea sitchensis*), western hemlock (*Tsuga heterophylla*), mixed conifer and mixed evergreen, grand fir (*Abies grandis*), Pacific silver fir (*Abies amabilis*), Douglas-fir (*Pseudotsuga menziesii*), white fir (*Abies concolor*), Shasta red fir (*Abies magnifica shastensis*), redwood/Douglas-fir (in coastal California and southwestern Oregon), and the moist end of the ponderosa pine coniferous forests zones at elevations up to approximately 3,000 feet (914 m) near the northern edge of the range and up to approximately 6,000 feet (1, 828 m) at the southern edge. These forest types may be in early-, mid-, or late-seral stages. This PCE is essential to the conservation of the species because it provides the biotic communities that are known to be necessary for the spotted owl. This PCE must occur in concert with at least one of the PCEs below (73 FR 47347).

Nesting, Roosting, and Foraging Habitat

The forest types described above that contain one or more of the habitat types described below to meet the home range needs of territorial pairs of spotted owls throughout the year or that are habitat-capable of developing one or more of these habitat types. Areas that are ‘‘habitat

capable'' of developing an essential habitat component are those forest types described above and that provide the requisite ecological conditions (e.g., moisture regime, soils, aspect, slope, potential vegetative community) for growing and sustaining the structural conditions required for that habitat component. A home range provides the habitat components essential for the survival and successful reproduction of a resident breeding pair of spotted owls. The amount, quality, and configuration of these habitat types required for a home range varies according to local conditions and factors such as the degree of habitat fragmentation, proportion of available nesting habitat, and primary prey species. The core area of the home range is used most intensively and usually includes the nesting area. The remainder of the home range is used for foraging and roosting. The size of home ranges extend from approximately 2,955 acres (1,196 ha) in the Oregon Cascades to approximately 14,271 acres (5,775 ha) on the Olympic Peninsula of Washington. The size of core areas extends from approximately 500 acres (202 ha) in the southern part of the species' range to approximately 4,057 acres (1,642 ha) in the northern part of the range (73 FR 47347). The three habitat types within the home range of a spotted owl are:

Nesting habitat. Nesting habitat is essential to provide structural features for nesting, protection from adverse weather conditions, and cover to reduce predation risks. It includes a moderate to high canopy closure (60 to 80 percent); a multi-layered, multi-species canopy with large (generally greater than 30 inches (76 cm) dbh) overstory trees; a high incidence of large trees with various deformities (e.g., large cavities, broken tops, mistletoe infections, and other platforms); 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. Patches of nesting habitat, in combination with roosting habitat must be sufficiently large and contiguous to maintain spotted owl core areas and home ranges, and must be proximate to foraging habitat. Nesting habitat can also function as roosting, foraging, and dispersal habitat (73 FR 47347).

Roosting habitat. Roosting habitat is essential to provide for thermoregulation, shelter, and cover to reduce predation risk while resting or foraging. It differs from nesting habitat in that it need not contain those specific structural features used for nesting (such as trees with cavities, broken tops, and mistletoe platforms), but does contain moderate to high canopy closure (60 to
80 percent); a multi-layered, multi- species canopy; large accumulations of fallen trees and other woody debris on the ground; and open space below the canopy for spotted owls to fly. Roosting habitat will also function as foraging and dispersal habitat, but not as nesting habitat due to lack of nesting structures (73 FR 47347).

Foraging habitat. Foraging habitat is essential to provide a food supply for survival and reproduction. It contains some roosting habitat attributes but can consist of more open and fragmented forests or, especially in the southern portion of the range where some younger stands may have high prey abundance and structural attributes similar to those of older forests, such as moderate tree density, sub-canopy perches at multiple levels, multi-layered vegetation, or residual older trees. Foraging habitat can also function as dispersal habitat (73 FR 47348).

Dispersal Habitat

Forest types described above that provide one or both of the habitat components described below that are essential to the dispersal of juvenile and non-territorial spotted owls, or that are capable of developing one or both of these components. Dispersal habitat can occur in intervening areas between larger blocks of nesting, foraging, and roosting habitat or within blocks of nesting, roosting, and foraging habitat. Dispersal habitat is essential to maintaining stable populations by supporting transient spotted owls which can fill territorial vacancies when resident spotted owls die or leave their territories, and to providing adequate gene flow across the range of the species (73 FR 47348). The two types of dispersal habitat are:

(A) Habitat supporting the transience phase of spotted owl dispersal contains stands with adequate tree size and canopy closure to provide protection from avian predators and minimal foraging opportunities. This 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 during the movement phase.

(B) Habitat supporting the colonization phase of spotted owl dispersal is generally equivalent to roosting and foraging habitat described above, although it may be in smaller amounts than that needed to support nesting pairs.

The critical habitat designation describes the PCEs essential to support the life history functions of the spotted owl in the amount and configuration required for the species' conservation. Because not all life history functions require all of the PCEs, not all of the critical habitat will contain all of the PCEs. Some units contain all PCEs and support multiple life processes, while some units contain only a portion of the PCEs necessary to support the species' particular use of that habitat. However, all of the critical habitat units in the designation support at least the first PCE described (forest-type) in conjunction with at least one of the other PCEs described above (73 FR 47348).

Conservation Role of Critical Habitat

The conservation role of spotted owl critical habitat is to identify those lands that are essential to the recovery of the species that may require special management considerations or protections (73 FR 47344). Generally, the conservation role of spotted owl critical habitat is to support a viable spotted owl population at the range-wide scale by providing a network of functional units within each physiographic province (73 FR 47358). For a wide-ranging species such as the spotted owl, where multiple CHUs are designated, each unit has a provincial and range-wide role in contributing to the conservation of the species. The size and distribution of the CHUs was based on the "managed owl conservation areas (MOCAs) recommended in the 2008 *Final Recovery Plan for the Northern Spotted Owl* (USFWS 2008) in the western portion of the species range, and on proposed MOCAs recommended under Option 1 in the *Draft Recovery Plan for the Northern Spotted Owl* (USFWS 2007a) in the eastern portion of the species range (73 FR 47330).

The MOCAs comprised a network of both large habitat blocks (capable of supporting 20 or more breeding pairs of owls (MOCA 1s), and small habitat blocks (capable of supporting up to 19 breeding pairs of owls (MOCA 2s). The MOCAs (and subsequent CHUs) formed a habitat network designed to support stable and well-distributed populations of spotted owls over time and allow for movement of spotted owls across the landscape (USFWS 2008, p. 13). The Federal lands comprising the MOCA network of the 2008 final recovery plan included areas of congressionally-reserved lands, such as designated wilderness areas; these areas were therefore included in the recovery plan's assessment that the MOCA network was sufficient to achieve the recovery of the spotted owl. As in the 1992 designation of critical habitat, congressionally-reserved lands such as designated Wilderness areas and National Parks were not included within the boundaries of the critical habitat designation. However, the contribution of these congressionally-reserved areas must be considered in any evaluation of the sufficiency of the overall conservation habitat network for the recovery of the spotted owl (73 FR 47328).

Current Condition of Critical Habitat

Summary of Range-wide Conditions

We designated 29 units as critical habitat for the spotted owl on Federal lands in Washington, Oregon, and California. These areas encompass over 5.3 million acres. Currently we estimate that approximately 98 percent of these lands are "habitat capable" (i.e., lands that are capable of supporting forest types that spotted owls use). Within the CHUs, many habitat areas are currently fragmented primarily due to past timber harvest, wildfire, disease, and wind-throw. Based on the spotted owl habitat data developed for monitoring the Northwest Forest Plan (Davis and Lint 2005), we estimate that approximately 50 percent of the lands within CHUs currently contain spotted owl habitat (2.6 million acres). Given natural events such as fire, windstorms, and insect damage, not all habitat capable lands in a CHU are likely to be high quality habitat at any one time. However, these lands retain the physical and biological features necessary to allow for the regrowth of the habitat characteristics required by spotted owls and are essential to achieving the area, quality, and configuration of habitat blocks required for recovery of the owl (USFWS 2008, p. 13).

Section 7 analyses of activities affecting spotted owl critical habitat consider the effects of proposed actions on the ability of the critical habitat to support a viable spotted owl population at the scale of individual CHUs, the physiographic province, and the range-wide scales (73 FR 47358). Following the revision of critical habitat in August, 2008, the Service has completed section 7 consultations on the removal of approximately 2,511 acres of suitable spotted owl habitat within critical habitat units in Washington, Oregon, and California (Table 8). We have also documented the loss of approximately 17,595 acres of suitable spotted owl habitat from wildfires and other natural events that occurred within designated CHUs (Table 8). The Service concluded that the effect of this habitat loss is not likely to destroy or adversely modify designated critical habitat.

Table 8. Changes in spotted owl suitable habitat within designated critical habitat from August 13, 2008 to present (October 3, 2012), resulting from Federal management actions and natural events by physiographic province.

Physiographic Province[4]		Evaluation Baseline[1]	Suitable[2] Critical Habitat Removed/Downgraded[3]			Percent Provincial Baseline Affected	Percent of Total Effects
		Acres of suitable habitat	Habitat loss to management activities (acres)	Habitat loss to natural events (acres)	Total Acres		
WA	Olympic Peninsula	149,090	6	0	6	<0.01%	0.03%
	Eastern Cascades	188,720	49	45	94	0.05%	0.47%
	Western Cascades	415,620	10	3	13	<0.01%	0.06%
	Western Lowlands	0	0	0	0	0	0.00%
OR	Coast Range	303,680	0	0	0	0	0.00%
	Klamath Mountains	210,430	1,293	0	1,293	0.61%	6.43%
	Cascades East	109,140	873	0	873	0.80%	4.34%
	Cascades West	498,020	14	0	14	<0.01%	0.07%
	Willamette Valley	0	0	0	0	0	0.00%
CA	Coast	53,480	0	0	0	0	0.00%
	Cascades	137,010	189	1,162	1,351	0.99%	6.72%
	Klamath	583,690	88	16,385	16,473	2.82%	81.89%
Total		2,648,880	2,522	17,595	20,117	0.76%	100%

Source: Table D from the Service's Northern Spotted Owl Consultation Effects Tracker (web application and database).

1 Revised critical habitat baseline is based on range-wide habitat maps developed by Davis and Lint (2005).

2 Nesting, roosting, foraging (NRF) habitat.

3 Includes effects reported by each field office.

4 Defined by the Northwest Forest Plan as the twelve physiographic provinces, as presented in Figure 3&4-1 on page 3&4-16 of the FSEIS.

ENVIRONMENTAL BASELINE: Spotted Owl Critical Habitat (2008)

Regulations implementing the ESA (50 CFR 402.02) define the environmental baseline as the past and present impacts of all Federal, State, or private actions and other human activities in the action area. Also included in the environmental baseline are the anticipated impacts of all

proposed Federal projects in the action area that have undergone section 7 consultation, and the impacts of State and private actions which are contemporaneous with the consultation in progress.

None of the SHA lands or private lands within the Action Area play a conservation role with regard to the 2008 designated critical habitat; however, those lands are adjacent to USFS lands that are designated critical habitat and do play a role in the conservation and recovery of spotted owls.

Description of the Affected Critical Habitat Units

Southeast Washington Cascades CHU

The Applicants' lands covered by the SHA are adjacent (within 200 feet of) to 80 acres located within the Southeast Washington Cascades CHU. The Southeast Washington Cascades CHU encompasses approximately 143,400 acres, and includes lands administered by the Gifford Pinchot and Okanogan-Wenatchee National Forests (73 FR 47355 [August 13, 2008]). There are six subunits within this CHU that correspond to draft MOCAs identified in the 2007 draft recovery plan for the spotted owl (USFWS 2007b, p. 119). These draft MOCAs were the basis of the 2008 critical habitat designation in the Eastern Cascades Province. The critical habitat subunits within the Southeast Washington Cascades CHU form a habitat network designed to support stable and well-distributed populations of spotted owls over time and allow for movement of spotted owls across the landscape in the southeast Washington Cascades.

Southwest Washington Cascades CHU

The SHA lands covered by the SHA are adjacent (within 200 feet of) to 213 acres located within the Southwest Washington Cascades CHU. The Southwest Washington Cascades CHU encompasses approximately 523,710 acres, and includes lands administered by the Mt. Baker-Snoqualmie, Gifford Pinchot, and Okanogan-Wenatchee National Forests (73 FR 47355 [August 13, 2008]). There are six subunits within this CHU that correspond to draft MOCAs identified in the 2007 draft recovery plan for the spotted owl (USFWS 2007b, p. 119). These draft MOCAs were the basis of the 2008 critical habitat designation in the Western Washington Cascades Province. The critical habitat subunits within the Southwest Washington Cascades CHU form a habitat network designed to support stable and well-distributed populations of spotted owls over time and allow for movement of spotted owls across the landscape in the southwest Washington Cascades.

Hood River CHU

The SHA lands covered by the SHA are adjacent (within 200 feet of) to 30 acres located within the Hood River CHU. The Hood River CHU encompasses approximately 42,683 acres, and includes lands administered by the Mt. Hood National Forest (73 FR 47355 [August 13, 2008]). There is one subunit within this CHU that corresponds to draft MOCAs identified in the 2007 draft recovery plan for the spotted owl (USFWS 2007b, p. 119). These draft MOCAs were the basis of the 2008 critical habitat designation in the Eastern Oregon Cascades Province. The

critical habitat subunit within the Hood River CHU is designed to support stable and well-distributed populations of spotted owls over time and allow for movement of spotted owls across the landscape in the Eastern Oregon Cascades.

EFFECTS OF THE ACTION: Spotted Owl Critical Habitat (2008)

Since spotted owl critical habitat is not designated within the SHA lands, the effects of the action are limited to indirect effects on designated critical habitat that is immediately adjacent to the SHA lands. We used Geographic Information System (GIS) to estimate the critical habitat unit areas that border the SHA lands, and estimated that about 324 acres of critical habitat occur adjacent to, and within 200 feet of, those lands. Effects to critical habitat are only anticipated within 200 feet of the covered lands because that is the maximum distance that the Service anticipates adverse effects could occur (from windthrow).

For this analysis, we assumed that 50 percent of those 324 acres would be suitable habitat for spotted owls because the 2008 critical habitat designation estimated that approximately 50 percent of the lands within CHUs contained spotted owl habitat based on monitoring data from the Northwest Forest Plan (Davis and Lint 2005). We also assumed for the purposes of this analysis that all of the critical habitat-adjacent acres on the SHA lands would be harvested during the 60-year SHA, exposing all 324 acres of critical habitat to indirect edge effects. If we assume that 50 percent is suitable habitat for spotted owls (162 acres is either nesting/roosting/foraging or foraging only), then we are also assuming that 50 percent is in unsuitable habitat. That is, 162 acres is either dispersal only or in an early seral stage that does not provide spotted owl habitat.

Windthrow is a natural phenomenon affecting forests throughout the Pacific Northwest. Every year hundreds of acres of trees are blown over in natural stands and along clearcut boundaries and road corridors (Stathers et al. 1994). The factors that influence windthrow include individual tree characteristics, stand characteristics, root zone soil characteristics, topographic exposure characteristics, and meteorological conditions (Stathers et al. 1994; Harris 1999). Windthrow usually occurs in the first few years after harvesting, particularly where more susceptible trees are exposed to stronger winds as a result of harvesting. Trees can become more windfirm after a few years of exposure as they develop reaction wood in response to swaying (Stathers et al. 1994). Timber harvesting can increase the windthrow hazard by increasing the wind speed and turbulence along the downwind edge of clearcut boundaries. Windthrow damage can extend into adjacent stands for hundreds of feet, although most damage is usually concentrated within the first 30 to 60 feet of the cutting boundary edge (Stathers et al. 1994).

Edge effects associated with clearcut timber harvest on the SHA lands could result in an increased risk of windthrow, resulting in the removal of individual trees and patches of trees in existing suitable and dispersal habitat in critical habitat units on adjacent Federal lands. We are not able to predict a more precise extent to which windthrow may occur in adjacent critical habitat, but acknowledge that this is an effect that is likely to occur. The Service anticipates that scattered loss of individual trees or patches of trees from windthrow could occur for distances up to 200 feet into adjacent stands of suitable and dispersal habitat within critical habitat.

Effects to Primary Constituent Elements

Effects to Forests Capable of Supporting Spotted Owls

All 324 acres of adjacent critical habitat subject to windthrow by the proposed action are located in forests that currently contain one or more of the PCEs and are capable of developing the PCEs of spotted owl critical habitat. Natural forest types in the action area include plant associations that are highly productive and capable of developing late-successional forest habitat. Individual trees and patches of trees may be blown over within these 324 acres in the first few years after adjacent harvest, but these forests would still retain the capacity to develop into late-successional habitat. After the edge effect had occurred those lands would be free to develop into late-successional forest unless managed by a future Federal action. Therefore, the effects of the proposed action on the PCE forests capable of developing into suitable habitat would be insignificant.

Effects to Spotted Owl Nesting, Roosting, and Foraging Habitat

Nesting, Roosting, and Foraging Habitat. As previously mentioned, we estimated that 50 percent of the 324 acres of affected critical habitat (162 acres) will be nesting/roosting/foraging habitat when the adjacent land is harvested and the edge effect (primarily windthrow) occurs. We anticipate that these 162 acres would be adversely affected by windthrow that removes individual trees and patches of trees. Loss of individual trees and patches of trees may reduce the function of the critical habitat at the site scale to provide for nesting/roosting/foraging if those trees were providing nesting, roosting, or foraging opportunities. Adverse effects would persist until the lost functions were replaced by other trees in nearby habitat. The replacement may happen quickly because the adverse effects would be spread out over 6.7 miles on three critical habitat units. Furthermore, we expect that not all of these 162 acres would be measurably affected by windthrow, and that the acres that would be affected would not all be affected at the same time during the 60-year SHA. Since the function of the habitat would be retained at a stand scale, we anticipate that the critical habitat would be degraded but not removed or downgraded.

Foraging Habitat. Some of the 162 acres of affected nesting/roosting/foraging habitat may be habitat that is suitable only for foraging when the adjacent land is harvested and the edge effect (primarily windthrow) occurs. We anticipate that that portion of the 162 acres would be adversely affected by windthrow that removes individual trees and patches of trees. Loss of individual trees and patches of trees may reduce the function of the critical habitat at the stand scale to provide for foraging if those trees were providing foraging opportunities. Adverse effects would persist until the lost functions were replaced by other trees in nearby habitat. The replacement may happen quickly because the adverse effects would be spread out over 6.7 miles on three critical habitat units. Furthermore, we expect that not all of these 162 acres would be measurably affected by windthrow, and that the acres that would be affected would not all be affected at the same time during the 60 year SHA. Since the function of the habitat would be retained at a stand scale, we anticipate that the critical habitat would be degraded but not removed or downgraded.

Effects to Spotted Owl Dispersal Habitat

As previously mentioned, we estimated that 50 percent of the 324 acres of affected critical habitat (162 acres) will be dispersal-only habitat when the adjacent land is harvested and the edge effect (primarily windthrow) occurs. Windthrow is anticipated to remove individual trees and patches of trees, but the loss of individual trees and patches of trees is not expected to reduce the function of the critical habitat to provide for spotted owl dispersal because that habitat would still support transient spotted owl movements and provide protection from avian predators and minimal foraging opportunities.

Effects of Early Termination of the SHA

As mentioned previously, there are 324 acres of designated critical habitat adjacent to the SHA lands. If the SHA is terminated early, those acres may be indirectly affected by windthrow from adjacent, regeneration-harvested, SDS-managed lands. This is the same result as would occur under the SHA under a full term. That is, with or without the SHA, 324 acres of designated critical habitat adjacent to the SHA lands may be adversely affected by windthrow. Therefore, early termination of the SHA by either party is not likely to result in significantly different effects to spotted owls than those considered for the life of the SHA.

Summary of Effects to Spotted Owl Critical Habitat

Approximately 162 acres of designated spotted owl critical habitat that contain nesting, roosting, and foraging habitat or foraging-only habitat would be adversely affected by windthrow in the first few years after the adjacent SHA lands are harvested. Windthrow would remove some individual trees and patches of trees within those 162 acres over the duration of the 60-year SHA. Some nesting/roosting/foraging functions provided by that critical habitat at the site scale would be lost until replaced by adjacent habitat over time, but since the function of the habitat would be retained at the stand scale, we anticipate that the critical habitat would be degraded but not removed or downgraded. The value or function of critical habitat within the action area to provide its intended conservation and recovery role would not be appreciably diminished.

CUMULATIVE EFFECTS: Spotted Owl Critical Habitat (2008)

Cumulative effects include the effects of future State, Tribal, local, or private actions that are reasonably certain to occur in the action area considered in this 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. Designated critical habitat in the action area is only on Federal land. Non-Federal lands in the action area are managed primarily for timber production. Therefore non-Federal actions that could affect adjacent spotted owl critical habitat are reasonably certain to occur within the action area. These will primarily include road management and timber harvest operations that are directly adjacent to designated critical habitat and could result in edge effects. Private timber harvest in the area must comply with the Washington Forest Practices Act (RCW 76.09) as well as the Washington Administrative Code with respect to the Washington Forest Practices Rules (WAC 222). The effects associated with this compliance are anticipated to be similar to those previously described in the Environmental Baseline section.

CONCLUSION: Spotted Owl Critical Habitat (2008)

After reviewing the current status of designated spotted owl critical habitat, the environmental baseline for the action area, the effects of the action, and the cumulative effects, it is the Service's Biological Opinion that the issuance of a SHA with SDS Company and Broughton Lumber Company, as proposed, along with cumulative effects, is not likely to destroy or adversely modify spotted owl critical habitat. The action area and the subunit would remain functional to serve its intended conservation role for the spotted owl because adverse effects are small in scale (less than 162 acres distributed over 6.7 miles and three critical habitat units) and the forests would remain capable of supporting spotted owls. Since 2008, there have been 2,522 acres of spotted owl critical habitat authorized for removal or downgraded through section 7 consultations nationwide. Implementation of the proposed action will degrade but not remove or downgrade critical habitat; and the amount of critical habitat authorized for removal or downgraded through section 7 consultations nationwide would remain at 2,522 acres. All three critical habitat units would continue to function as intended by providing essential nesting, roosting, foraging, and dispersal habitat as well as providing essential breeding habitat connectivity within the sub-provinces. Adverse effects to 162 acres of critical habitat from the proposed action would be minor in the context of the CHU, physiographic province, and critical habitat range-wide. Critical habitat at the scale of the action area, subunit, CHU, physiographic province, and range-wide would continue to serve its intended conservation role for the species.

In summary, the direct, indirect, and cumulative effects from the action would not diminish the value or function of the critical habitat to maintain a stable, self-sustaining, and interconnected population of spotted owls and provide the intended conservation and recovery role within the action area, the Southeast Washington Cascades CHU, the Southwest Washington Cascades CHU, the Hood River CHU, or across the species' listed range.

CONFERENCE OPINION: Proposed Spotted Owl Critical Habitat (2012)

Under 50 CFR §402.10, the Service has the option to prepare a Conference Opinion for effects to proposed species or proposed critical habitat in accordance with the procedures for formal consultation as identified in 50 CFR §402.14. The Conference Opinion and/or letter of concurrence can be written as if critical habitat were designated in a final rule such that the effect determination threshold is at the "may affect" level, as opposed to the "destruction or adverse modification" level described in 50 CFR §402.10. The conference may be adopted as a final consultation when the species or critical habitat is designated, but only if no significant new information is developed and no significant changes to the Federal action are made that would alter the content of the conference consultation. In recognition of this part of the regulation, we evaluated effects to proposed spotted owl critical habitat as if it were designated.
This conference 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.

STATUS OF PROPOSED SPOTTED OWL CRITICAL HABITAT (2012)

Legal status

On March 8, 2012, the Service announced a revised critical habitat proposal for the northern spotted owl (USFWS 2012, p. 14062). The 2012 proposed critical habitat currently includes 13,962,944 acres in 11 units and 63 subunits in California, Oregon, and Washington. Of the total area identified, approximately 2,631,736 acres of National Park Lands, Federal Wilderness Areas, and other congressionally-reserved natural areas, as well as 164,776 acres of State Park lands are proposed to be excluded from the final designation. The Service has also proposed to exclude from a final designation approximately 936,816 acres of State and private lands that have a Habitat Conservation Plan, Safe Harbor Agreement, conservation easement, or similar conservation protection. The Service is also considering exclusion of an additional 838,344 acres of other non-Federal lands from the final designation. The final rule for revised critical habitat for the spotted owl is scheduled for publication in the Federal Register in November 2012.

Primary Constituent Elements

The PCEs are described in the proposed rule as the specific elements that comprise the physical or biological features needed for the conservation of the spotted owl. The physical or biological features identified in the proposed rule are the forested areas that are used or likely to be used by the spotted owl for nesting, roosting, foraging, or dispersing (USFWS 2012, p. 14082). The effects analysis for proposed critical habitat determines how a proposed action is likely to affect the physical and biological features of critical habitat essential to the species conservation. The PCEs identified in the proposed rule include: 1) forest types in early-, mid-, or late-seral stages that support the spotted owl across its geographic range; and specific habitats that provide for: 2) nesting and roosting; 3) foraging; and, 4) dispersal (USFWS 2012, pp. 14148-49).

In this analysis, we use the terms nesting, roosting, and foraging (NRF) to indicate "suitable" spotted owl habitat. In the context of the SHA both YFM and SM habitat as defined in the Washington Forest Practices Rules are considered to be "suitable" NRF habitat. Dispersal habitat is habitat used by dispersing spotted owls that does not contain suitable NRF habitat. These stands provide protection from avian predators and at least minimal foraging opportunities during dispersal (USFWS 2012, p. 14093).

Conservation Role of Critical Habitat

The conservation role of spotted owl critical habitat is to support the life-history needs of the species to the extent that well-distributed and inter-connected populations are likely to persist at the critical habitat unit and range-wide scales (USFWS 2012, p. 14124). The expectation of critical habitat is to ensure sufficient habitat to support population viability and demographically stable populations of northern spotted owls across the historic range of the species, but this will likely require habitat conservation in concert with the implementation of recovery actions that address other, non-habitat-based threats to the species, including the barred owl (USFWS 2012, p. 14073).

General management recommendations for spotted owl critical habitat include (USFWS 2012, p. 14064):

1) Conserve the older growth, high quality and occupied forest habitat as necessary to meet recovery goals.

2) Implement science-based, active vegetation management to restore forest health, especially in drier forests in the eastern and southern portions of the spotted owl's range.

3) Encourage landscape-level planning and vegetation management that allow historical ecological processes, such as characteristic fire regimes and natural forest succession, to occur on these landscapes throughout the range of the spotted owl. This approach has the best chance of resulting in forests that are resilient to future changes that may arise due to climate change.

Special Management Considerations

Because the specific management approaches and types of forest vary geographically across the range of the spotted owl, the Service has identified special management considerations or protections that may be required to preserve or enhance the essential physical and biological features of habitat for the northern spotted owl in the West Cascades/Coast Ranges of Oregon and Washington, East Cascades, Klamath, and Northern California Interior Coast Ranges, and the Redwood Coast (USFWS 2012, p. 14093-14095).

The majority of the action area considered in this Opinion is located in the East Cascades region. The special management considerations listed in the proposed rule for this region include the following.

East Cascades (USFWS 2012, pp. 14094-14095)

Special management considerations or protection may be required in the East Cascades to address the effects of past activities associated with Euro-American settlement, such as timber harvest, livestock grazing, fire suppression, and fire exclusion, that have substantially altered the inland northwest, modifying the patterns of vegetation and fuels, and subsequent disturbance regimes to the degree that contemporary landscapes no longer function as they did historically (Hessburg *et al.* 2000a, pp. 74–81; Hessburg and Agee 2003, pp. 44–46; Hessburg *et al.* 2005, pp. 134–135; Skinner *et al.* 2006, pp. 178–179; Skinner and Taylor 2006, pp. 201–203). This has affected not only the existing forest and disturbance regimes, but the quality, amount, and distribution of northern spotted owl habitat on the landscape. In order to preserve the essential physical or biological features, these dynamic, disturbance-prone forests must be managed in a way that promotes northern spotted owl conservation, responds to climate change, and restores dry forest ecological structure, composition, and processes, including wildfire and other disturbances (USFWS 2011, p. III-20). The following restoration principles apply to the management that may be required in this dry forest region (USFWS 2011, pp. III-34 to III-35):

1) Emphasize vegetation management treatments outside of northern spotted owl core areas or high-value habitat where consistent with overall landscape project goals;
2) Design and implement restoration treatments at the landscape level;
3) Retain and restore key structural components, including large and old trees, large snags, and downed logs;
4) Retain and restore heterogeneity within stands;
5) Retain and restore heterogeneity among stands;
6) Manage roads to address fire risk; and
7) Use wildfires to meet vegetation management objectives where appropriate.

The above principles will result in treatments that have a variety of effects on northern spotted owl habitat in the short and long term. For example, some restoration treatments may have an immediate neutral or beneficial effect on existing northern spotted owl habitat (e.g., roads management, some prescribed fire prescriptions). Other treatments, however, may involve reductions in stand densities, canopy closure, or ladder fuels (understory vegetation that has the potential to carry fire up into the crown), and thus affect the physical or biological features of habitat needed by the species. At the stand scale, this can result in a level of conflict between conserving existing northern spotted owl habitat and restoring dry-forest ecosystems. We typically cannot expect to meet both objectives on the same acre if that acre currently functions as suitable northern spotted owl habitat. We can reconcile this conflict, however, by managing at the landscape scale.

For example, land managers need to move away from implementing many small, uncoordinated and independent fuel-reduction and restoration treatments. Instead, coordinated and strategic efforts that link individual projects to the larger objectives of restoring landscapes while conserving and recovering northern spotted owl habitat are needed (Sisk *et al.* 2005, entire; Prather *et al.* 2008, entire; Gaines *et al.* 2010, entire).

Summary of Consultations for 2012 Proposed Critical Habitat

A small number of formal conferences have been completed in Oregon that addressed effects to the 2012 proposed critical habitat, but there have been no prior consultations for effects within the SHA area considered in this opinion. No prior conference opinions addressing effects to the 2012 proposed critical habitat have been issued in Washington. Conferences opinions issued to date have all concluded that the minor habitat losses consulted upon were "not likely to adversely modify" the proposed critical habitat.

ENVIRONMENTAL BASELINE: Proposed Spotted Owl Critical Habitat (2012)

A total of 16,521 acres of the SHA lands in Washington are located within two proposed critical habitat units – Unit 5: West Cascades Central, and Unit 7: East Cascades North. Specifically, there are 599 acres of SHA lands identified as proposed critical habitat in Unit 5, and 15,922 acres of SHA lands identified as proposed critical habitat in Unit 7. SHA lands in Oregon do not

occur within a proposed critical habitat unit, but SHA lands in Oregon are located adjacent to portions of Unit 7.

As described elsewhere, the majority of the SHA lands have been previously harvested or burned, and there is relatively little old-forest habitat on the SHA lands. SDS estimates that there are approximately 140 acres of old forest habitat (greater than 150 years old) on their entire ownership (both within and outside proposed critical habitat) that exists in small scattered patches, primarily along the White Salmon River. SDS provided information concerning owl habitat within the proposed critical habitat areas (Table 9). We also used a map of spotted owl habitat developed for the Northwest Forest Plan (NWFP) (Davis et al. 2011) to estimate habitat conditions within the proposed critical habitat (Table 9). The Northwest Forest Plan habitat map provides an estimate of forest conditions as they existed in 2006/2007. We use those data here only to provide context for our critical habitat analysis. The two sources of information provide similar estimates of "suitable" owl habitat, but vary considerably for dispersal and non-habitat types, perhaps due to management actions that have occurred over the past 6 years.

Table 9. Summary of current habitat conditions within proposed critical habitat on the SHA lands.

Habitat Type	SDS Stand Data (Acres) (circa 2011/2012)	NWFP Habitat Map (Acres) (circa 2006/2007)
Suitable (YFM and SM)	8,883	8,945
Dispersal	3,814	5,488
Non-habitat	3,824	2,088
Totals	16,521	16,521

Notes: All acre figures are approximate values based on GIS data. NWFP habitat data is based on the Northwest Forest Plan spotted owl 15-year review habitat map and represents conditions circa 2006/2007 (Davis et al. 2011). SDS habitat estimates for suitable habitat are based on stand age, and include 5,084 acres of YFM habitat, and 3,799 acres of SM habitat (J. Spadaro, pers. comm. 2012).

Description of Affected Critical Habitat Units

Critical Habitat Unit 5: West Cascades Central (WCC)

This unit contains 1,353,045 acres and three subunits (WCC-1, WCC-2, and WCC-3) (USFWS 2012, p. 14110). This region consists of the midsection of the Western Cascades, extending from Snoqualmie Pass in central Washington south to the Columbia River.

Subunit WCC-3 (USFWS 2012, p. 14111)

The 599 acres of SHA lands that occur in Unit 5 are located within critical habitat subunit WCC-3 (Table 10). The WCC-3 subunit consists of approximately 499,449 acres in Clark, Skamania, and Yakima Counties, Washington, and comprises lands managed by the USFS, the State of Washington, and private landowners. The USFS manages 286,220 acres as Late-successional Reserves to maintain functional, interactive, late-successional, and old-growth forest ecosystems; 32,862 acres as congressionally-reserved or wilderness areas (propose to exclude); and 125,488

acres under the Matrix land use allocation where multiple uses occur, including most timber harvest and other silvicultural activities. The State of Washington, primarily the Department of Natural Resources, manages 63,504 acres in the Siouxon and Columbia Gorge SOSEAs for multiple uses, including timber revenue production, water quality, recreation and wildlife habitat. Private landowners manage 1,746 acres for various uses within the Siouxon and Columbia Gorge SOSEAs, including maintenance of spotted owl habitat for demographic and dispersal support of habitat on Federal lands and will be considered for exclusion in the final designation. Threats in this subunit include current and past timber harvest, competition with barred owls, and the Columbia River as an impediment to spotted owl dispersal.

This subunit is expected to provide demographic support of the overall population and an opportunity for demographic exchange between the WCC Unit and the WCS Unit across the Columbia River. WCC-3 is located primarily in the watersheds of the Lewis, Wind, and White Salmon rivers, and is bounded on the south by the Columbia River. In this subunit, the Service has proposed to exclude lands covered under the Washington Department of Natural Resources State Lands HCP.

We have determined that all of the unoccupied and likely occupied areas in this subunit are essential for the conservation of the species to meet the recovery criterion that calls for the continued maintenance and recruitment of spotted owl habitat (USFWS 2011, p. ix). 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 expansion, successful dispersal, and buffering from competition with the barred owl.

Based on the 2006/2007 spotted owl habitat map developed for the NWFP spotted owl 15-year review (Davis et al. 2011), subunit WCC-3 contains approximately 246,404 acres (49 percent) of nesting, roosting, and foraging habitat, and 159,728 acres (32 percent) of dispersal habitat.

<u>Critical Habitat Unit 7: East Cascades North (ECN)</u>

Unit 7 contains 1,919,469 acres and nine subunits (USFWS 2012, p. 14113). This unit consists of the eastern slopes of the Cascade Range, extending from the Canadian border south to the Deschutes National Forest near Bend, Oregon. Terrain in portions of this region is glaciated and steeply dissected. This region is characterized by a continental climate (cold, snowy winters and dry summers) and a high-frequency/low-mixed severity fire regime.

Subunit ECN-6 (USFWS 2012, pp.14115-14116)

The 15,922 acres of SHA lands that occur in Unit 7 are located within critical habitat subunit ECN-6 (Table 10). The ECN-6 subunit consists of approximately 169,139 acres in Skamania, Yakima, and Klickitat Counties, Washington, and comprises lands managed by the USFS, the State of Washington, and private landowners. Of this subunit, 4,466 acres are managed as part of the Columbia River Gorge National Scenic Area as a congressionally-reserved area under the NWFP. We propose to exclude this acreage in the final critical habitat designation. The USFS manages 32,430 acres as Late-successional Reserves to maintain functional, interactive, late-successional, and old-growth forest ecosystems; and 49,338 acres under the Matrix land use

allocation where multiple uses occur, including most timber harvest and other silvicultural activities. The State of Washington, primarily the Department of Natural Resources, manages 39,555 acres, mostly in the White Salmon SOSEA, for multiple uses, including timber revenue production, water quality, recreation, and wildlife habitat.

Private landowners manage 43,392 acres for various uses within the White Salmon SOSEA, including maintenance of spotted owl habitat for demographic and dispersal support of habitat on Federal lands. This acreage will be considered for exclusion in the final designation. Threats in this subunit include current and past timber harvest, competition with barred owls, and the Columbia River as an impediment to spotted owl dispersal.

This subunit is expected to provide demographic support of the overall population. ECN-6 is located primarily in the watersheds of the Klickitat and White Salmon rivers, and is bounded on the south by the Columbia River. In this subunit, we propose to exclude lands covered under the Washington Department of Natural Resources State Lands HCP. We have determined that all of the unoccupied and likely occupied areas in this subunit are essential for the conservation of the species to meet the recovery criterion that calls for the continued maintenance and recruitment of spotted owl habitat (USFWS 2011, p. ix). 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 expansion, successful dispersal, and buffering from competition with the barred owl.

Based on the 2006/2007 spotted owl habitat map developed for the NWFP spotted owl 15-year review (Davis et al. 2011), there are approximately 89,685 acres (55 percent) of nesting, roosting, and foraging habitat, and 48,925 acres (30 percent) of dispersal habitat on all ownerships within ECN-6.

Table 10. Summary of proposed spotted owl critical habitat in the SHA analysis area.

Proposed CH[1] Subunit	Proposed CH Acres			Estimated NRF Habitat in Proposed CH		
	Total CH Subunit Acres	Total SHA CH Acres	Percent of Total CH Subunit on SHA Lands	Total NRF Habitat in CH Subunit	CH Subunit NRF Habitat on SHA Lands	Percent of CH Subunit NRF Habitat on SHA Lands
ECN-6 (White Salmon SOSEA)	163,766	15,922	9.72 %	89,685	8,762	9.8%
WCC-3 (Columbia Gorge SOSEA)	499,449	599	0.12 %	246,405	183	< 0.1%
SHA Totals	-	16,521	-	-	8,945	-

[1] CH = Critical Habitat

Notes: Spotted owl NRF habitat information is based on the Northwest Forest Plan spotted owl 15-year review habitat map and represents conditions circa 2006/2007 (Davis et al. 2011). All acre figures are approximate values. The total NRF habitat acres (8,945 acres) generated from this map data are comparable to the habitat estimates provided by SDS based on stand age class information for YFM and SM habitat (8,883 acres).

Critical Habitat Associated with Spotted Owl Circles

All proposed critical habitat within the action area that is located on non-Federal lands is associated with the Columbia Gorge and White Salmon SOSEAs. In the absence of an approved HCP or SHA, the Washington Forest Practices Rules provide regulatory protection of the best 2,605 acres of suitable NRF habitat within the median home range circle surrounding a spotted owl activity center (1.8 mile radius). Of the estimated 8,945 acres of suitable owl habitat on SHA lands in critical habitat, approximately 4,692 acres (52 percent) of these acres are associated with 18 spotted owl circles in SOSEAs (Table 11), while remaining suitable habitat acres are outside spotted owl circles where there are no restrictions on the harvest of owl habitat.

Table 11. Summary of suitable owl habitat in proposed CH on SHA lands in spotted owl circles (1.8-mile radius) in SOSEAs.

CH Subunit	CH Suitable NRF Habitat on SHA Lands	CH Suitable NRF Habitat in Owl Circles	CH Suitable NRF Habitat Not in Owl Circles
Totals	8,945	4,692	4,253

Spotted owl NRF habitat information is based on the NWFP spotted owl 15-year review habitat map and represents conditions circa 2006/2007 (Davis et al. 2011). All acre figures are approximate values. The total NRF habitat acres (8,945 acres) generated from this map data are comparable to the habitat estimates provided by SDS based on stand age class information for YFM and SM habitat (8,883 acres).

EFFECTS OF THE ACTION: Proposed Spotted Owl Critical Habitat (2012)

Effects to PCEs (Nesting, Roosting, Foraging and Dispersal Habitats)

Effects of Current and Likely Future Timber Management without the SHA

In the absence of the SHA, SDS and BLC would be expected to harvest all owl habitat on their lands outside of spotted owl circles over the next 15 to 20 years. In critical habitat, forest that is currently providing suitable (YFM or SM) or dispersal habitats would be harvested and managed into the future on a 45-year harvest rotation. There are approximately 8,945 acres of suitable owl habitat on SHA lands within critical habitat. An estimated 4,692 acres of currently suitable habitat is located in spotted owl circles that would be precluded from harvest by the existing Washington Forest Practices regulations. However, because the majority of these habitat acres occur in the East Cascades, the potential for long-term persistence of suitable habitat in any one location is highly uncertain. This is due to the vulnerability of these forests to natural disturbances from storms, wildfire, insects, and disease. As suitable habitat within spotted owl circles declines, there is no incentive or requirement for SDS and BLC to regrow habitat that is lost due to natural disturbance.

Existing suitable habitat outside of spotted owl circles (approximately 4,253 acres) would be harvested, and all remaining forested areas on SHA lands within critical habitat would be managed for an average 45-year harvest rotation. Over the long-term, suitable spotted owl habitat in critical habitat on the SHA lands would become increasingly fragmented and isolated as existing habitat in the spotted owl circles declined due to natural disturbance over time. Because spotted owl dispersal habitat generally does not develop in forests under 40 years old, we would expect there to be a substantial reduction in the total amount and configuration of dispersal habitat in critical habitat on SHA lands due to the expected harvest rotation of 45 years. In summary, in the absence of the SHA, of the 16,521 acres of SHA lands located within critical habitat, only 4,692 acres (28 percent) would be managed for owl habitat (both suitable and dispersal), but these areas would likely decline over time. All other areas (over 11,800 acres) would transition to be managed as non-habitat with only minor areas of marginal dispersal habitat present on the landscape.

Effects of Management with the SHA

Under the SHA, SDS and BLC would shift from managing strictly for habitat in spotted owl circles to providing for owl habitat (dispersal and YFM habitat) distributed across the broader landscape encompassed by their ownership. Habitat in spotted owl circles would no longer be constrained by the regulatory restrictions that preclude harvest of suitable habitat within spotted owl circles in SOSEAs. Although some harvest of suitable habitat within the spotted owl circles would be deferred over the short-term (10 years), most habitat acres within critical habitat (estimated at 8,883 to 8,945 acres) would eventually be harvested, with the exception of small habitat areas that are included in SSAs, riparian management zones, or other areas deferred from harvest.

Under the terms of the SHA, a minimum of 33 percent of SHA lands within the White Salmon SOSEA (which includes 96 percent of critical habitat on the SHA lands) will be maintained as dispersal habitat or better for the 60-year term of the agreement. If we apply this ratio (33 percent) to the SHA lands within critical habitat (15,922 acres) in the White Salmon SOSEA, we would expect a minimum of 5,250 acres will be maintained as dispersal habitat or better for the life of the SHA, including approximately 2,600 acres of YFM and SM habitat maintained as part of the SHA commitment to maintain an “elevated baseline” in the White Salmon SOSEA. Based on the terms of the SHA and predicted timber harvest rates, we would expect a minimum of approximately 33 to 40 percent of the SHA lands within critical habitat to provide owl habitat (dispersal, YFM, and SM) at any given time over the next 60 years.

Over the life of the SHA, the total amount of suitable SM and YFM habitat on SHA lands will be reduced from a current estimate of approximately 8,900 acres to a minimum of 2,600 acres (16.5 percent). Ultimately, there will be a net loss of suitable habitat on the SHA lands within critical habitat for a minor gain in dispersal habitat acres maintained within the critical habitat (28 percent suitable and dispersal habitat under management without the SHA, vs. 33 to 40 percent dispersal and suitable habitat with the SHA).

Implementation of a longer harvest rotation of conifer-dominated stands, i.e., a 60-year rotation as opposed to a 45-year rotation, will result in the retention of more commercial forest that

ranges from 50 to 70 years of age. Currently there are approximately 7,576 acres (46 percent) of SHA lands that are younger forests that are either non-habitat or dispersal habitats that will develop into dispersal or YFM over the term of the SHA. These acres would provide dispersal habitat for a period of 10 to 20 years longer as a result of the SHA. These stands if commercially thinned, may develop into spotted owl YFM habitat. A potential result of thinning would be an acceleration of stand development into a YFM condition that could be used by spotted owls for some foraging opportunities above the minimal levels present in young-forest dispersal habitat.

Effects to PCEs in Spotted Owl Circles

Critical habitat on the SHA lands includes currently suitable spotted owl habitat in 10 spotted owl circles, including 8 circles with expected habitat loss within the 0.7-mile radius circle. Harvest of SM and YFM habitats in these spotted owl circles will reduce the amount of habitat in these circles and is considered to be an adverse effect to both spotted owls and spotted owl critical habitat due to the loss of PCEs that are likely to affect spotted owls at the scale of a "core" area (USFWS 2012, p.14125). These effects are not unexpected because the purpose of the SHA is to transition away from managing for small "fixed" habitat reserves associated with spotted owl circles to a broader landscape-scale approach. The effects of habitat loss in spotted owl circles are discussed in detail under *Effects to Spotted Owls*.

Indirect Effects to Critical Habitat PCEs Associated with Windthrow

Windthrow is a natural phenomenon affecting forests throughout the Pacific Northwest. Every year hundreds of acres of trees are blown over in natural stands and along clearcut boundaries and road corridors (Strathers et al. 1994). The factors that influence windthrow include individual tree characteristics, stand characteristics, root zone soil characteristics, topographic exposure characteristics, and meteorological conditions (Strathers et al. 1994; Harris 1999). Windthrow usually occurs in the first few years after harvesting, particularly where more susceptible trees are exposed to stronger winds as a result of harvesting. Trees can become more windfirm after a few years of exposure as they develop reaction wood in response to swaying (Strathers et al. 1994). Timber harvesting can increase the windthrow hazard by increasing the wind speed and turbulence along the downwind edge of clearcut boundaries. Winthrow damage can extend into adjacent stands for hundreds of feet, although most damage is usually concentrated within the first 30 to 60 feet of the cutting boundary edge (Strathers et al. 1994).

Edge effects associated with clearcut timber harvest on the SHA lands could result in an increased risk of windthrow, resulting in adverse effects to existing NRF habitat in critical habitat units on adjacent Federal lands. We are not able to predict the extent to which windthrow may occur within the SHA lands, but acknowledge here that this is an effect that is likely to occur. The Service anticipates that scattered loss from windthrow could occur for distances up to 200 feet into adjacent stands of suitable NRF habitat within critical habitat.

Special Management Considerations for PCEs in the East Cascades

Critical Habitat Unit 7 has special management considerations for impacts to PCEs, as discussed in the 2012 proposed critical habitat Rule (USFWS 2012, pp. 14094-14095). The following

discussion addresses how the proposed actions affect PCEs relative to these management considerations.

1) *Emphasize vegetation management treatments outside of northern spotted owl core areas or high-value habitat where consistent with overall landscape project goals*.

The SHA includes currently suitable spotted owl habitat in 10 spotted owl circles. These effects are not unexpected because the purpose of the SHA is to transition away from managing for small "fixed" habitat reserves associated with spotted owl circles to a broader landscape-scale approach.

2) Design and implement restoration treatments at the landscape level.

The purpose of the SHA is to provide habitat for spotted owl roosting, foraging, and dispersal at a broad landscape scale that complements existing conservation strategies for both demographic support and dispersal connectivity provided by the WNDR HCP and the Northwest Forest Plan.

3) Retain and restore key structural components, including large and old trees.

The SHA includes 661 acres of special set asides for old-forest reserves, as well as provisions for retaining wildlife trees in both commercial thinning and regeneration harvest units.

4) Retain large snags and downed logs.

The SHA includes provisions for retention of snags and down logs in both thinned and regeneration harvest units.

5) Retain and restore heterogeneity within stands.

The SHA includes provisions for commercial thinning to promote the development YFM habitat.

6) Retain and restore heterogeneity among stands.

The SHA will provide for a dynamic landscape that includes reserves and special set asides, as well as a commitment to maintain a minimum of 33 percent of the landscape as dispersal or YFM habitat in the White Salmon SOSEA.

7) Manage roads to address fire risk, and 8) Use wildfires to meet vegetation management objectives where appropriate.

The SHA does not specifically address the use of roads to address fire risk, and it does not address the use of fire management in the SHA area.

Subunit Analysis

The proposed rule (USDI FWS 2012, p. 14125) recommends that the section 7(a)(2) analysis for destruction or adverse modification determination should evaluate how a proposed action is likely to affect the capability of the critical habitat to support the spotted owl. This analysis should consider the scales at which life-history requirements are based: 1) The extent of the critical habitat subunit that is affected; 2) The specific purpose of the subunit; 3) The impact of the action on the subunit's likelihood of serving its intended conservation function/purpose; and 4) The overall consistency of the action with the Spotted Owl Recovery Plan or other landscape-level spotted owl conservation plan (USFWS 2012, p.14125).

1) The extent of the critical habitat Subunits that are affected

Critical Habitat Subunit WCC-3 encompasses 499,449 acres in the western Washington Cascades. SHA lands (599 acres) within the subunit represent only a minor portion of the lands within the subunit (0.12 percent). Short-term effects would include a loss of approximately 183 acres (less than 0.1 percent) of SM or YFM habitat, that would be offset by the eventual development of 400 acres of forests into YFM that are currently non-suitable or dispersal habitat.

Critical Habitat Subunit ECN-6 encompasses 163,766 acres in the eastern Washington Cascades, including approximately 89,685 acres of suitable owl NRF habitat. SHA lands (15,922 acres) within the subunit represent 9.72 percent of the subunit in an area that is important for both demographic support and dispersal connectivity adjacent to Federal and State lands. Over the 60-year term of the SHA, the total amount of suitable SM and YFM habitat on SHA lands will be reduced from a current estimate of approximately 8,900 acres to a minimum of 2,600 acres (16.5 percent). Ultimately, there will be a net loss of suitable habitat on the SHA lands within critical habitat for a minor gain in dispersal habitat acres maintained within the critical habitat (28 percent suitable and dispersal habitat under management with the SHA, vs. 33 to 40 percent dispersal and suitable habitat with the SHA). The short-term losses in suitable habitats on SHA lands within critical habitat over the next 10 to 20 years would be offset by further development of suitable NRF habitat on adjacent Federal reserves and State HCP lands within the subunit, as dispersal habitat (currently estimated at 48,925 acres [30 percent] for all ownerships) transitions to YFM and SM mature habitats.

2) The specific purpose of the subunits

These subunits are expected to provide demographic support of the overall population and an opportunity for demographic exchange across the Columbia River. The critical habitat units are necessary to provide for viable populations of spotted owls over the long term by providing for population expansion, successful dispersal, and buffering from competition with the barred owl.

3) The impact of the action on the subunit's likelihood of serving its intended conservation function/purpose

Although we expect there to be adverse effects associated with the short-term loss of suitable YFM and SM habitat on SHA lands within critical habitat, the capability of the SHA lands to

provide for dispersal connectivity will be maintained by the SHA. Demographic support at the subunit scale will continue to be provided by adjacent Federal and State lands which comprise approximately 74 percent of the acreage in Subunit ECN-6.

4) *The overall consistency of the action with the Spotted Owl Recovery Plan or other landscape level spotted owl conservation plan.*

Recovery Action 10 (USFWS 2011, p.iii-43) - Conserve spotted owl sites and high value spotted owl habitat to provide additional demographic support to the spotted owl population.

The SHA includes currently suitable spotted owl habitat in 10 spotted owl circles. Under the SHA, some of the habitat in these spotted owl circles will be removed. These effects are not unexpected because the purpose of the SHA is to transition away from managing for small "fixed" habitat reserves associated with spotted owl circles to a broader landscape scale approach.

Recovery Action 14 (USFWS 2011, p.III-52) - Encourage applicants to develop Habitat Conservation Plans and Safe Harbor Agreements that are consistent with the recovery objectives. The Service identified non-Federal lands as proposed critical habitat essential to the conservation of the spotted owl because it alerts State and local government agencies and private landowners to the value of the habitat, and may help facilitate voluntary conservation partnerships such as Safe Harbor Agreements and Habitat Conservation Plans that may contribute to the recovery and delisting of the species (USFWS 2012, p. 14063). The purpose of the SHA is to provide for roosting, foraging and dispersal habitat that is complementary to existing conservation strategies in the area provided by the Northwest Forest Plan and the WDNR State Lands HCP.

Critical Habitat Unit and Range-wide Scale Analysis

Critical Habitat Unit 5: West Cascades Central (WCC)
This unit contains 1,353,045 acres within three subunits (WCC-1, WCC-2, and WCC-3) (USFWS 2012, p. 14110). Unit 5 consists of the midsection of the Western Cascades, extending from Snoqualmie Pass in central Washington south to the Columbia River. SHA lands comprise 599 acres within Unit 5. The potential effects of the SHA are essentially immeasurable at the scale of Unit 5.

Critical Habitat Unit 7: East Cascades North (ECN)

Unit 7 contains 1,919,469 acres within nine subunits (USFWS 2012, p. 14113). This unit consists of the eastern slopes of the Cascade Range, extending from the Canadian border south to the Deschutes National Forest near Bend, Oregon. SHA lands comprise 15,922 acres within Unit 7 (less than 1 percent of the unit). The effects of the SHA are measurable at the subunit and potentially the critical habitat unit scales. However, these effects are not expected to diminish the ability of the critical habitat to provide for spotted owl conservation and recovery at the scale of critical habitat Unit 7.

At the range-wide scale, the proposed critical habitat designation currently includes 13,962,944 acres in 11 units and 63 subunits in California, Oregon, and Washington. The minor losses of suitable habitat in the short-term, coupled with maintenance of dispersal habitats on SHA lands, are anticipated to result in immeasurable effect at the range-wide scale.

Effects of Early Termination of the SHA

The proposed 2012 critical habitat designation would designate 16,521 acres of spotted owl critical habitat on the SHA lands. Of these 16,521 acres of proposed critical habitat, 4,692 acres are currently suitable habitat and considered to be "restricted" due to their location within spotted owl circles in SOSEAs. With the SHA, we expect the removal of 4,076 of those proposed critical habitat acres in eight spotted owl circles that would otherwise not occur under existing regulatory mechanisms. This habitat loss will result in long-term effects, and three spotted owl circles that are currently above habitat thresholds would be below habitat thresholds. Under a worst-case scenario, these acres would be harvested during the early portion of the SHA, and then the SHA would be terminated, resulting in a loss of critical habitat in spotted owl circles in SOSEAs that would not have occurred but for the SHA. With early termination, SHA land acres within 0.7-mile circles would be restricted again and eventually transition back to habitat. Outside the 0.7-mile circles, the burden to maintain the best 2,605 acres would have shifted to other landowners within the SOSEA spotted owl circles, but the regulatory guidelines to maintain a minimum of 2,605 acres of habitat would remain. With or without the SHA, the majority of the proposed critical habitat acres outside of SOSEA circles are likely to be harvested over the next 60 years, and the effects to PCEs in the larger landscape would be similar. Therefore, early termination of the SHA by either party is not likely to result in significantly different effects to proposed critical habitat than those considered for the life of the SHA.

Summary

Although the proposed SHA will adversely affect spotted owl critical habitat at the scale of the action area, the project is consistent with the intent of the 2011 Spotted Owl Recovery Plan. In summary, the direct and indirect effects of the action would not diminish the value or function of the critical habitat to maintain a stable, self-sustaining, and interconnected population of spotted owls and provide the intended conservation and recovery role at the scale of the critical habitat subunit, critical unit, or across or across the species' listed range.

CUMULATIVE EFFECTS: Proposed Spotted Owl Critical Habitat (2012)

Cumulative effects include the effects of future State, Tribal, local or private actions that are reasonably certain to occur in the action area considered in this conference 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.

Non-Federal lands in the action area are managed primarily for timber production. Therefore non-Federal actions that could affect adjacent spotted owl critical habitat are reasonably certain to occur within the action area. These will primarily include road management and timber harvest operations. Private timber harvest in the area must comply with the Washington Forest

Practices Act (RCW 76.09) as well as the Washington Administrative Code with respect to the Washington Forest Practices Rules (WAC 222). The effects associated with this compliance are anticipated to be similar to those previously described in the Environmental Baseline section.

CONCLUSION: Proposed Spotted Owl Critical Habitat (2012)

After reviewing the current status of 2012 proposed critical habitat for 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 conference opinion that the action, as proposed, is not likely to destroy or adversely modify proposed critical habitat.

The Service reached this conclusion because critical habitat would remain functional to serve its intended recovery role for the spotted owl at the range-wide scale. The proposed action is not likely to appreciably diminish the effectiveness of the conservation strategy established in the 2011 Spotted Owl Recovery Plan to protect the spotted owl and its habitat on Federal, State, and private lands within its range including proposed spotted owl critical habitat. Additionally, cumulative effects would not change the determinations made under the effects of the proposed action.

The conservation needs of the spotted owl will continue to be met at the critical habitat subunit, critical habitat unit and critical habitat range-wide scales because the proposed action is consistent with the guidance of the 2011 Spotted Owl Recovery Plan. The conservation value of the subunits will not be appreciably reduced at the critical habitat subunit, unit, or range-wide scales. Therefore, the Service believes this project will not appreciably diminish the value of proposed critical habitat for the conservation of the spotted owl.

INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and Federal regulation pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. *Harm* is defined by the Service as an act which actually kills or injures wildlife. Such an act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavior patterns, including breeding, feeding, or sheltering (50 CFR 17.3). *Harass* is defined by the Service as an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering (50 CFR 17.3). Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be a prohibited taking under the ESA provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The proposed SHA and its associated documents clearly identify anticipated adverse effects to covered species likely to result from the proposed action and the measures that are necessary and appropriate to minimize those adverse effects. All conservation measures described in the SHA, together with the provisions described in the associated Implementation Agreement and section 10(a)(1)(A) Permit, are hereby incorporated by reference as reasonable and prudent measures and terms and conditions within this Incidental Take Statement pursuant to 50 CFR §402.14(i). Such terms and conditions are non-discretionary and must be undertaken by the Service so that they become binding conditions of the permit issued to the Applicants, as appropriate, for the exemptions under section 10(a)(1)(A) and section 7(o)(2) of the ESA to apply.

The Service has a continuing duty to regulate the activity covered by this incidental take statement. If the Service (1) fails to assume and implement the terms and conditions; or (2) If the Permittee fails to adhere to the section 10(a)(1)(A) permit conditions, the protective coverage of the Permit and section 7(o)(2) may lapse. The amount or extent of incidental take anticipated under the proposed SHA and associated reporting requirements are as described in the SHA and its accompanying section 10(a)(1)(A) permit.

In order to monitor the impact of incidental take, the Service Washington Fish and Wildlife Office must report the progress of the action and its impact on the species as specified in the incidental take statement [50 CFR 402.14(i)(3)].

AMOUNT OR EXTENT OF TAKE

The Service anticipates that the proposed action is likely to result in the incidental take of spotted owls in the form of harm and harass. We anticipate incidental take of individuals would typically be difficult to detect for the following reasons: (1) there is a low likelihood of finding injured or dead individuals due to one or more of the following factors: relatively low population density, secretive behavior and cryptic coloration, concealing habitat, small size, and sporadic distribution over a large portion of the landscape; (2) the large area associated with implementation of the proposed activities covered by the Permit; (3) the delayed effects of many of the activities that could take species and the take may manifest itself outside the covered lands or outside portions of the covered lands where activities are being conducted; (4) the rapid rate of decomposition after death; (5) the high probability of scavenging of dead individuals by predators; and (6) injured or affected individuals may suffer sub-lethal effects that are difficult to detect. For these reasons, we have used the amount of habitat removed or degraded as a surrogate for expressing the anticipated amount of incidental take in the form of harm or harass. Changes in habitat conditions are a reasonably good indicator of those forms of take.

We anticipate harm of spotted owls is reasonably certain to occur over the 60-year term of the SHA in the following situations:

- Removal of spotted owl habitat that is reasonably certain to be used by spotted owls associated with activity centers located on or adjacent to the covered SHA lands. Removal of habitat from within the home range of a spotted owl pair or resident single can be reasonably expected to result in the impairment of essential breeding, feeding and sheltering behaviors when the habitat loss reduces the total suitable habitat in the home

range (represented by a spotted owl circle) to below accepted viability thresholds, or further removes habitat from home ranges that are currently below viability thresholds. We expect habitat in 3 spotted owl circles will be reduced to below-habitat thresholds, and 1 additional spotted owl circle that is currently below habitat thresholds will have additional habitat loss resulting from the SHA. We expect take in the form of harm associated with significant habitat loss for a total of 4 spotted owl circles which represent potential spotted owl pairs and/or resident single spotted owls in the SHA landscape (Table 12).

We also anticipate that harassment of spotted owls from noise and visual disturbance is reasonably certain to occur over the 60-year term of the SHA in the following situations:

- Regeneration harvest, commercial thinning, or other activities adjacent to active nesting sites located on or adjacent to the covered lands during the early nesting season. Such activities create the likelihood of injury to nestlings by annoying them to such an extent as to significantly disrupt their feeding or sheltering behavior. Take in the form of harassment is reasonably certain to occur over the 60-year term of the SHA because the terms of the SHA do not include seasonal timing restrictions to avoid noise or visual disturbance during the spotted owl nesting season. We used the 0.7-mile spotted owl circles in SOSEAs with the Applicants' ownership to represent the areas where noise and visual disturbance to spotted owls is most likely to occur. There are a total of eight 0.7-mile spotted owl circles with existing Applicants' lands in the White Salmon SOSEA where we expect take in the form of harassment is likely to occur. These include spotted owl site numbers 734, 753, 852, 875, 991, 1003, 1116, and 1048.

Table 12. Summary of incidental take from habitat loss in historic spotted owl circles where SHA management will remove habitat below minimum habitat thresholds (40 percent habitat). The potential effects displayed here account for habitat retained in 0.7-mile circles as part of the "elevated baseline."

Area	Site No. and Name	Total acres of habitat in 1.8-mile circle (all ownerships)	Percent habitat in 1.8- mile circle	Total SHA acres of habitat in 1.8- mile circle	Estimated habitat remaining in 1.8-mile circle	Percent of habitat remaining in 1.8-mile circle
White Salmon SOSEA	#753- GILMER CREEK SOUTH	2,999	46.0%	781	2,458	37.7%
	#1048 - RATTLESNAKE CR - MILL CR	3,893	59.8%	1,401	2,521	38.7%
	#824 - LITTLE WIND RIVER UPPER	3,347	51.4%	799	2,548	39.1%
Columbia Gorge SOSEA	#765 RED BLUFFS	1,333	20.5%	43	1,290	19.8%

EFFECT OF THE TAKE

In the accompanying 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 AND TERMS AND CONDITIONS

Pursuant to 50 CFR 402.14 (i)(1)(ii), reasonable and prudent measures are those the Service considers necessary to minimize the impact of the incidental taking. The Agreement and all associated documents identify anticipated impacts to the spotted owl likely to result from the proposed takings and the specific measures and levels of species and habitat protection that are necessary and appropriate to minimize those impacts. No additional reasonable and prudent measures and terms and conditions are necessary.

The Service will not refer the incidental take of any migratory bird for prosecution under the Migratory Bird Treaty Act of 1918, as amended (16 U.S.C. 703-711), if such take is in compliance with the terms and conditions (including amount and/or number) specified herein.

CONSERVATION RECOMMENDATIONS

Sections 2(c) and 7(a)(1) of the ESA direct Federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of listed species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on covered species or critical habitat, to help implement recovery plans, or to develop information. The Service offers the following conservation recommendations:

1) The Service should facilitate research and monitoring regarding the development and management of spotted owl dispersal habitat and young forest marginal habitat on private lands.

2) The Service should conduct regular compliance monitoring and should review periodic implementation reports produced by the Applicants to ensure this Safe Harbor Agreement is being implemented as agreed.

3) The Service should prepare a report summarizing the implementation of conservation recommendations within 5 years of permit issuance. This report should be made available to affected State and Federal agencies, the Tribes, other stakeholders, and interested members of the public. This report should also be kept in the implementation file for the SHA.

REINITIATION NOTICE

This concludes formal consultation on the actions outlined in this Opinion. As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect covered species or critical habitat in a manner or to an extent not considered in this Opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the covered 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.

The factors enumerated above could include approved deviations from the proposed SHA that result from implementation of the adaptive-management program under the SHA. Adaptive-management changes to benefit one covered species may have adverse effects to the other covered species (or listed species which are not covered by the SHA). Should such adjustments occur to the extent that covered or listed species, or critical habitat, are adversely affected in a manner or to an extent not considered in this Opinion, consultation would be reinitiated.

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APPENDIX A: Status of the Northern Spotted Owl

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Legal Status

The northern spotted owl (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 (55 FR 26114 [June 26, 1990]). The U.S. Fish and Wildlife Service (Service) recovery priority number for the spotted owl is 12C (USFWS 2011, p. I-6) on a scale of 1C (highest) to 18 (lowest). This number reflects a moderate degree of threat, a low potential for recovery, the spotted owl's taxonomic status as a subspecies and inherent conflicts with development, construction, or other economic activity given the economic value of older forest spotted owl habitat. A moderate degree of threat equates to a continual population decline and threat to its habitat, although extinction is not imminent. While the Service is optimistic regarding the potential for recovery, there is uncertainty regarding our ability to alleviate the barred owl impacts to spotted owls and the techniques are still experimental, which matches our guidelines' "low recovery potential" definition (48 FR 43098 [1983]). The spotted owl was originally listed with a recovery priority number of 3C, but that number was changed to 6C in 2004 during the 5-year review of the species (USFWS 2004, p. 55) and to 12C in the 2011 Revised Recovery Plan for the Northern Spotted Owl (USFWS 2011, p. I-6).

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 (Gutierrez et al. 1995, p. 2), and biogeographic information (Barrowclough and Gutiérrez 1990, pp. 741-742). The distribution of the Mexican subspecies (*S. o. lucida*) is separate from those of the northern and California (*S. o. occidentalis*) subspecies (Gutierrez et al. 1995, p. 2). Recent studies analyzing mitochondrial DNA sequences (Barrowclough et al. 2005, p. 1117; Chi et al. 2004, p. 3; Haig et al. 2004, p. 1354) and microsatellites (Henke et al. 2005, 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 Nevadas, appears to be stable (Barrowclough et al. 2005, p. 1116).

Physical Description

The spotted owl is a medium-sized owl, approximately 18-19 in (46-48 cm) in length and approximately 1.1-1.9 lbs (490-850 gm) in weight (Gutierrez et al. 1995, p. 2), and is the largest of the three subspecies (Gutierrez et al. 1995, p. 2). It is dark brown with a barred tail and white spots on the head and breast, and has dark brown eyes that are surrounded by prominent facial disks. Three age classes can be distinguished on the basis of plumage characteristics (Moen et

al. 1991, p. 493). The spotted owl superficially resembles the barred owl (*Strix varia*), a species with which it occasionally hybridizes (Kelly and Forsman 2004, p. 807). Hybrids exhibit characteristics of both species (Hamer et al. 1994, p. 488).

Current and Historical Range

The current range and distribution of the spotted owl extends from southern British Columbia through western Washington, Oregon, and California as far south as Marin County (55 FR 26115 [June 26, 1990]). The southeastern boundary of its range is the Pit River area of Shasta County, California. The range of the spotted owl is partitioned into 12 physiographic provinces (provinces), based upon recognized landscape subdivisions exhibiting different physical and environmental features (Figure 1) (USFWS 1992, p. 31). These provinces are distributed across the 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 has been extirpated or is uncommon in certain areas. For instance, there have only been a few nesting pairs in southwestern Washington for a number of years, although they have persisted there for the past decade. Timber harvest activities have eliminated, reduced, or fragmented spotted owl habitat and decreased overall population densities across its range, particularly within the coastal provinces where habitat reduction has been concentrated (USFWS 1992, p. 1799).

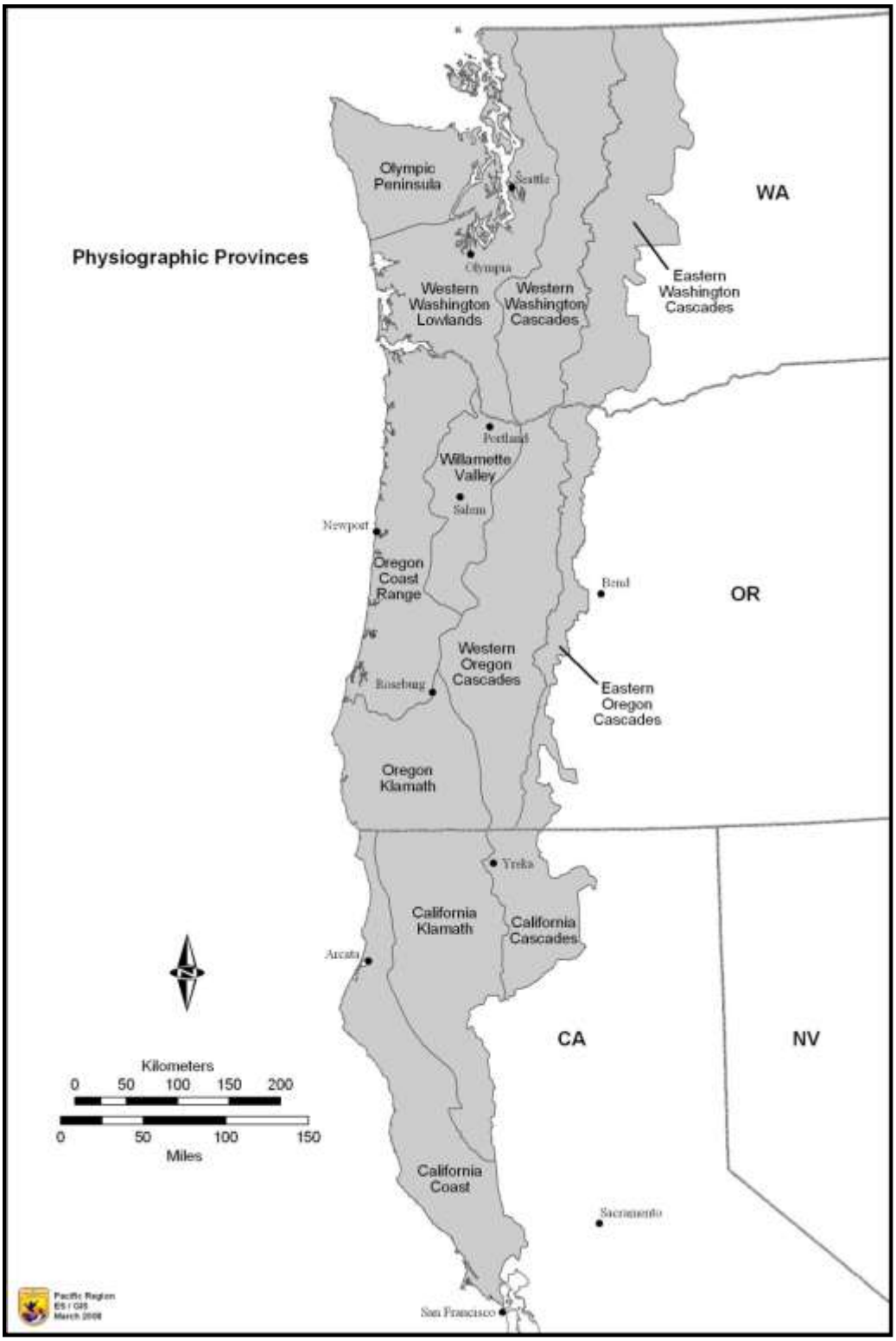

Figure 1. Physiographic provinces in the range of the spotted owl in the United States.

Behavior

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. 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 (Gutierrez 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 (Gutierrez 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 (Gutierrez et al. 1995, p. 10).

Habitat Relationships

Home Range

Home-range sizes vary geographically, generally increasing from south to north, which is likely a response to differences in habitat quality (55 FR 26114:26117 [June 26, 1990]). Estimates of median size of their annual home range (the area traversed by an individual or pair during their normal activities (Thomas et al. 1993, p. IX-15) vary by province and range from 2,955 acres in the Oregon Cascades (Thomas et al. 1990, p. 194) to 14,271 acres on the Olympic Peninsula (USFWS 1992, p. 23). 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. Within the home range there is a smaller area of concentrated use during the breeding season (~20 percent of the home range), often referred to as the core area (Bingham and Noon 1997, pp. 133-135). Spotted owl core areas vary in size geographically and provide habitat elements that are important for the reproductive efficacy of the territory, such as the nest tree, roost sites and foraging areas (Bingham and Noon 1997, p. 134). Spotted owls use smaller home ranges during the breeding season and often dramatically increase their home range size during fall and winter (Forsman et al. 1984, pp. 21-22; Sisco 1990, p. iii).

Although differences exist in natural stand characteristics that influence provincial 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

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 grandi*s), 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).

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.

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 (Buchanan et al. 1995, p.1402; Folliard 1993, p. 40; Hershey et al. 1998, p. 1404).

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

Habitat Selection

Spotted owls generally rely on older forested habitats because they contain the structures and characteristics required for nesting, roosting, foraging, and dispersal. These characteristics include the following: 1) a multi-layered, multi-species canopy dominated by large overstory trees, 2) moderate to high canopy closure, 3) a high incidence of trees with large cavities and other types of deformities, especially dwarf mistletoe brooms, 4) numerous large snags, 5) an abundance of large, dead wood on the ground, and 6) open space within and below the upper canopy for spotted owls to fly (Thomas et al. 1990, p. 19). Forested stands with high canopy closure also provide thermal cover, as well as protection from predation (Weathers et al. 2001, p. 686).

Foraging habitat for spotted owls provides a food supply for survival and reproduction. Foraging activity is positively associated with tree height diversity (North et al. 1999, p. 524), canopy closure (Courtney et al. 2004, pp. 5-15; Irwin et al. 2000, p. 180), snag volume, density of snags greater than 20 in (50 cm) dbh (Courtney et al. 2004, p. 5-15; Irwin et al. 2000, pp. 179-180; North et al. 1999, p. 524), 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. 2005, 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 spotted owls die or leave their territories, and to providing adequate gene flow across the range of the species. Dispersal habitat, at a minimum, consists of stands with adequate tree size and canopy closure to provide protection from avian predators and at least minimal foraging opportunities. Dispersal habitat may include younger and less diverse forest stands than foraging habitat, such as even-aged, pole-sized stands, but such stands should contain some roosting structures and foraging habitat to allow for temporary resting and feeding for dispersing juveniles (USFWS 1992, p. 1798). Forsman et al. (2002, p. 222) 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 (Diller and Thome 1999, p. 275; Thomas et al. 1990, p. 158). 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 Cascade Mountains, spotted owls used mature/old forests dominated by trees greater than 20 in (50 cm) diameter-at-breast height with greater than 60 percent canopy closure more often than expected for roosting during the non-breeding season and used young forest trees 8 to 20 in (20 to 50 cm) diameter-at-breast height with greater than 60 percent canopy closure) less often than expected based on 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 (Carey et al. 1990, pp. 14-15; Forsman et al. 1984, pp. 24-25; 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 that had lower variance in prey densities (prey were more predictable in occurrence) within older forests and near ecotones of old forest and brush seral stages. Zabel et

al. (1996, p. 436) showed that spotted owl home ranges are larger where flying squirrels are the predominant prey and, conversely, are smaller where woodrats (*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 (Franklin et al. 2000, pp. 573-579; Meyer et al. 1998, p. 43; Zabel et al. 2003, p. 1038). 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.

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 (Gutierrez 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 (Forsman et al. 2002, p. 17; Franklin 1992, p. 821; Miller et al. 1985, p. 93). 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 (Anthony et al. 2006, p. 28; Forsman et al. 1984, pp. 32-34), and renesting after a failed nesting attempt is rare (Gutierrez 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 (Gutierrez 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 (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 (Forsman et al. 2002, p. 18; Haig et al. 2001, p. 35).

Dispersal Biology

Natal dispersal of spotted owls typically occurs in September and October with a few individuals dispersing in November and December (Forsman et al. 2002, 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 (Miller 1989, pp. 32-41). Known or suspected causes of mortality during dispersal include starvation, predation, and accidents (Forsman et al. 2002, pp. 18-19; Miller 1989, pp. 41-44). Parasitic infection may contribute to these causes of mortality, but the relationship between parasite loads and survival is poorly understood (Forsman et al. 2002, pp. 18-19; Gutierrez 1989, pp. 616-617; Hoberg et al. 1989, p. 249). 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 lakes rather than cross them (Forsman et al. 2002, p. 22). Analysis of genetic structure of spotted owl populations suggests adequate rates of gene flow may occur across the Puget Trough between the Olympic Mountains and Washington Cascades and across the Columbia River between the Olympic Mountains and the Coast Range of Oregon (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 apparently random in direction (Forsman et al. 2002, pp. 21-22).

Food Habits

Spotted owls are mostly nocturnal, although they also forage opportunistically during the day (Forsman et al. 1984, p. 51; 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; Hamer et al. 2001, p. 224) 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; Forsman et al. 2004, p. 218; Ward et al. 1998, p. 84). Depending on location, other important prey include deer mice (*Peromyscus maniculatus*), tree voles (*Arborimus longicaudus, A. pomo*), red-backed voles (*Clethrionomys* spp.), gophers (*Thomomys* spp.), snowshoe hare (*Lepus americanus*), bushy-tailed wood rats (*Neotoma cinerea*), birds, and insects, although these species comprise a small portion of the spotted owl diet (Forsman et al. 1984, pp. 40-43; Forsman et al. 2004, p. 218; Hamer et al. 2001, p. 224; Ward et al. 1998, p. 84).

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 (Courtney et al. 2004, p. 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; Forsman et al. 2004, pp. 218-219).

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 (Gutierrez 1996, 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, pp. 437-438) 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

Reasons for Listing

The spotted owl was listed as threatened throughout its range "due to loss and adverse modification of suitable habitat as a result of timber harvesting and exacerbated by catastrophic events such as fire, volcanic eruption, and wind storms" (55 FR 26114-26194). More specifically, significant threats to the spotted owl included the following: 1) low populations, 2) declining populations, 3) limited habitat, 4) declining habitat, 5) distribution of habitat or populations, 6) isolation of provinces, 7) predation and competition, 8) lack of coordinated conservation measures; and (9) vulnerability to natural disturbance (57 FR 1796-1838). These threats were characterized for each province as severe, moderate, low, or unknown. Declining habitat was recognized as a severe or moderate threat to the spotted owl in all 12 provinces, isolation of provinces within 11 provinces, and declining populations in 10 provinces. Together, these three factors represented the greatest concern range-wide to the conservation of the spotted owl. Limited habitat was considered a severe or moderate threat in nine provinces, and low populations a severe or moderate concern in eight provinces, suggesting that these factors are a concern throughout the majority of the 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.

New Threats

The Service conducted a 5-year review of the spotted owl in 1994 (USFWS 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 et al. 2004, p. 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 et al. 2004, p. 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 et al. 2004, p. 11-8).

Barred Owls

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

Barred owls were initially thought to be more closely associated with early successional forests than spotted owls, based on studies conducted on the west slope of the Cascades in Washington (Hamer 1988, 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; Schmidt 2006, p. 13). In the fire prone forests of eastern Washington, a telemetry study conducted on barred owls showed that barred owl home ranges were located on lower slopes or valley bottoms, in closed canopy, mature, Douglas-fir forest, while spotted owl sites were located on mid-elevation areas with southern or western exposure, characterized by closed canopy, mature, ponderosa pine or Douglas-fir forest (Singleton et al. 2005, p. 1).

The only study comparing spotted owl and barred owl food habits in the Pacific Northwest indicated that barred owl diets overlap strongly (76 percent) with spotted owl diets (Hamer et al. 2001, p. 226). However, barred owl diets are more diverse than spotted owl diets and include species associated with riparian and other moist habitats, along with more terrestrial and diurnal species (Hamer et al. 2001, pp. 225-226).

The presence of barred owls has been reported to reduce spotted owl detectability, site occupancy, reproduction, and survival. Olson et al. (2005, 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 mile) 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.

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 (USFWS 2008, p. 65). 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.

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).

The preponderance of evidence suggests that barred owls are exacerbating the spotted owl population decline, particularly in Washington, portions of Oregon, and the northern coast of California (Gutierrez et al. 2004, pp. 7-39 to 7-40; 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 spotted owls have been already fully realized" (Gutierrez et al. 2004, p. 7-38).

Wildfire

Studies indicate that the effects of wildfire on spotted owls and their habitat are variable, depending on fire intensity, severity and size. Within the fire-adapted forests of the spotted owl's range, spotted owls likely have adapted to withstand fires of variable sizes and severities. Bond et al. (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 further understand the relationship between fire and spotted owl habitat use.

At the time of listing there was recognition that large-scale wildfire posed a threat to the spotted owl and its habitat (55 FR 26114: 26183 [June 26, 1990]). New information suggests fire may be more of a threat than previously thought. In particular, the rate of habitat loss due to fire has been greater than expected with over 102,000 acres of late-successional forest lost on Federal lands from 1993-2004 (Moeur et al. 2005, p. 110). Currently, the overall total amount of habitat loss from wildfires has been relatively small, and is estimated at 1.2 percent on Federal lands (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, p. 12-11). The Northwest Forest Plan (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) has killed millions of wild birds in North America since it arrived in 1999 (Caffrey 2003, p. 12; 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). One captive spotted owl in Ontario, Canada, is known to have contracted WNV and died (Gancz et al. 2004, p. 2137), but there are no documented cases of the virus in wild spotted owls.

Health officials expect that WNV will eventually spread throughout the range of the spotted owl (Courtney et al. 2004, p. 8-31) but it is unknown how WNV will ultimately affect owl populations. Susceptibility to infection and mortality rates of infected individuals vary among bird species, even within groups (Courtney et al. 2004, p. 8-33). Owls appear to be quite susceptible. For example, eastern screech owls (*Megascops asio*) in Ohio experienced 100 percent mortality (Courtney et al. 2004, p. 8-33). Barred owls, in contrast, showed lower susceptibility (Courtney et al. 2004, p. 8-34).

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

Sudden Oak Death

Sudden oak death was recently identified as a potential threat to the spotted owl (Courtney et al. 2004, p. 11-8). This disease is caused by the fungus-like pathogen, *Phytopthora ramorum*, that was recently introduced from Europe and is rapidly spreading. At the present time, sudden oak death is found in natural stands from Monterey to Humboldt Counties, California, and has reached epidemic proportions in oak (*Quercus* spp.) and tanoak (*Lithocarpus densiflorus*) forests along approximately 186 mi (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 2625 feet (800 m). Sudden oak death poses a threat of uncertain proportion because of its potential impact on forest dynamics and alteration of key prey and spotted owl habitat components (e.g., hardwood trees - canopy closure and nest tree mortality); especially in the southern portion of the spotted owl's range (Courtney et al. 2004, p. 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). However, in Canada, the breeding population is estimated to be less than 33 pairs and annual population decline may be as high as 35 percent (Harestad et al. 2004, p. 13). Canadian populations may be more adversely affected by issues related to small population size including inbreeding depression, genetic isolation, and reduced genetic diversity (Courtney et al. 2004, p. 11-9). Low and persistently declining populations throughout the northern portion of the species range (see "Population Trends" below) may be at increased risk of losing genetic diversity.

Climate change

Climate change, a potential additional threat to spotted owl populations, is not explicitly addressed in the NWFP. Climate change could have direct and indirect impacts on spotted owls and their prey. However, the emphasis on maintenance of seral stage complexity and related biological diversity in Matrix Lands under the NWFP should contribute to the resiliency of the Federal forest landscape related to impacts of climate change (Courtney et al. 2004, p. 9-15).

Based upon a global meta-analysis of climate change data, Parmesan and Yohe (2003, pp. 37-42) discussed several potential implications of global climate change to biological systems, including terrestrial plants and animals. Results indicated that 62 percent of species exhibited trends indicative of advancement of spring conditions. In bird species, climate change trends were manifested in earlier nesting activities. Because the spotted owl exhibits a limited tolerance to heat relative to other bird species (Weathers et al. 2001, p. 685), subtle changes in climate have the potential to affect spotted owls. However, the specific impacts to the species are unknown.

Disturbance-Related Effects

The effects of noise on spotted owls are largely unknown, and whether noise is a concern has been a controversial issue. The effect of noise on birds is extremely difficult to determine due to the inability of most studies to quantify one or more of the following variables: 1) timing of the disturbance in relation to nesting chronology; 2) type, frequency, and proximity of human disturbance; 3) clutch size; 4) health of individual birds; 5) food supply; and 6) outcome of previous interactions between birds and humans (Knight and Skagen 1988, pp. 355-358). Additional factors that confound the issue of disturbance include the individual bird's tolerance level, ambient sound levels, physical parameters of sound and how it reacts with topographic characteristics and vegetation, and differences in how species perceive noise.

Although information specific to behavioral responses of spotted owls to disturbance is limited, research indicates that 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 (Andersen et al. 1989, p. 296; McGarigal et al. 1991, p. 5; White and Thurow 1985, p. 14).

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; Sapolsky 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 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 spotted owl core areas (Tempel and Gutiérrez 2004, p. 544; Wasser et al. 1997, p. 1021).

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):

Habitat-specific Needs

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

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

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

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

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

Habitat-independent Needs

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

2. Monitoring to better understand the risk that West Nile Virus and sudden oak death pose to spotted owls and, for West Nile Virus, 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. The various efforts began with the Interagency Scientific Committee's Conservation Strategy (Thomas et al. 1990). The efforts continued with the designation of critical habitat (57 FR 1796-1838, the Draft Recovery Plan (USFWS 1992); the Scientific Analysis Team report (Thomas et al. 1993); and the report of the Forest Ecosystem Management Assessment Team (FEMAT 1993). The efforts culminated with the NWFP (USDA and USDI 1994). Each conservation strategy was based upon the reserve design principles first articulated in the Interagency Scientific Committee'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.

Conservation on Federal Lands

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 (1994; USFS and USBLM 1994). The NWFP was designed to protect large blocks of old growth forest and provide habitat for species that depend on those forests including the spotted owl, as well as to produce a predictable and sustainable level of timber sales. The NWFP included land use allocations which would provide for population clusters of spotted owls (i.e., demographic support) and maintain connectivity between population clusters. Certain land use allocations in the plan contribute to supporting population clusters: Late-successional Reserves (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. (1994; USFS and USBLM 1994) which would persist into future managed timber stands.

The NWFP with its range-wide system of LSRs was based on work completed by three previous studies (Thomas et al. 2006, pp. 279-280): the 1990 Interagency Scientific Committee (ISC) Report (Thomas et al. 1990), the 1991 report for the Conservation of Late-successional Forests and Aquatic Ecosystems (Johnson et al. 1991), and the 1993 report of the Scientific Assessment Team (Thomas et al. 1993). In addition, the 1992 Draft Recovery Plan for the Northern Spotted Owl (USFWS 1992) 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 et al. 1993, p. II-31; USFS and USBLM 1994, 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). (Courtney et al. 2004, p. 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 (Courtney et al. 2004, p. 6-34).

Under the NWFP, the agencies anticipated a decline of spotted owl populations during the first decade of implementation. Recent reports (Anthony et al. 2006, pp. 33-34) identified greater than expected spotted owl declines in Washington and northern portions of Oregon, and more stationary populations in southern Oregon and northern California. The reports did not find a direct correlation between habitat conditions and changes in vital rates of spotted owls at the meta-population scale. However, at the territory scale, there is evidence of negative effects to spotted owl fitness due to reduced habitat quantity and quality. Also, there is no evidence to suggest that dispersal habitat is currently limiting (Courtney et al. 2004, 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 spotted owl population declines, indicates that the spotted owl continues to meet the definition of a threatened species (USFWS 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.

Revised Northern Spotted Owl Recovery Plan

In June 2011, the Service published the Revised Recovery Plan for the Northern Spotted Owl (USFWS 2011). The recovery plan identifies that competition with barred owls, ongoing loss of suitable habitat as a result of timber harvest and catastrophic fire, and loss of amount and distribution of suitable habitat as a result of past activities and disturbances are the most important range-wide threats to the spotted owl (USFWS 2011, p. II-2). To address these threats, the revised recovery strategy has identified 33 Recovery Actions which address four basic steps:

1. Development of a range-wide habitat modeling tool;
2. Habitat conservation and active forest restoration
3. Barred owl management;
4. Research and monitoring.

In addition to describing specific actions to address the barred owl threat, the Revised Recovery Plan continues to recognize the importance of maintaining and restoring high value habitat for the recovery and long-term survival of the spotted owl.

To address habitat conservation, the Revised Recovery Plan recommends land managers continue to implement the standards and guidelines of the NWFP throughout the range of the species, as well as fully consider other habitat conservation recommendations listed in the Revised Recovery Plan (USFWS 2011, p. II-3).

Conservation Efforts on non-Federal Lands

In the report from the Interagency Scientific Committee (Thomas et al. 1990, p. 3), the draft recovery plan (USFWS 1992, p. 272), and the report from the Forest Ecosystem Management Assessment Team (Thomas et al. 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 U.S. Fish and Wildlife Service's primary expectations for private lands are for their contributions to demographic support (pair or cluster protection) to Federal lands, or their connectivity with Federal lands. In addition, timber harvest within each state is governed by rules that provide protection of spotted owls or their habitat to varying degrees.

There are 17 current or completed Habitat Conservation Plans (HCPs) that have incidental take permits issued for spotted owls—eight in Washington, three in Oregon, and four in California (USFWS 2008, p. 55). The HCPs range in size from 40 acres to more than 1.6 million acres, although not all acres are included in the mitigation for spotted owls. In total, the HCPs cover approximately 2.9 million acres (9.1 percent) of the 32 million acres of non-Federal forest lands in the range of the spotted owl. The period of time that the HCPs will be in place ranges from 5 to 100 years; however, most of the HCPs are of fairly long duration. While each HCP is unique, there are several general approaches to mitigation of incidental take:

- Reserves of various sizes, some associated with adjacent Federal reserves.
- Forest harvest that maintains or develops suitable habitat.
- Forest management that maintains or develops dispersal habitat.
- Deferral of harvest near specific sites.

Washington. In 1996, the State Forest Practices Board adopted rules (WFPB 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 (Buchanan et al. 1994, p. ii; Hanson et al. 1993, pp. 11-15). The 1996 rule package was developed by a stakeholder policy group and then reviewed and approved by the Forest Practices Board (Buchanan and Sweeden 2005, p. 9). Spotted owl-related HCPs in Washington generally were intended to provide demographic or connectivity support (USFWS 1992, p. 272).

Oregon. The Oregon Forest Practices Act provides for protection of 70-acre core areas around sites occupied by an adult pair of spotted owls capable of breeding (as determined by recent protocol surveys), but it does not provide for protection of spotted owl habitat beyond these areas (ODF 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 (USFWS 2008, p. 56).

California. The California State Forest Practice Rules, which govern timber harvest on private lands, require surveys for spotted owls in suitable habitat and to provide protection around activity centers (CDF 2007, pp. 85-87). Under the Forest Practice Rules, no timber harvest plan can be approved if it is likely to result in incidental take of federally listed species, unless the take is authorized by a Federal incidental take permit (CDF 2007, pp. 85-87) (California Department of Forestry and Fire Protection 2007, pp. 85-87). The California Department of Fish and Game initially reviewed all timber harvest plans to ensure that take was not likely to occur; the U.S. Fish and Wildlife Service took over that review function in 2000. Several large industrial owners operate under spotted owl management plans that have been reviewed by the U.S. Fish and Wildlife Service and that specify basic measures for spotted owl protection. Four HCPs authorizing take of spotted owls have been approved; these HCPs cover more than 669,000 acres of non-Federal lands. Implementation of these plans is intended to provide for spotted owl demographic and connectivity support to NWFP lands (USFWS 2008, p. 56).

Current Condition of the Spotted Owl

The current condition of a species incorporates the effects of all past human and natural activities or events that have led to the present-day status of the species and its habitat (USFWS and NMFS 1998, pp. 4-19).

Range-wide Habitat Trends

Habitat Baseline

The 1992 Draft Spotted Owl Recovery Plan estimated approximately 8.3 million acres of spotted owl habitat remained range-wide (USFWS 1992, p. 37). However, reliable habitat baseline information for non-Federal lands is not available (Courtney et al. 2004, p. 6-5). The Service has used information provided by the U.S. Forest Service, Bureau of Land Management, and National Park Service to update the habitat baseline conditions on Federal lands for spotted owls on several occasions since the spotted owl was listed in 1990. The estimate of 7.4 million acres used for the NWFP in 1994 (USDA and USDI 1994, p. G-34) was determined to be representative of the general amount of spotted owl habitat on these lands. This baseline was used to track relative changes over time in subsequent analyses.

In 2005, a new map depicting suitable spotted owl habitat throughout their range was produced as a result of the NWFP's effectiveness monitoring program (Lint 2005, pp. 21-82). However, the spatial resolution of this new habitat map currently makes it unsuitable for tracking habitat effects at the scale of individual projects. The Service is evaluating the map for future use in tracking habitat trends. Additionally, there are no reliable estimates of spotted owl habitat on other land ownerships; consequently, acres that have undergone ESA section 7 consultation can be tracked, but not evaluated in the context of change with respect to a reference condition on

non-Federal lands. The production of the NWFP monitoring program habitat map does, however, provide an opportunity for future evaluations of trends in non-Federal habitat.

NWFP Lands Analysis 1994 – 2001

In 2001, the Service conducted an assessment of habitat baseline conditions, the first since implementation of the NWFP (USFWS 2001, p. 1). This range-wide evaluation of habitat, compared to the Final Supplemental Environmental Impact Statement, was necessary to determine if the rate of potential change to spotted owl habitat was consistent with the change anticipated in the NWFP. In particular, the Service considered habitat effects that were documented through the ESA section 7 consultation process since 1994. In general, the analytical framework of these consultations focused on the reserve and connectivity goals established by the NWFP land-use allocations (USDA and USDI 1994), with effects expressed in terms of changes in suitable spotted owl habitat within those land-use allocations. The Service determined that actions and effects were consistent with the expectations for implementation of the NWFP from 1994 to June, 2001 (USFWS 2001, p. 32).

Range-wide Analysis 1994 – Present.

This section updates the information considered in U.S. Fish and Wildlife Service (2001), relying particularly on information in documents the Service produced pursuant to section 7 of the ESA and information provided by NWFP agencies on habitat loss resulting from natural events (e.g., fires, windthrow, insect and disease). To track impacts to spotted owl habitat, the Service designed the Consultation Effects Tracking System database which records impacts to spotted owls and their habitat at a variety of spatial and temporal scales. Data are entered into the database under various categories including, land management agency, land-use allocation, physiographic province, and type of habitat affected.

In 1994, about 7.4 million acres of suitable spotted owl habitat were estimated to exist on Federal lands managed under the NWFP. As of September 7, 2012, the Service had consulted on the proposed removal of approximately 193,566 acres (Table 1) or 2.6 percent of 7.4 million acres of spotted owl suitable habitat on Federal lands. Of the total Federal acres consulted on for removal, approximately 165,131 acres or 2.2 percent of 7.4 million acres of spotted owl habitat were removed as a result of timber harvest. These changes in suitable spotted owl habitat are consistent with the expectations for implementation of the NWFP (USDA and USDI 1994).

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

Habitat loss from Federal lands due to management activities has varied among the individual provinces with most of the impacts concentrated within the Non-Reserve relative to the Reserve land-use allocations (Table 2). When habitat loss from management activities is evaluated as a

proportion of the affected acres range-wide, the most pronounced losses have occurred within Oregon (77.8 percent), followed by much smaller habitat losses in Washington (13.8 percent) and California (8.4percent) (Table 2).

From 1994 through September 7, 2012, habitat lost due to natural events was estimated at approximately 246,111 acres range-wide (Table 2). About two-thirds of this loss was attributed to the Biscuit Fire that burned over 500,000 acres in southwest Oregon (Rogue River basin) and northern California in 2002. This fire resulted in a loss of approximately 113,451 acres of spotted owl habitat, including habitat within five LSRs. Approximately 18,630 acres of spotted owl habitat were lost due to the B&B Complex and Davis Fires in the East Cascades Province of Oregon. When habitat loss from natural events and timber harvest is evaluated as a proportion of provincial baselines, the Oregon Klamath Mountains (20.44 percent) and the Cascades East (13.04 percent) provinces have proportional losses greater than the range-wide mean (5.93 percent) (Table 2).

Because there is no comprehensive spotted owl habitat baseline for non-Federal lands, there is little available information regarding spotted owl habitat trends on non-Federal lands. Yet, we do know that internal Service consultations conducted since 1992 have documented the eventual loss of 472,772 acres (Table 1) of habitat on non-Federal lands. Most of these losses have yet to be realized because they are part of large-scale, long-term HCPs. Combining effects on Federal and non-Federal lands, the Service had consulted on the proposed removal of approximately 665,618 acres of spotted owl habitat range-wide, resulting from all management activities, as of September 7, 2012 (Table 1).

Table 1. Range-wide changes in spotted owl NRF[1] habitat (in acres) caused by Federal actions subject to section 7 consultations and natural disturbance events (wildfire, etc.) from May 1994 to present (September 7, 2012).

Land Ownership	Consulted On Habitat Changes[2]		Other Habitat Changes[3]	
	Removed/ Downgraded	Maintained/ Improved	Removed/ Downgraded	Maintained/ Improved
Northwest Forest Plan (USFS, BLM, NPS)	193,566	520,979	246,111	39,720
Bureau of Indian Affairs/ Tribes	108,210	28,372	2,398	0
Habitat Conservation Plans / Safe Harbor Agreements	295,889	14,430	N/A	N/A
Other Federal, State, County, or Private Lands	68,673	21,894	279	0
TOTAL Changes	666,338	585,675	248,788	39,720

Source: Table A from the Service's Northern Spotted Owl Consultation Effects Tracker (web application and database) September 7, 2012.

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-June 6, 2001. After June 26, 2001, suitable habitat includes NRF for Washington and Oregon but only nesting and roosting (NR) for California.

2 Includes both effects reported by U.S. Fish and Wildlife Service (2001) and subsequent effects compiled in the Northern Spotted Owl Consultation Effects Tracker (web application and database).

3 Includes effects to NRF habitat (as documented through technical assistance) resulting from wildfires (not from suppression efforts), insect and disease outbreaks, and other natural causes, private timber harvest, and land exchanges not associated with consultation.

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

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

6 Includes lands not covered by Habitat Conservation Plans that are owned or managed by states, counties, municipalities, and private entities. Effects that occurred on private lands from right-of-way permits across U.S. Forest Service and Bureau of Land Management lands are included.

Table 2. Aggregate results of all adjusted, suitable habitat (NRF[1]) acres affected by ESA section 7 consultation for the spotted owl; baseline and summary of effects by state, physiographic province, and land use function from 1994 to present for lands managed under the NWFP (September 7, 2012).

Physiographic Province[2]		Evaluation Baseline[3]	Habitat Removed/Downgraded[4]					% Provincial Baseline Affected	% Range-wide Effects
			NWFP Land Use Allocations			Habitat Loss to Natural Events[7]	Total (Consultation and Natural Event Effects)		
		Total	Reserves[5]	Non-Reserves[6]	Total Consultation Effects				
WA	Eastern Cascades	706,849	4,533	6,392	10,925	14,307	25,232	3.57	5.74
	Olympic Peninsula	560,217	869	1,711	2,580	299	2,879	0.51	0.65
	Western Cascades	1,112,480	1,691	11,579	13,270	3	13,273	1.19	3.02
OR	Cascades East	443,659	2,589	14,368	16,957	40,884	57,841	13.04	13.16
	Cascades West	2,046,472	3,872	66,274	70,146	24,583	94,729	4.63	21.55
	Coast Range	516,577	447	3,994	4,441	66	4,507	0.87	1.03
	Klamath Mountains	785,589	2,631	56,269	58,900	101,676	160,576	20.44	36.52
	Willamette Valley	5,658	0	0	0	0	0	0	0
CA	Cascades	88,237	10	4,820	4,830	329	5,159	5.85	1.17
	Coast	51,494	464	79	543	275	818	1.59	0.19
	Klamath	1,079,866	1,546	9,428	10,974	63,689	74,663	6.91	16.98
	Total	7,397,098	18,652	174,914	193,566	246,111	439,677	5.94	100

Source: Table B from the Service's Northern Spotted Owl Consultation Effects Tracker (web application and database) September 7, 2012.
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-June 26, 2001. After June 26, 2001, suitable habitat includes NRF for Washington and Oregon but only nesting and roosting (NR) for California.

2 Defined by the NWFP as the twelve physiographic provinces, as presented in Figure 3 and 4-1 on page 3 and 4-16 of the Final Supplemental Environmental Impact Statement (FSEIS) (USFS and USBLM 1994).

3 1994 FSEIS baseline (USFS and USBLM 1994).

4 Includes both effects reported by USFWS (2001) and subsequent effects compiled in the Northern Spotted Owl Consultation Effects Tracking System (web application and database).

5 Land-use allocations intended to provide large blocks of habitat to support clusters of breeding pairs (LSR, MLSA, CRA).

6 Land-use allocations intended to provide habitat to support movement of spotted owls among reserves (Matrix, AMA, AWA).

7 Acres for all physiographic provinces, except the Oregon Klamath Mountains, are from the Scientific Evaluation of the Status of the Northern Spotted Owl (Courtney et al. 2004, p. 6-5) and subsequent effects entered into the Northern Spotted Owl Consultation Effects Tracking System. Acres for the Oregon Klamath Mountains province are from the biological assessment entitled: Fiscal year 2006-2008 programmatic consultation: re-initiation on activities that may affect listed species in the Rogue-River/South Coast Basin, Medford BLM, and Rogue-Siskiyou National Forest and from subsequent effects entered into the Northern Spotted Owl Consultation Effects Tracking System.

Other Habitat Trend Assessments

In 2005, the Washington Department of Wildlife released the report, "*An Assessment of Spotted Owl Habitat on Non-Federal Lands in Washington between 1996 and 2004*" (Pierce et al. 2005). This study estimates the amount of spotted owl habitat in 2004 on lands affected by state and private forest practices. The study area is a subset of the total Washington forest practice lands, and statistically-based estimates of existing habitat and habitat loss due to fire and timber harvest are provided. In the 3.2-million acre study area, Pierce et al. (2005, p. 88) estimated there was 816,000 acres of suitable spotted owl habitat in 2004, or about 25 percent of their study area. Based on their results, Pierce and others (2005, p. 98) estimated there were less than 2.8 million acres of spotted owl habitat in Washington on all ownerships in 2004. Most of the suitable owl habitat in 2004 (56 percent) occurred on Federal lands, and lesser amounts were present on state-local lands (21 percent), private lands (22 percent) and tribal lands (1 percent).

Most of the harvested spotted owl habitat was on private (77 percent) and state-local (15 percent) 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, p. 91). Approximately 77 percent of the harvested habitat occurred on private lands and about 15 percent occurred on State lands. Pierce and others (2005, p. 80) also evaluated suitable habitat levels in 450 spotted owl management circles (based on the provincial annual median spotted owl home range). Across their study area, they found that owl circles averaged about 26 percent suitable habitat in the circle across all landscapes. Values in the study ranged from an average of 7 percent in southwest Washington to an average of 31 percent in the east Cascades, suggesting that many owl territories in Washington are significantly below the 40 percent suitable habitat threshold used by the State as a viability indicator for spotted owl territories (Pierce et al. 2005, p. 90).

Moeur et al. (2005, p. 110) estimated an increase of approximately 1.25 to 1.5 million acres of medium and large older forest (greater than 20 inches dbh, single and multi-storied canopies) on Federal lands in the NWFP area between 1994 and 2003. The increase occurred primarily in the lower end of the diameter range for older forest. The net area in the greater than 30 inch dbh size class increased by only an estimated 102,000 to 127,000 acres (Moeur et al. 2005, p. 100). The estimates were based on change-detection layers for losses due to harvest and fire and remeasured inventory plot data for increases due to ingrowth. Transition into and out of medium and large older forest over the 10-year period was extrapolated from inventory plot data on a subset of Forest Service land types and applied to all Federal lands. Because size class and general canopy layer descriptions do not necessarily account for the complex forest structure often associated with spotted owl habitat, the significance of these acres to spotted owl conservation remains unknown.

<u>Spotted Owl Numbers, Distribution, and Reproduction Trends</u>

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 (USFWS 1989, pp. 2-

17). The final rule listing the spotted owl as threatened (55 FR 26114-26194 [June 26, 1990]), estimated that approximately 90 percent of the roughly 2,000 known spotted owl breeding pairs were located on federally managed lands, 1.4 percent on State lands, and 6.2 percent on private lands. The percent of spotted owls on private lands in northern California was slightly higher (Thomas et al. 1990, p. 64; USFWS 1989, pp. 4-11).

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 (55 FR 26114 [June 26, 1990]). 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 (USFWS 1992, 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 locations of, or site centers of spotted owl pairs or resident singles: 851 sites (16 percent) in Washington, 2,893 (53 percent) in Oregon, and 1,687 (31 percent) in California (60 FR 9484:9495 [Feb. 17, 1995]). By June 2004, the number of territorial spotted owl sites recognized by Washington Department of Fish and Wildlife was 1,044 (Buchanan and Sweeden 2005, p. 37). The actual number of currently occupied spotted owl locations across the range is unknown because many areas remain unsurveyed (USFWS 2008, p. 44). In addition, many historical sites are no longer occupied because spotted owls have been displaced by barred owls, timber harvest, or severe fires, and it is possible that some new sites have been established due to reduced timber harvest on Federal lands since 1994. The totals listed in 60 FR 9484:9495 [Feb. 17, 1995], represent the cumulative number of locations recorded in the three states, not population estimates.

Because existing survey coverage and effort are insufficient to produce reliable range-wide estimates of population size, researchers use other indices, such as demographic data, to evaluate trends in spotted owl populations. Analysis of demographic data can provide an estimate of the rate and direction of population growth [i.e., lambda (λ)]. A λ of 1.0 indicates a stationary population (i.e., neither increasing nor decreasing), a λ less than 1.0 indicates a declining population, and a λ 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. 1996; Forsman et al. 2011) to estimate trends in the populations of the spotted owl.

In January 2009, two meta-analyses modeled rates of population change for up to 24 years using the re-parameterized Jolly-Seber method (λRJS). One meta-analysis modeled the 11 long-term study areas (Table 3), while the other modeled the eight study areas that are part of the effectiveness monitoring program of the NWFP (Forsman et al. 2011, cited in USFWS 2011, p. A-5).

Table 3. Summary of spotted owl population trends in demographic study areas (Forsman et al. 2011, cited in USFWS 2011, p. A-5).

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), 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. 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.

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. (Forsman et al. 2011, p. 64) express concerns by the collective declines in adult survival across the subspecies range because spotted owl populations are most sensitive to changes in adult survival.

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

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APPENDIX B: Summary of Habitat in Spotted Owl Circles

Appendix B. Summary of effects to suitable habitat in owl circles in the White Salmon SOSEA. Habitat thresholds for owl circles in Washington are 500 acres within 0.7- mile circles and 2,605 acres (40 percent) within a 1.8 mile circle.

Site No.	Site Name White Salmon SOSEA	Total acres of habitat in 0.7- mile circle (all ownerships)	Total SHA acres of habitat in 0.7- mile circle	SHA habitat maintained in 0.7- mile circle (elevated baseline)	Estimated habitat remaining in 0.7- mile circle	Total acres of habitat in 1.8 mile circle (all ownerships)	Percent habitat in 1.8 mile circle	Total SHA acres of habitat in 1.8 mile circle	Expected habitat remaining in 1.8 mile circle	Percent of habitat remaining in 1.8 mile circle
753	GILMER CREEK SOUTH	609	195	240	654	2,999	46.0%	781	2,458	37.7%
1048	RATTLESNAKE CR - MILL CR	637	75	29	591	3,893	59.8%	1,401	2,521	38.7%
824	LITTLE WIND RIVER UPPER	nc	0	0	nc	3,347	51.4%	799	2,548	39.1%
852	CAVE CR - TROUT LK VALLEY	886	72	26	840	3,060	47.0%	456	2,630	40.4%
734	DRY CR - WHITE SALMON R	785	253	120	652	3,702	56.8%	964	2,858	43.9%
875	WHITE SALMON RIVER	503	6	6	503	3,134	48.1%	206	2,934	45.1%
1003	MOSS CREEK CAMPGROUND	668	117	96	647	3,613	55.5%	755	2,954	45.4%
828	BEAR CR - TROUT LAKE CR	751	1	0	750	3,501	53.8%	339	3,162	48.6%
991	MILL CREEK - WHITE SALMON	985	131	44	898	3,956	60.7-%	768	3,232	49.6%
1116	WIEBERG CREEK	749	150	55	654	3,868	59.4%	570	3,353	51.5%
284	MONTE CRISTO	nc	0	0	nc	4,111	63.1%	1	4,110	63.1%
970	BERRY CREEK	nc	0	0	nc	4,479	68.8%	256	4,223	64.8%
874	PHELPS CREEK	nc	0	0	nc	4,376	67.2%	109	4,267	65.5%
289	MOSS CREEK	nc	0	0	nc	4,982	76.5%	419	4,563	70.1%

Notes: nc = not calculated. All habitat acreages are approximate values based on GIS. Habitat estimates provided here may differ from values reported elsewhere. Values are based on the 2009 habitat typing developed by WDNR for spotted owl circles in the White Salmon SOSEA.

Appendix B (continued). Summary of effects to suitable habitat in owl circles in the Columbia Gorge SOSEA. Habitat thresholds for owl circles in Washington are 500 acres within 0.7- mile circles and 2,605 acres (40 percent) within a 1.8 mile circle.

Site No.	Site Name Columbia Gorge SOSEA	Total acres of habitat in 0.7- mile circle (all ownerships)	Total SHA acres of habitat in 0.7- mile circle	SHA habitat maintained in 0.7- mile circle (elevated baseline)	Estimated habitat remaining in 0.7- mile circle	Total acres of habitat in 1.8 mile circle (all ownerships)	Percent habitat in 1.8 mile circle	Total SHA acres of habitat in 1.8 mile circle	Expected habitat remaining in 1.8 mile circle	Percent of habitat remaining in 1.8 mile circle
765	RED BLUFFS	nc	0	0	nc	1,333	20.5%	43	1,290	19.8%
302	BUDWEISER CREEK	nc	0	0	nc	2,935	45.1%	119	2,816	43.2%
667	STEEP CREEK	nc	0	0	nc	3,064	47.0%	133	2,931	45.0%
647	CARSON RIDGE	nc	0	0	nc	3,591	55.1%	268	3,323	51.0%

Notes: nc = not calculated. All habitat acreages are approximate values based on GIS. Habitat estimates provided here may differ from values reported elsewhere. Values are based on the 2006/2007 habitat typing developed for the Northwest Forest Plan (Davis et al. 2011).