United States Department of the Interior

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In Reply Refer To: 81333-2011-F-0018

Memorandum

To: Assistant Regional Director, Ecological Services
Sacramento, California
Attention: Michael Fris

From: Project Leader, Yreka Fish and Wildlife Office
Yreka, California

Subject: Biological and Conference Opinions for the Issuance of a Section 10(a)(1)(B) Incidental Take Permit to the Fruit Growers Supply Company for its Multi-Species Habitat Conservation Plan (FWS Reference: 81333-2011-F-0018)

This document constitutes the U.S. Fish and Wildlife Service's (Service) biological and conference opinions (BO) regarding the proposed issuance of an incidental take permit (ITP) to Fruit Growers Supply Company (FGS) for the implementation of its Habitat Conservation Plan (HCP) on 152,178 acres of commercial timberland in Siskiyou County, California, and its effects on the federally threatened northern spotted owl (*Strix occidentalis caurina*) and federal candidate West Coast Distinct Population Segment (DPS) of fisher (*Martes pennanti*), hereafter "fisher." Issuance of an incidental take permit is pursuant to section 10(a)(1)(B) and section 7(a)(2) of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*; ESA).

Fruit Growers Supply Company is requesting 50-year coverage of incidental take for the northern spotted owl that may arise from timber management operations on its ownership. The proposed FGS HCP will not involve activities that would adversely affect the primary constituent elements of critical habitat for the northern spotted owl because the activities would not take place within critical habitat or directly or indirectly affect the primary constituent elements. This BO will address affects to northern spotted owls occupying critical habitat resulting from activities conducted by FGS on its own lands. Fruit Growers Supply Company did not request coverage for the fisher; however, since this species is a federal candidate and it is the Service's policy to treat candidate species as if they were proposed species, the Service conducted a conference opinion pursuant to section 7(a)(4) of the ESA.

Although take of plant species is not prohibited under the ESA, and therefore cannot be authorized under an ITP, the endangered Yreka phlox (*Phlox hirsuta*) would also be included on the permit in recognition of the conservation benefits provided to the species under the FGS HCP. The Service finds that the proposed action is not likely to adversely affect Yreka phlox

because although suitable habitat for this species exists on FGS's ownership, currently there are no known populations on their property. Additionally, Yreka phlox will benefit from the conservation measures described in section 5.3.2 of the HCP, which include survey and monitoring efforts on FGS property, and equipment exclusion zones to avoid direct adverse impacts to the plants. Therefore, Yreka phlox will not be addressed further in this BO.

Fruit Growers Supply Company is also requesting an ITP from the National Marine Fisheries Service (NMFS) for take authorization of one federally listed species, the Southern Oregon/Northern California Coast coho salmon (*Oncorhynchus kisutch*) Evolutionarily Significant Unit (ESU), and two non-listed species, the Klamath Mountains Province steelhead (*Oncorhynchus mykiss*) ESU and the Upper Klamath and Trinity Rivers Chinook salmon (*Oncorhynchus tshawytscha*) ESU should they become listed within the term of the ITP. Assurances provided under the "No Surprises" rule at 50 C.F.R. 17.3, 17.22(b)(5) and 17.32(b)(5) would extend to all Covered Species. The HCP is a requirement of FGS's application to the Service and NMFS for ITPs pursuant to the Federal ESA, as amended.

These Opinions are based primarily on information provided in the Environmental Impact Statement (EIS; USDI FWS and USDC NMFS 2009), and Implementing Agreement (IA) and HCP (FGS 2009), which are incorporated by reference, and the sources cited herein. A complete administrative record of this consultation is on file at the Service's Yreka Fish and Wildlife Office.

Attachments

Endangered Species Act – Section 7 Formal Consultation

Biological and Conference Opinions

Fruit Growers Supply Company
Multi-Species Habitat Conservation Plan

(Service Reference Number: 81333-2011-F-0018)

Agency:

U.S. Fish and Wildlife Service
Region 8
Sacramento, CA

Draft Biological Opinion Written by:

U.S. Fish and Wildlife Service
Red Bluff Fish and Wildlife Office
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Conference Opinion Written and Biological Opinion Finalized by:

U.S. Fish and Wildlife Service
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April 20, 2012

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Consultation History

In late 2007, the Red Bluff Fish and Wildlife Office (RBFWO) was asked to conduct Intra-Service consultation with the Yreka Fish and Wildlife Office (YFWO) on the FGS HCP in regards to the northern spotted owl once that document and supporting documents (e.g., EIS, IA) were prepared. In February 2008, draft documents were sent to the RBFWO for initial review. On March 11, 2008, Keith Paul of the RBFWO attended a public scoping meeting on the FGS HCP and EIS in Yreka, CA. Over the next year and a half, draft chapters of the HCP, EIS, and IA were sent to the RBFWO for review and comment. Minor comments were made on the draft documents and sent to YFWO and FGS for inclusion into the final draft. A Notice of Availability (NOA) of the HCP and Draft EIS was published in the Federal Register on November 13, 2009. On December 2, 2009, Keith attended a second public meeting in Yreka, CA shortly after the release of the NOA to allow the public to comment on the proposed HCP and Draft EIS. On May 5, 2011, due to staffing changes at the RBFWO, the BO was sent to YFWO for finalization. The conference opinion for fisher was developed by YFWO and incorporated into the BO.

BIOLOGICAL OPINION

1. DESCRIPTION OF THE PROPOSED ACTION

1.1 Introduction

The Service proposes to issue a 50-year ITP under the authority of section 10(a)(1)(B) of the ESA to FGS to cover the incidental take of the northern spotted owl that may result through implementation of the FGS HCP. Although take of plant species is not prohibited under the ESA and therefore cannot be authorized under an ITP, the Yreka phlox would also be a Covered Species in recognition of the conservation benefits provided to the species under the FGS HCP. Separately, FGS is also requesting an ITP from NMFS for coverage of three evolutionarily significant units of anadromous salmonids.

Fruit Growers Supply Company has been managing a portion of its ownership, the Hilt/Siskiyou forest, since the early 1900s. The Hilt/Siskiyou forest lies within the geographic range of the northern spotted owl. The Service regards the harvest of suitable habitat in areas occupied by northern spotted owls as having the potential for take in violation of the ESA. California Board of Forestry (CBF) regulations restrict timber harvest operations in suitable habitat within occupied owl territories in order to prevent the take of northern spotted owls. Surveys[1] of FGS lands and adjoining Federal and private lands have shown that many northern spotted owl activity centers[2] are located on or have a home range[3] that extends onto the FGS ownership.

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[1] The California Department of Fish and Game (CDFG) Northern Spotted Owl Database contains the most comprehensive compilation of northern spotted owl detections in California, including results of protocol-level surveys of FGS lands and adjacent private and public lands. The database contains records beginning in 1987. For the HCP, owl records are used through 2007.

[2] For the purposes of the HCP, "activity center" is defined as the area of concentrated activity of either a pair of owls or a territorial single (USDI FWS 1992b).

[3] "Home range" is defined as the area to which an animal usually confines its daily activities. The home range of

Consequently, FGS's forest management activities in much of the Hilt/Siskiyou forest are restricted by CBF regulations. FGS indicates that the restrictions, in conjunction with the large number of owl territories that are located on or overlap FGS lands, have substantially reduced FGS's management and operational flexibility since the owl was listed in 1990 and resulted in FGS operating more intensively in other portions of its ownership in order to generate the timber volume necessary to remain economically viable.

Since November 2003, the Service has provided technical assistance to FGS in the development of an HCP covering company lands. In requesting the Service's approval of the HCP, FGS seeks to gain the management and operational flexibility necessary to administer its forest resources in a manner that will ensure the long-term sustainable production of timber (see section 2.1.4.5).

1.2 HCP Area Definitions

The HCP covers FGS's Hilt/Siskiyou ownership located in Siskiyou County, northern California. The ownership consists of three management units defined by FGS: Klamath River, Scott Valley and Grass Lake, covering 65,340, 39,153, and 47,685 acres, respectively, for a total of 152,178 acres. FGS's Klamath River and Scott Valley management units are located west of Interstate 5, adjacent to and intermixed with Klamath National Forest (KNF) lands. FGS's Grass Lake management unit (also adjacent to the KNF) lies east of Interstate 5 and predominantly north of State Highway 97.

It is recognized that FGS may buy, sell, or exchange timberlands in the general area covered by the HCP during the 50-year term of the ITP. To reflect this aspect of FGS's business practices, the HCP is designed to allow some flexibility in the application of the HCP and ITP since the ownership may adjust over time. The HCP and this BO use a number of defined terms to describe the area in which FGS's activities will be covered under the HCP, the area in which impacts of FGS's activities are analyzed, and the extent to which adjustments may occur to the area in which the HCP will be implemented. Those terms and their definitions are set forth as follows:

- "Plan Area" means all privately owned commercial timberlands that, over the term of the HCP, are either included within the Initial Plan Area (defined below) or are eligible for coverage by the HCP as provided in the IA (see "Adjustment Area" below). This represents the entire acreage analyzed in the HCP and the EIS prepared pursuant to the National Environmental Policy Act (NEPA) to support the HCP's provisions, allowing for additions and deletions of lands from the Plan Area over the term of the HCP and ITP. Lands within the Adjustment Area may be added to the HCP over the term of the ITP without amendment, given the proper analysis and approval by the Service and NMFS, and subject to the limitation that no more than 15,218 acres (an area equal to 10 percent of the Initial Plan Area) can be added over the term of the Permit.

- "Initial Plan Area" means FGS's land ownership as of the effective date of the ITP (152,178 acres in three management units as described above).

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northern spotted owls in the California Klamath and Cascades provinces is considered to be approximately 3,400 acres, the equivalent of a circle with a 1.3 mile radius (the provincial radius) (USDI FWS 1992b).

- "Adjustment Area" means commercial timberlands that were not within the Initial Plan Area, but are eligible for addition to the Plan Area through acquisition, subject to the terms and conditions imposed by the IA.

- "Action Area" is defined as all areas to be affected directly or indirectly by the Federal action and not merely the immediate areas involved in the action (50 CFR 402.02). Action Area in regards to northern spotted owl means all acreage within a 1.3-mile radius around the FGS ownership. This 1.3-mile radius around the FGS ownership has been termed Action Area for the purposes of characterizing environmental baseline conditions and describing the direct and indirect effects of the Covered Activities on the northern spotted owl. The 1.3-mile distance criterion is based on the average home range size of the northern spotted owl within the California Klamath and California Cascades Provinces. The Action Area for fishers consists of FGS ownership with a surrounding 1.6-mile buffer that was based on the radius of an estimated circular home range (i.e., 7.7 mile^2) for female fishers in the Klamath Province (see Appendix E of the FGS HCP). The Action Area includes the portion of the fisher population that could be directly or indirectly affected by the HCP.

1.3 Plan Area Adjustments over Time

During the term of the HCP and ITP, FGS may elect to add commercial timberlands to the Plan Area within any of the identified drainages by submitting to the Service and NMFS a description of the lands within the Adjustment Area that it intends to add, along with a summary of relevant biological and physical characteristics in the area proposed for addition. Lands within the "Initial Plan Area" are similar in characteristics and conservation value to lands in adjacent areas that could be brought into the Plan Area via land purchase. Fruit Growers Supply Company estimates that there are approximately 338,900 acres of other privately held commercial timberlands in the drainages that could be added to the Plan Area if acquired by FGS in the future. However, expansion of the Plan Area under this process is limited to10 percent of the Initial Plan Area (15,218 acres). Addition of lands to the Plan Area (i.e., to be covered by the HCP) in excess of the 10 percent limit or outside of the identified Adjustment Area would require an amendment to the HCP and ITP.

Further, through a notification to the Service and NMFS, and subject to their review, lands covered by the HCP and ITP may be disposed of without limitation provided that the lands remain subject to the terms and conditions of the IA and HCP. The extent to which lands may be disposed of without adhering to the terms and conditions of the IA is limited to 10 percent of the Initial Plan Area (15,218 acres), and the remaining Plan Area must provide benefits and effectiveness equal to those intended in the HCP and ITP.

1.4 Plan Implementation

The primary administrator for implementation of this HCP is FGS. FGS will be responsible for the conduct of all conservation, mitigation, monitoring, and reporting activities specified in the

HCP; however, some of the activities may be delegated to and carried out by contractors, partners, or volunteers.

Although significant technical expertise and local knowledge of Covered Species and their habitats are held by the agency staff that advised FGS personnel and consultants that prepared this plan, FGS may seek to consult with outside scientists and other technical experts who can provide technical advice on implementation of the conservation and monitoring programs. In developing the conservation program for northern spotted owls, FGS, in consultation with the Service, consulted with noted authorities on northern spotted owl biology and behavior. These experts provided input on the analysis of impacts to northern spotted owls and development of an evaluation matrix used to establish the relative conservation value of northern spotted owl activity centers (see section 3.2.4). In the event of changed or unforeseen circumstances (described below) that substantially alter habitat for northern spotted owls in the Conservation Support Areas (CSAs) established on the FGS ownership, outside experts may be consulted to provide input on actions needed to ensure that FGS is meeting its mitigation obligations for take of northern spotted owl. However, the Service is responsible for monitoring and enforcing the terms of the HCP and ITP.

1.4.1 Covered Activities

This section describes FGS' activities that are covered under the HCP and associated ITP, which include forest practices and related land management activities on FGS's Hilt/Siskiyou forest (the Plan Area), and those activities necessary to carry out all mitigation and conservation measures identified in the HCP and/or the ITP. Timber management is the primary activity in the Plan Area, occurring on 152,178 acres. Covered Activities include activities associated with timber harvest, road construction and maintenance, silviculture, stand regeneration, harvest of minor forest products, and fire prevention. Collectively, these are referred to as Covered Activities. In addition to the ESA and California Endangered Species Act (CESA), the Covered Activities occurring on FGS's ownership are subject to numerous other State and Federal environmental and public safety laws. All Covered Activities will be implemented in accordance with the HCP and ITP, the California Forest Practice Rules (CFPRs), and other applicable Federal and State regulations.

1.4.1.1 Timber Harvest

Timber harvest includes activities necessary to the logging and transport of timber products [primarily ponderosa pine (*Pinus ponderosa*), sugar pine (*Pinus lambertiana*), Douglas-fir (*Pseudotsuga menziessii*), and white fir (*Abies concolor*)]: felling and bucking of timber, yarding timber, salvage and transport of timber products.

Felling and Bucking of Timber

The cutting of trees (felling) is the first step in any timber harvest operation, and bucking is cutting the felled tree in predetermined log lengths. Felling and bucking are generally done with chain saws by crews working in pairs. On gentle terrain, mechanical felling machines (feller-bunchers) can be used to fell the trees and place them in a pile for moving to the log landing.

Ground-based Yarding

Ground-based yarding usually involves the use of tracked or rubber-tired tractors (skidders) to move logs to the landing. The skidders are usually equipped with mechanical grapple attachments or wind lines to grasp the logs, and they follow constructed "skid trails" on all but the mildest terrain. Skidding is generally done in a downhill direction, and occasionally is used for uphill yarding where it is limited to short distances. If logs will be moved only a short distance, a shovel or a hydraulic boom log loader may be used. A shovel is a tracked excavator that has been fitted with a grapple for grasping logs. The shovel may move a short distance off the truck road to pick up felled logs and pass them back to the truck road using the boom structure. Construction of skid trails is not necessary when using the boom loader. Ground-based yarding is typically conducted on slopes less than 55 percent.

Cable Yarding

Cable yarding generally involves the use of steel cables to skid logs to a truck road or log landing using a yarder that is set up on the truck road or landing. A yarder has a vertical tower that is held in place by a number of guylines. The skidding cables, which are operated using powered drums, are used to haul or skid the logs to the landing. The tower is used to elevate and lift the cables, hence providing lift to logs as they are yarded to the landing. High-lead systems are designed to lift only the lead end of logs so that the logs do not dig into the soil surface as they are yarded. This system is typically used for short yarding distances. Skyline systems involve the use of a skyline cable that runs from the top of the tower to an anchor located at some elevated point beyond the harvest area. Logs are attached to a carriage that rides on the skyline cable, providing increased lift to suspend logs above the ground surface. Logs are generally yarded uphill with cable systems, but occasionally these systems are used for downhill yarding. Cable yarding is typically conducted on slopes greater than 55 percent.

Aerial Yarding

Aerial yarding by helicopter is used where roads cannot be constructed to provide access to a harvest unit for conventional (ground-based or cable) yarding systems. Aerial logging suspends logs from long cables and transports them to the landing with virtually no ground disturbance. In general, it is not necessary for the helicopter to land in the loading area. However, a separate service landing is needed that provides a clean, rocked, debris- and dust-free area to protect the helicopter's engine(s) from damage. This yarding technique is usually reserved for steep (greater than 65 percent) and/or unstable terrain, although lack of a road right-of-way may trigger its use.

Loading and Landing Operations

After logs are yarded to a landing or roadside, there may be additional saw work to remove limbs, buck long pieces into shorter segments, or to remove broken sections. These operations are conducted either with hand labor (chain saws) or a mechanical delimber. Logs are then loaded onto log trucks using a shovel or front-end loader (a wheeled bucket loader equipped with log forks instead of a bucket). Some log trucks have their own loading system (self-loaders).

Salvage of Timber Products

Dead, dying, and downed trees are periodically salvaged. Salvage is primarily related to road maintenance, fire damage, insect damage, or storm damage. Generally the economics and logistics involved in the potential harvest determine the feasibility of salvage operations. Salvage operations are feasible when damaged or weakened trees occur adjacent to ongoing logging operations, or are in heavy enough concentrations over a large enough area to justify sending in a salvage logger. It is typically not feasible to harvest individual occurrences of one or two trees, or trees that have been dead for more than 2 years. Salvage operations typically occur in isolated locations throughout the Plan Area, and consist of harvesting dead and dying conifers as individuals or in small groups.

Transport of Timber Products

Timber products are most commonly transported along roads via truck and trailer. Maintenance activities on these haul roads are described below.

1.4.1.2 Road Construction and Maintenance

Activities for maintenance, improvement, construction, and closure of roads and landings include the following:

- Construction of new roads in connection with timber management, including clearing vegetation from road rights-of-way, removing trees, grubbing (removing stumps and surface organics), grading, and compaction

- Extraction of rock, sand, and gravel from small borrow pits for use in road construction and maintenance

- Drainage facility repair and/or upgrade, and erosion control

- Construction of stream crossing (bridges, culverts, fords, and a variety of temporary crossings)

- Maintenance or reconstruction of surfaced roads, seasonal roads, culverts, bridges, fords, cuts, and fillslopes

- Closure of roads, temporarily (abandoned) or permanently (decommissioned)

- Dust abatement activities, such as treating road surfaces with materials commonly used for dust abatement, including but not limited to lignin, calcium chloride, magnesium chloride, and water

- Construction and maintenance of water holes used for water drafting (a short-duration, small-pump operation that withdraws water from streams or impoundments to fill conventional tank trucks or trailers)

- Water drafting for dust abatement, road construction, and routine maintenance

1.4.1.3 Silviculture

Silviculture is the culture and management of forest trees. FGS's silvicultural practices are designed to maintain and enhance the productivity of its timberlands by promoting prompt regeneration of harvested areas and rapid forest growth. Silvicultural treatments vary by stand age, stand condition, site class, and species composition. Not all treatments are applied to every site.

FGS forest inventory serves as the foundation for long-term planning by identifying stands of generally homogeneous site, stocking, and silvicultural potential. Forest conditions are currently estimated at the landscape level by a Maximum Sustainable Production (MSP) analysis (a sustained yield planning framework is required under the CFPRs [14 CCR 933.11a]). For planning purposes, stands of similar condition are combined and a range of feasible silviculture is modeled for each of these units with yields reported at the mid-point of each decade. Once a given silviculture treatment is applied, it limits the range of future opportunities for a given stand. The current MSP analysis is intentionally non-spatial so that silviculture can be developed at the landscape level and applied at the stand level on the basis of need. Each stand is part of a modeling unit in which a range of silvicultural practices are designated by acres by decade. The forester applies silviculture within these limits and within other spatial constraints, such as for areas protected for other resources.

Forest Management Regimes

The general categories of silviculture include even-aged regeneration, even-aged thinning, and uneven-aged treatments. Even-aged regeneration occurs on a 50- to 80-year rotation and produces stands that will remain in young seral stages for 20 to 50 years depending on site potential and stocking retained. These units are generally small, from 10 to 30 acres, and scattered on the landscape. In most cases, even-aged regeneration targets marginally stocked and/or deteriorating stands to improve their long-term productivity. Harvest methods include seed tree, shelterwood, and clearcutting methods. Regeneration occurs artificially through planting nursery-grown seedlings, or naturally by seed trees retained within harvest units. Seed trees are retained to propagate certain species or characteristics (for example, rust resistance). Even-aged thinning units are intermediate treatments of mid-seral even-aged stands designed to accelerate growth of trees. Uneven-aged harvests are generally designed to maintain a distribution of tree sizes at a stocking level that maximizes board foot growth at the stand level. Site potential determines the desired stocking level. Uneven-aged silviculture is used to harvest trees individually or in small groups with the goal of developing or maintaining a variety of age classes within a stand. Typically, sites are restocked through natural regeneration and, where necessary, supplemented by planting seedlings obtained from a nursery.

Silvicultural Methods

The types of silvicultural methods commonly employed by FGS throughout its ownership and its application in the development of the MSP analysis are consistent with the methods defined and regulated in the CFPRs.

Clearcutting

The clearcutting regeneration method involves the removal of a stand in one harvest. Under the CFPR's, regeneration after harvesting shall be obtained by direct seeding, planting, sprouting, or natural seed fall[4]. When practical, clearcuts shall be irregularly shaped and variable in size to mimic natural patterns and features found in landscapes. Even-aged regeneration harvests have been allocated to portions of most merchantable-sized timber types on the Hilt/Siskiyou Forest. Actual clearcut unit locations are determined during Timber Harvest Plan (THP) layout by the area foresters.

Commercial Thin

Commercial thinning is the removal of trees in a young-growth stand to maintain or increase the average diameter of the remaining trees, promote timber growth, and/or improve forest health. Commercial thinning is used as a tool to extend the "life" of some stands before using a regeneration harvest to better balance age class distributions across the forest. Commercial thinning is used to improve stand health and growth in relatively healthy, well-stocked stands of trees large enough to be harvested for lumber [> 10 inches diameter at breast height (dbh)] that exceed target stocking requirements.

Biomass Thin

This intermediate treatment is used to thin younger, overstocked, submerchantable-sized stands to improve stand health and growth. It is predominantly used in young ponderosa pine stands and in mixed conifer stands with a heavy pine component. Although some saw logs are harvested, the main product is hog fuel (an unprocessed mix of barks and wood fiber) or paper chips from trees ranging from 4 to 10 inches dbh. Biomass thinning has been periodically used in the Grass Lake management unit to improve stand condition. It is also a valuable tool to reduce wildfire potential.

Seedtree/Shelterwood Removal (Even-aged)

This silvicultural method is used where a two-tiered structure of healthy, well-stocked understory with a scattered overstory exists. Future harvests will be even-aged (one or two commercial thins followed by regeneration harvests). The benefits of using this method are improved stand health, increased growth of trees in the understory, and promoting a more regular structure. This silvicultural method is widely used in all of the management units on FGS ownership.

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[4] Age and acreage limitations for clearcuts are regulated by the California Forest Practice Rules (14 CCR 913.1)

Selection/Group Selection (Uneven-aged)

This silvicultural method is used in heavily stocked, relatively healthy stands that have an uneven-aged structure. Merchantable trees are harvested from all size classes present. The intent is to maintain an uneven-aged structure, maintain stand health, and generate a harvest return. Harvest entries occur every 10 to 20 years. Selection harvest has also been applied to other stands throughout FGS ownership on the Hilt/Siskiyou forest, including those in watercourse protection zones and on potentially unstable slopes, including inner gorges and shallow, unstable soils.

Alternative Prescriptions

A number of alternative prescriptions are commonly used by FGS in its silvicultural management. All alternative prescriptions are analyzed and approved during the THP review process. In most cases where alternative prescriptions are employed, past management and timber harvest have created an irregular condition in stand structure and/or stocking. Standard silvicultural prescriptions as specified in the rules are difficult to apply in these irregular stands. FGS's management scheme is to maintain stand health and generate a periodic and economical harvest in these stands through the use of alternative prescriptions over the first 1 to 4 years, gradually building up inventory to a point when standard silvicultural prescriptions can be applied. These alternative prescriptions include, but are not limited to:

- Seedtree/shelterwood removal (uneven-aged)
- Modified selection
- Combination shelterwood removal/biomass thin
- Modified commercial thin
- Combination shelterwood removal/commercial thin

1.4.1.4 Stand Regeneration and Improvement

Timber stand regeneration and improvement includes activities necessary to establish, grow, and achieve the desired species composition, spacing, and rate of growth of forest stands on the ownership:

- Site preparation, prescribed burning, and slash treatment
- Tree planting
- Vegetation management
- Silvicultural thinning (includes biomass, pre-commercial, and commercial thinning)

Silvicultural thinning is described previously under silvicultural methods.

Site Preparation, Prescribed Burning, and Slash Treatment

Site preparation activities for even-aged regeneration involve the removal of logging residue and/or unwanted shrub and tree species. This is typically accomplished by using tractors to pile

logging residue for burning, broadcast burning, or, less commonly, by mechanical methods. By removing fuels, this treatment has the additional benefit of reducing the potential for wildfire to ignite or spread. As needed, fuel breaks may be constructed to protect resources. The need and location of fuel breaks is determined by the area forester [in consultation with California Department of Forestry and Fire Protection (CAL FIRE) as needed]. Occasionally, site preparation also requires soil scarification for planting. This treatment applies only to regeneration harvest units where it may be necessary to ensure successful regeneration.

Tree Planting

Artificial regeneration is commonly used to ensure that sites are adequately stocked as per the stocking requirements specified in the CFPRs. The usual practice is to plant seedlings in those areas that have been either clearcut or burned by wildfire. Seedlings are grown at commercial nurseries from seed collected within the appropriate seed zones typically by FGS on its property, and/or purchased for the environmental conditions of each site where they will be planted.

Vegetation Management

Occasionally, sites may require one or more vegetation management treatments to reduce the impacts of unwanted competing vegetation on the growth of seedlings. Such treatments commonly involve the mechanical removal of competing brush species using tractors or hand crews. Brush is typically piled and burned, or may be chipped. FGS is not seeking coverage for herbicide use under the ITP.

1.4.1.5 Minor Forest Products

Minor forest products are occasionally harvested from the Plan Area and transported over private and public roads. These products include, but are not limited to, Christmas trees and bows, mistletoe, firewood, fence posts, poles, yew bark, stumps, root wads, and mushrooms. These are all very minor components of this forest and are regulated by contract. The management of Christmas trees includes pruning and growth control in scattered locations throughout the Plan Area. The harvest of Christmas trees is small enough to be considered a minor forest product.

1.4.1.6 Fire Prevention and Suppression

Wildfire prevention involves vegetation management and the construction of fuel breaks strategically located throughout the Plan Area. These activities are designed and implemented by the area forester on a local basis, and are therefore generally very limited in scale. The prescription typically includes thinning for shaded fuel breaks along property lines or between watersheds where FGS deems it beneficial. Wildfire suppression is typically under the authority of local, State, or Federal agencies. In cases of escaped prescribed burns where local, State, or Federal agencies are not involved, or for initial responses until responsible agencies have arrived, FGS employs emergency fire suppression activities, such as construction of fuel breaks by hand or bulldozer, lighting backfires, applying aerial fire suppressants, falling trees or snags, and water drafting for fire suppression.

1.4.1.7 Other Activities

In addition to FGS's forest management activities, this HCP and associated ITP will cover certain other activities undertaken by FGS and third parties pursuant to FGS obligations (for example, easements) or authorization (leases and licenses) in the future. Generally, such activities include those consistent with the zoning of FGS's lands as Timber Production Zone (TPZ). Under California's Timberland Productivity Act (CTPA), a TPZ is for growing and harvesting of timber and other designated "compatible uses." Examples of compatible uses are watershed management; fish and wildlife habitat improvement; and use of roads, landings, and log decks. Grazing is considered a compatible use, but will not be a Covered Activity under this HCP.

With regard to road use, the HCP and ITP will cover general road use, construction, and maintenance activities carried out on road segments owned by and under control of FGS. Construction and maintenance activities pursuant to cooperative road use and maintenance agreements between FGS and the United States Forest Service (USFS) would not be covered under this HCP. The USFS is developing a road use and maintenance plan through consultation with NMFS to cover roads on lands in the KNF. Rock quarrying activities would be covered under this HCP. FGS quarries rock from a number of locations on its ownership for the purpose of obtaining material for road surfacing. FGS has four primary rock quarries on the ownership that are each less than 2 acres in size. These quarries are used solely by FGS to provide rock products used on its ownership and in road construction and maintenance activities on roads governed by cooperative agreements with the USFS. Typically up to five or more local rock sources, commonly referred to as "borrow pits," are developed as needed for road upgrades associated with THPs. Each local rock source is rarely larger than 0.5 acre in size and is most often located in the upper portion of watersheds.

1.4.2 Conservation Measures

1.4.2.1 Overview of the Terrestrial Species Conservation Program

Biological Goals

The overall biological goal for northern spotted owl is to contribute to the sustainable maintenance of the local and regional populations of owls through both species and habitat objectives.

Northern Spotted Owl Biological Objectives

As described below, five specific objectives were developed to meet the biological goal for the northern spotted owl.

Objective 1: Demographic Support. Consistent with Service expectations for private lands as stated in the Revised Recovery Plan for the Northern Spotted Owl (USDI FWS 2011b), a biological objective of the HCP is to contribute to northern spotted owl conservation and recovery by providing demographic support to owl populations on nearby federal lands. This objective to support the federal conservation strategy will be accomplished through conservation

of suitable habitat within 1.3-miles of selected high conservation value activity centers located near FGS's ownership, thus providing compensatory mitigation for incidental take of owls associated with other low conservation value activity centers that may occur over the term of the HCP.

Conservation Support Areas (CSAs) will be established on FGS's ownership within the 0.5-mile radius core around high conservation value activity centers, coinciding with the area of highest likelihood of owl use. Selected nesting/roosting and foraging habitat in these areas will be maintained, and strategic locations with the potential to grow into suitable habitat will be managed to promote use by northern spotted owls in the future. FGS will provide reasonable extensions of the CSAs into the 1.3-mile-radius home range around selected activity centers to maintain connectivity with nesting/roosting habitat, and to provide foraging opportunities for owls. Extensions into the 1.3-mile radius home range will be focused primarily along riparian zones, which generally provide greater prey abundance and diversity due to increased understory vegetation and moisture.

Objective 2: Riparian Management. The biological objective of the HCP for riparian management is to provide foraging and dispersal opportunities for the northern spotted owl across the landscape by establishing Watershed and Lake Protection Zones (WLPZs) that promote growth in stands toward a more mature state with a high level of overstory canopy coverage and legacy structures, such as old large trees, snags, and downed wood.

Objective 3: Dispersal Habitat. The biological objective of the HCP for dispersal habitat is to contribute to a general trend of increased quality and quantity of northern spotted owl dispersal habitat across the ownership over the term of the ITP.

Objective 4: Incidental Take Minimization. The biological objective of the HCP for take minimization is to avoid direct take of northern spotted owls resulting from authorized timber harvesting operations. This objective will be accomplished through a combination of: (1) seasonal timing restrictions; (2) pre-harvest surveys; and (3) on-site monitoring by a qualified biologist.

Objective 5: Threat Management. The biological objective of the HCP is to manage, to the maximum extent practicable, known threats to the northern spotted owl. Significant threats to the northern spotted owl within the Plan Area include the barred owl and catastrophic wildfire. This objective will be accomplished through actions that: (1) control barred owls through management actions within the Plan Area; and (2) reduce the potential for catastrophic wildfire on the FGS ownership that could diminish the quality and amount of owl nesting/roosting, foraging, and dispersal habitat both on and off the FGS ownership.

1.4.2.2 Terrestrial Species Conservation Program

Based on the stated biological goals and objectives, FGS developed a comprehensive conservation program with a number of specific conservation measures to provide protection for the northern spotted owl. Collectively these measures are termed the "Terrestrial Species Conservation Program," and they reflect the binding, enforceable commitments FGS will make

to satisfy the requirements of section 10(a) of the ESA. The Terrestrial Species Conservation Program is incorporated by reference in the section of the IA that describes all FGS's conservation planning commitments that must be made and carried out to qualify for and comply with the ITP that FGS is seeking.

The following subsections describe the specific measures associated with each of the biological objectives for northern spotted owls.

Objective 1: Demographic Support

The following measures are associated with the demographic support objective:

- FGS will establish 24 CSAs on its ownership to provide demographic support to northern spotted owls associated with strategic activity centers located within 1.3 miles of the FGS ownership (Action Area), and whose home ranges overlap with Critical Habitat Units (CHUs).

- FGS will promote and maintain the following general conditions and habitat features on its ownership within the CSAs:

  - A multi-layered mature forest to provide a more stable and moderate microclimate

  - Areas composed of tree species associated with use by northern spotted owls (i.e., Douglas-fir with mistletoe infections to provide nesting platforms, hardwoods to provide food and shelter for prey)

  - Variable and increasing average tree diameter

  - A large tree component (trees greater than 26 inches dbh)

  - Variable tree densities

- FGS will ensure that specific habitat standards for both nesting/roosting and foraging habitat are met within the entire CSA (which includes lands owned by others) before harvest can occur on its ownership in a CSA (see below).

- Harvest on the FGS ownership within CSAs will be restricted, and any harvest on the FGS ownership within the CSAs will require evaluation for compliance with the HCP provisions, and written approval by the Service.

- FGS will prioritize conservation efforts on lower elevation, northern-facing slopes near the northern spotted owl nest sites. FGS will prioritize management of owl habitat on its ownership within the lower third of mesic slopes near riparian zones, including designated WLPZs.

- Existing large hardwoods on the FGS ownership within CSAs will be retained to provide nesting structures for owls and food for prey species.

- Large down woody material on the FGS ownership within CSAs will be retained to provide nesting and foraging habitat for northern spotted owl prey species.

- Existing snags on the FGS ownership within CSAs will be retained. Snags that are judged to be a safety hazard may be felled and left onsite.

Conditions for allowable harvest within the 500-acre core area: If there are more than 250 acres of nesting/roosting habitat and more than 150 acres of foraging habitat within the overall 500-acre core area (regardless of ownership) of mitigation sites, then harvest can occur on lands owned by FGS in the core area. Any harvest allowed must maintain more than 250 acres of nesting/roosting habitat and more than 150 acres of foraging habitat within the core area post-harvest. All existing substrate for northern spotted owl nest structures (tree deformities, mistletoe brooms, tree cavities) will be maintained within the 500-acre core area where it does not create a hazard for public safety.

Nesting/roosting habitat is defined as having the following attributes:

- $\geq$150 ft^2/acre of basal area
- $\geq$ 60 percent canopy closure
- $\geq$ 15 inches average quadratic mean diameter (qmd)
- $\geq$ 8 trees/acre (or $\geq$ 30 ft^2/acre basal area) of large conifers $\geq$ 26 inches dbh
- Multi-layered canopy, nesting substrates, snags, down woody material, decadent trees

Of the 250 acres of nesting/roosting habitat in the core area of the CSA (regardless of ownership), at least 100 acres must be high quality habitat with greater than or equal to 210 ft^2/acre of basal area, and at least 100 acres must be of at least moderate quality with 180 to 210 ft^2/acre of basal area for harvest to occur on lands owned by FGS in the CSA.

Foraging habitat is defined as having the following attributes:

- 80 to 180 ft^2/acre of basal area
- $\geq$ 40 percent canopy closure
- $\geq$ 13 inches average qmd
- $\geq$ 5 trees/acre ($\geq$ 20 ft^2/acre basal area) of large conifers $\geq$ 26 inches dbh

Of the 150 acres of foraging habitat, at least 60 acres must be high-quality foraging habitat with 150 to 180 ft^2/acre of basal area and greater than or equal to 60 percent canopy closure.
At least 40 acres can be of moderate-quality, with 120 to 150 ft^2/acre of basal area and greater than or equal to 40 percent canopy closure.

As part of the CSA selection process, specific areas on the FGS ownership with the potential to develop into suitable owl habitat over the term of the ITP were identified to support mitigation sites that currently contain less than 250 acres of nesting/roosting habitat and/or less than 150

acres of foraging habitat within the overall 500-acre core area. See Appendix D in the HCP for detailed maps. Harvest in these areas will be restricted until the habitat thresholds are exceeded. High priority for conservation was given to areas at low elevations, and on north-facing slopes near riparian zones that are relatively contiguous with the activity center.

These harvest restrictions, which are based on habitat targets for the mitigation sites as a whole (regardless of ownership), were established to promote a high probability of occupancy by northern spotted owl nesting pairs at known activity centers with high conservation value to the federal conservation strategy outlined in the Revised Recovery Plan for the Northern Spotted Owl (USDI FWS 2011b). The habitat targets guide management and stand development on FGS land within the core area. Harvest will be restricted on the entire FGS ownership within the CSAs because any harvest conducted by FGS within the CSAs will require evaluation and written approval by the Service. Overall, 78 percent of the total FGS ownership in the core areas of the mitigation sites will be managed to provide suitable owl habitat in support of the federal conservation strategy. The remaining portion of the FGS ownership in the core areas of the mitigation sites was either identified as non-habitat, could not be reasonably expected to provide habitat over the term of the ITP, or was of low priority given the amount and quality of habitat elsewhere in the core area. FGS's habitat commitments associated with the core area and home range of each mitigation site are summarized in Table 1.

Table 1. FGS Habitat Commitments in CSAs Supporting Mitigation Sites (acres).

Activity Center ID	**Habitat Type**	**Suitable Northern Spotted Owl Habitat within the 502-Acre Core Area (0.5-mile radius around activity center)**	**Suitable Northern Spotted Owl Habitat within the 2,894-Acre Outer Ring Home Range (0.5 to 1.3-mile radius around activity center)**	**Suitable Northern Spotted Owl Habitat within the 3,396-Acre Home Range (1.3-mile radius around activity center)**
SK002	Foraging	210	719	929
	Nesting/Roosting	0	6	6
SK028	Foraging	33	283	316
	Nesting/Roosting	0	0	0
SK040	Foraging	9	372	381
	Nesting/Roosting	0	0	0
SK044	Foraging	27	545	572
	Nesting/Roosting	0	1	1
SK061	Foraging	0	158	158
	Nesting/Roosting	0	0	0
SK063	Foraging	2	199	201
	Nesting/Roosting	0	0	0
SK097	Foraging	34	286	320
	Nesting/Roosting	0	0	0
SK099	Foraging	1	304	305
	Nesting/Roosting	0	1	1
SK100	Foraging	80	86	166

Activity Center ID	Habitat Type	Suitable Northern Spotted Owl Habitat within the 502-Acre Core Area (0.5-mile radius around activity center)	Suitable Northern Spotted Owl Habitat within the 2,894-Acre Outer Ring Home Range (0.5 to 1.3-mile radius around activity center)	Suitable Northern Spotted Owl Habitat within the 3,396-Acre Home Range (1.3-mile radius around activity center)
	Nesting/Roosting	38	5	43
SK153	Foraging	168	643	811
	Nesting/Roosting	0	0	0
SK238	Foraging	0	53	53
	Nesting/Roosting	0	15	15
SK262B	Foraging	140	297	437
	Nesting/Roosting	12	27	39
SK284	Foraging	124	522	646
	Nesting/Roosting	6	0	6
SK291	Foraging	11	72	83
	Nesting/Roosting	4	3	7
SK352	Foraging	58	622	680
	Nesting/Roosting	0	1	1
SK378	Foraging	33	29	62
	Nesting/Roosting	0	0	0
SK428	Foraging	16	311	327
	Nesting/Roosting	0	0	0
SK446	Foraging	43	350	393
	Nesting/Roosting	5	38	43
SK462	Foraging	110	593	703
	Nesting/Roosting	0	0	0
SK503	Foraging	38	445	483
	Nesting/Roosting	0	0	0
SK512	Foraging	15	121	136
	Nesting/Roosting	0	0	0
SK530	Foraging	28	293	321
	Nesting/Roosting	0	0	0
SK531	Foraging	108	947	1055
	Nesting/Roosting	0	1	1
SK548	Foraging	4	273	277
	Nesting/Roosting	0	1	1

* The acreage listed in this table represents the amount of habitat that will be maintained on FGS property only. The remainder of the 500-acre core and 3,396-acre home range include FGS lands that were not designated for conservation in the CSAs (e.g., non-habitat, suitable habitat not prioritized for conservation), are located on lands that are owned by others (private, Federal and State) and may include overlap with adjacent CSAs.

While silvicultural practices will be tailored to individual activity centers, FGS will manage its lands within the CSAs to develop and maintain northern spotted owl habitat as described above

to promote heterogeneous habitat conditions within the 500-acre core area around an activity center (i.e., promote variable basal areas and canopy closures). The habitat commitments in Table 1 will be incorporated into FGS's management of its land within the 500-acre core area in CSAs around the strategic activity centers. As stands develop over the term of the ITPs, the actual areas of suitable habitat may shift spatially due to natural events or silvicultural activities. If an area identified for conservation as foraging habitat grows into nesting/roosting habitat, then FGS can harvest this or other nesting/roosting habitat in the CSA down to the high quality foraging habitat standards, provided that their commitments for nesting/roosting and foraging habitat are met and at least 250 acres of nesting/roosting habitat and 150 acres of foraging habitat is maintained within the overall 500-acre core area, regardless of ownership.

Upon evaluation and written concurrence by the Service, exceptions may be made on a case-by-case basis for mitigation sites that lack the acreage or site potential to meet this requirement. Timber harvest on the FGS ownership in a CSA would not be allowed if such harvest would result in FGS being unable to meet its habitat commitment (Table 1) post-harvest. Any harvest conducted by FGS within the CSAs will require evaluation and written approval by the Service for compliance with the HCP provisions.

Conditions for Allowable Harvest within the Home Range: If there are more than 600 acres of nesting/roosting habitat (as defined above for the core area) and more than 1,050 acres of foraging habitat (with at least 730 acres of high- and moderate-quality foraging habitat, as defined above for the core area) within the 3,396-acre home range, then harvest can occur outside of these habitat retention areas. By definition, the home range includes the 500-acre core area around the activity center, and the acreage identified above for the core area must be maintained. Any harvest allowed must maintain more than 600 acres of nesting/roosting habitat and more than 1,050 of foraging habitat, including at least 730 acres of high and moderate quality foraging habitat, within the home range post-harvest. As part of the CSA selection process, specific areas on FGS's ownership with the potential to develop into suitable owl habitat over the term of the permits were identified to support mitigation sites that currently contain less than 600 acres of nesting/roosting habitat and/or less than 1,050 acres of foraging habitat within the entire 3,396-acre home range. Maps with these specified areas can be seen in Appendix D of the HCP. Harvest in these areas will be restricted until the habitat thresholds are exceeded. High priority for conservation was given to areas that provide connectivity with nesting/roosting habitat in the 500-acre core area and with other owl activity centers, and with a high likelihood of use by northern spotted owls (lower third of mesic slopes near riparian zones, including designated WLPZs) to provide additional foraging opportunities for owls.

These harvest restrictions are based on habitat targets, for the mitigation sites as a whole (regardless of ownership), established to promote a high probability of occupancy by northern spotted owl nesting pairs at known activity centers with high conservation value to the Federal conservation strategy. The habitat targets guide management and stand development on FGS land within the home range and any harvest conducted by FGS within the CSAs will require evaluation and written approval by the Service. Overall, 41 percent of the total FGS ownership in the home ranges of the mitigation sites will be managed to provide suitable owl habitat in support of the Federal conservation strategy. The remaining portion of the FGS ownership in the home ranges of the mitigation sites was either identified as non-habitat, could not be reasonably

expected to provide habitat over the term of the Permit, or was of low priority given the amount and quality of habitat elsewhere in the home range. FGS's habitat commitments associated with the home range of each mitigation site are summarized in Table 1.

While silvicultural practices will be tailored to individual activity centers, the habitat commitments in Table 1 will be incorporated into the management of CSAs within the 1.3-mile radius home range around each mitigation site. The amount and location of nesting/roosting and foraging habitat will change through time as stands age and grow. If an area in the CSA identified for conservation as foraging habitat grows into nesting/roosting habitat, then FGS can harvest this or other nesting/roosting habitat in the CSA down to the high quality foraging habitat standards, provided that their commitments for nesting/roosting and foraging habitat in the home range are met and at least 600 acres of nesting/roosting habitat and 1,050 acres of foraging habitat is maintained within the entire 3,396-acre home range area, regardless of ownership.

Upon evaluation and written concurrence by the Service, exceptions may be made on a case-by-case basis for mitigation sites that lack the acreage or site potential to meet this requirement. Timber harvest on the FGS ownership in a CSA would not be allowed if such harvest would result in FGS being unable to meet its habitat commitment (see Table 1) post-harvest. Any harvest conducted by FGS within the CSAs will require evaluation and written approval by the Service for compliance with the HCP provisions.

Objective 2: Riparian Management Objective

The following measure is associated with the riparian management objective:

- FGS will establish WLPZs or Equipment Exclusion Zones (EEZs) along all stream classes, and implement the management prescriptions described in the Aquatic Species Conservation Program over the term of the Permit. The WLPZs will provide foraging habitat and dispersal corridors for the northern spotted owl. No additional riparian management measures are included in the Terrestrial Species Conservation Strategy.

Objective 3: Dispersal Habitat Objective

The following measure is associated with the dispersal habitat objective:

- Consistent with the Service's expectations for conservation efforts on private lands, as stated in the "Revised Recovery Plan for the Northern Spotted Owl (*Strix occidentalis caurina*)" (USDI FWS 2011b), FGS will promote forest management practices that develop and maintain dispersal habitat across its ownership to provide connectivity between the CSAs and nearby Federal lands.

Dispersal habitat is essential to the dispersal of juvenile, non-territorial, or displaced northern spotted owls (USFWS 2008a). Dispersal habitat can occur in intervening areas between larger blocks of nesting, roosting, and foraging habitat or within blocks of nesting, roosting, and foraging habitat. Dispersal habitat is essential to maintaining stable populations by filling territorial vacancies when resident northern spotted owls die or leave their territories, and to

providing adequate gene flow across the range of the species. Dispersal habitat is composed of two types of habitat; habitat that supports the transience phase of dispersal and habitat that supports the colonization phase of dispersal (USFWS 2008b). Habitat supporting the transience phase of 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. Habitat supporting the colonization phase of dispersal is generally equivalent to roosting and foraging habitat, although it may be in smaller amounts than that needed to support nesting pairs. One or both of these habitat components are essential the dispersal of northern spotted owls.

Objective 4: Take Minimization Objective

The following measures are associated with the take minimization objective:

- FGS will not conduct timber operations or create a noise disturbance in conducting Covered Activities within 0.25 mile of active northern spotted owl nest sites during the breeding season beginning February 1 and ending August 31. "Active northern spotted owl nest site" is defined as the nest tree of a pair of nesting northern spotted owls. Road use and maintenance within 0.25 mile of an active northern spotted owl nest site may occur during the breeding season, but will require evaluation by the Service. Other timber operations and other Covered Activities on FGS land within 0.25 mile of an active northern spotted owl nest site may commence without restriction after August 31 for activity centers authorized for take.

- To help ensure protection of active northern spotted owl nest sites on FGS lands and on adjacent land within 0.25-mile of a FGS THP boundary or Covered Activities during the active breeding season, FGS will conduct protocol surveys each year of operation at known activity centers and within unsurveyed suitable habitat to determine site occupancy and reproduction status. Survey results will be reviewed and approved by the Service prior to operations to ensure compliance with the current Service approved protocol.

- To help assure that all active northern spotted owl nest sites on FGS lands and on adjacent lands within 0.25-mile of a THP boundary established by FGS are identified, FGS will use the most recent information on northern spotted owl locations from DFG, the Service, and private timber companies with adjacent land, during the preparation of each THP. FGS will also provide training on northern spotted owl identification and signs of northern spotted owl presence for field personnel that will be conducting THP preparation and timber operations to increase the probability that previously unknown owl sites within or adjacent to THPs are identified. All new northern spotted owl activity centers located through surveys or incidentally will become "known" activity centers, and will be subject to the survey and avoidance provisions above. If there is no response from an historic activity center during three consecutive years of protocol-level northern spotted owl surveys, the Service will evaluate that activity center to determine its

occupancy status. Recent analysis conducted on northern spotted owl site occupancy indicates that three years of surveys are not sufficient to conclude that a site will not become occupied (Dugger et al. 2009), thus other factors should be evaluated when making these determinations. Determinations regarding the likelihood of occupancy and the potential for re-occupancy of activity centers must consider the history and quality of northern spotted owl surveys, in combination with current habitat conditions and history of management activities. The Service is expected to provide additional guidance to address these situations later in 2011.

Objective 5: Threat Management Objective

The following measures are associated with the threat management objective and apply to CSAs established on the FGS ownership:

- FGS will implement the following barred owl control measures:

    - FGS will conduct barred owl monitoring using current Service-approved survey protocols every 4 years within the CSAs as long as deemed necessary by the Service. Barred owl monitoring will be conducted in coordination with protocol-level northern spotted owl surveys as described in the monitoring section of the HCP. Within the 4-year interval, FGS will conduct a barred owl survey for two consecutive years to determine if barred owls are present. Survey results will be compiled and a status report provided to the Service every 4 years.

    - If a barred owl is detected in the Plan Area, FGS will locate and monitor the barred owl and notify the Service within 10 days of detection.

    - As part of the ITP issuance, FGS will apply for a Federal Depredation Permit for barred owls as needed. FGS will help to facilitate (e.g., through providing access to and across its ownership) implementation of barred owl control measures deemed appropriate by the Service.

- Consistent with its fuels management guidelines for the Plan Area, FGS will implement the following stocking control and fuel maintenance measures within the CSAs:

    - Plantation and naturally regenerated stands will be maintained at or below stocking levels considered “normal” as defined in standard yield tables where feasible.

    - Fine fuels (slash, brush, and trees less than 3 inches in diameter) will not be permitted to accumulate to levels greater than 10 tons/acre. Thinning of suitable habitat in CSAs would require pre-approval by the Service.

- FGS will implement the following measures to prevent and/or control the spread of forest disease and insect outbreaks in the CSAs:

- Salvage of trees that are weakened or killed by disease or insects, or that are damaged by wildfire or climatic events. Except where human safety is a factor, or in instances where snags have the potential to promote wildfires, salvage is not allowed in WLPZs or in designated suitable habitat within the CSAs. Salvage operations in CSAs would require pre-approval by the Service.

1.4.3 Monitoring

1.4.3.1 Compliance Monitoring for the Northern Spotted Owl

Compliance monitoring for the northern spotted owl consists of documenting compliance with the measures set forth in the Terrestrial Species Habitat Conservation Strategy. Compliance monitoring for measures associated with each biological objective are described below.

Compliance Monitoring Associated with Objective 1 – Demographic Support.

Compensatory mitigation for incidental take of owls over the term of the ITP will be provided through establishment of CSAs on FGS's ownership to provide demographic support to activity centers with high conservation priority. FGS may harvest in CSAs only if general habitat conditions within the home range and core area of the activity center(s) set forth in section 5.3.1.1 of the HCP are met, and specific habitat targets within the CSA (see Table 1) will be maintained post-harvest. Harvest within a CSA will require written approval from the Service. Compliance monitoring for this objective consists of: 1) documenting that FGS has not conducted harvest activities within the CSAs unless the required general habitat conditions are met; and 2) if FGS conducts timber operations in the CSAs, verifying that the specific habitat targets are met following these activities.

To verify that no timber operations have occurred in CSAs without prior approval from Service, FGS will provide the Service with a list of the locations of active THPs on an annual basis (see "Reporting" section below).

If FGS proposes to conduct timber operations in a CSA, prior to conducting these activities, FGS will provide map(s) of the CSA showing suitable northern spotted owl habitat in the home range and core areas of the supported activity center to the Service. As part of the THP process, FGS will inventory areas proposed for harvest to verify that the specific targets for northern spotted owl habitat within the CSA pre-harvest can be met following harvest. FGS will provide the Service with a copy of the proposed THP encompassing the CSA, and obtain written approval for harvest in the CSA. Following completion of timber operations in a CSA, FGS will inventory harvested stands to document post-harvest stand conditions and submit a post-harvest report to the Service. The post-harvest report will quantify the amount of nesting, roosting, and foraging habitat in the harvested area, and characterize stand conditions in sufficient detail to verify compliance with the minimum habitat requirements for the CSA. FGS will submit the post-harvest report to Service within 6 months of completing timber operations.

Monitoring Type:	Compliance monitoring.
Sites:	CSAs with proposed timber operations.
Objective:	Demonstrate compliance with habitat commitments for the CSA within the core and home range of the activity center.
Methods:	Forest stand inventories documenting stand basal area, canopy cover, QMD, and number of large trees to identify suitable habitat for northern spotted owls.
Reporting:	Within 6 months following completion of timber operations in a CSA.

Compliance Monitoring Associated with Objective 2 – Riparian Management.

The Aquatic Species Habitat Conservation Strategy provides for protection of riparian zones through establishment of WLPZs with restrictions on harvest and other activities within the WLPZ. No additional riparian management measures for northern spotted owls are included in the Terrestrial Species Habitat Conservation Strategy. Compliance with the WLPZ measures will be documented through reporting and post-harvest WLPZ inspections as described in section 7.2.1 of the HCP.

Compliance Monitoring Associated with Objective 3 – Dispersal Habitat.

Dispersal habitat is composed of two types of habitat; habitat that supports the transience phase of dispersal and habitat that supports the colonization phase of dispersal (USFWS 2008b). Habitat supporting the transience phase of 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. Habitat supporting the colonization phase of dispersal is generally equivalent to roosting and foraging habitat, although it may be in smaller amounts than that needed to support nesting pairs. One or both of these habitat components are essential the dispersal of northern spotted owls. Because FGS will maintain a forested landscape on its ownership, it is anticipated that the biological objective for dispersal habitat will be met. No compliance monitoring or additional reporting is required to document compliance with this measure. However, at 10-year intervals throughout the term of the ITP, FGS will provide a summary of acres in each California Wildlife Habitat Relationships (CWHR) diameter and canopy cover class in the Plan Area as part of the annual report for that year.

***Compliance Monitoring Associated with Objective 4 – Incidental Take Avoidance and Minimization*.**

Incidental take avoidance and minimization will be accomplished through a combination of pre-harvest surveys and seasonal timing restrictions. In addition, FGS will provide formal training on owl identification and signs of northern spotted owl presence to field personnel that will be conducting THP preparation and timber operations. As described in section 5.3.1.4 of the HCP, FGS will conduct protocol surveys each year of operation at known activity centers if necessary to determine site occupancy and reproductive status and survey suitable habitat within 0.25-mile of Covered Activities planned for operations during the active breeding season. Survey plans and results must be reviewed and approved by the Service prior to operations to ensure compliance with the most current Service approved protocol. Compliance monitoring for this objective consists of documenting that pre-harvest surveys have been conducted, seasonal restrictions have been implemented as necessary, and personnel have been trained.

To demonstrate compliance with the incidental take avoidance and minimization measures, FGS will submit an annual report to the Service. The report will include the locations, dates, and results of the surveys conducted in association with THPs. Upon request, FGS will provide copies of the THPs in which take avoidance and minimization measures were implemented. FGS will document which employees have undergone northern spotted owl training and, upon request, provide the materials used in training employees to the Service.

***Compliance Monitoring Associated with Objective 5 – Threat Management*.**

Threat management focuses on the CSAs and includes surveys for barred owl, measures for wildfire prevention in CSAs, and measures to control disease and insect outbreaks in CSAs. To demonstrate compliance with the barred owl control measures, FGS will submit an annual report to the Service of the results of any barred owl surveys conducted. The report will include the protocol followed, locations, dates, and results of the surveys. As described in section 5.3.1.5 of the HCP, FGS will monitor any barred owl detections in a CSA and notify the Service within 10 days of detection. FGS will work closely with the Service to implement barred owl control measures deemed appropriate by the Service at the time of detection. The annual report will also describe any control measures for barred owls that are implemented and the results of the control actions.

FGS may conduct fuel management or salvage in CSAs only if general habitat conditions within the home range and core area of the supported activity center(s) set forth in section 5.3.1.1 of the HCP are met and specific habitat commitments within the CSA (see Table 1) will be maintained post-harvest. Fuels management and salvage in CSAs will require prior written approval by the Service. If FGS proposes to conduct fuel management or salvage in a CSA, prior to conducting these activities, FGS will provide the Service with a copy of the proposed fuels management or salvage plan for the CSA and provide the agency an opportunity for pre-activity review of the proposed management activity. Following completion of management or salvage operations in a CSA, FGS will inventory harvested stands to document post-harvest stand conditions and submit the results of the post-harvest inventory to the Service. The post-harvest inventory will quantify the amount of nesting, roosting, and foraging habitat in the harvested area and characterize stand

conditions in sufficient detail to verify compliance with the minimum habitat requirements for the CSA. FGS will submit the results of the post-harvest inventory to the Service as part of the annual report prepared for the year in which the inventory is completed.

1.4.3.2 Effectiveness Monitoring for the Northern Spotted Owl

Monitoring the effectiveness of the northern spotted owl conservation measures is necessary to evaluate whether the biological goals and objectives established in the HCP for the species are being met, and whether the effects of HCP implementation on northern spotted owls and their habitats are exceeding the levels anticipated by the Service in their BO.

FGS's effectiveness monitoring program for northern spotted owls focuses on monitoring habitat conditions and northern spotted owl occupancy of the CSAs.

***Effectiveness Monitoring of Northern Spotted Owl Habitat in CSAs*.**

Under the HCP, timber harvest will be restricted in CSAs unless general habitat conditions within the home range and core areas of the supported activity center(s) are present and specific habitat targets within the CSA will be maintained post-harvest. Thus, the amount and quality of northern spotted owl habitat in the CSAs is expected to be maintained or to increase over the term of the ITP. To assess the effectiveness of the HCP in maintaining or improving habitat in the CSAs, habitat conditions for northern spotted owls within the core and home range of each activity center supported by a CSA on the FGS ownership will be monitored and compared to the habitat standards described in section 5.3.1.1 of the HCP.

Monitoring Type:	Effectiveness monitoring.
Sites:	All CSAs established on the FGS ownership.
Sampling Frequency:	Stand inventories within all CSAs will be completed within 2 years of issuance of the ITP and repeated every 10 years during the permit period.
Objectives:	Demonstrate that FGS's management activities in CSAs promote development of stand conditions that provide suitable owl habitat within the CSAs over the term of the ITP.
Methods:	Stand level inventories of areas in the CSAs identified as suitable northern spotted owl habitat or potential northern spotted owl habitat (see FGS HCP Appendix D – Maps of CSA habitat areas).
Reporting:	Baseline report following initial inventory of CSAs and periodic reports following repeat inventories at 10-year intervals.

Monitoring for Northern Spotted Owl Use in CSAs.

The biological goal of establishing the CSAs and specifying habitat requirements within the CSAs is to enhance the likelihood that activity centers supported by CSAs will remain or become occupied by northern spotted owls, and thereby provide demographic support to the Federal conservation strategy. Occupancy of an area by northern spotted owls is influenced by many factors, of which habitat condition is only one. Also, home ranges for owls supported by CSAs encompass land managed by many different entities (e.g., USFS, other private timber companies) in addition to FGS. As a result of these circumstances, habitat conditions on FGS lands is only one factor affecting the presence or absence of northern spotted owls in these activity centers, and the absence of owls in an activity center cannot be used as a definitive measure of the HCP's effectiveness. Nonetheless, it is desirable to monitor occupancy of the activity centers supported by CSAs on the FGS ownership as one component for assessing the effectiveness of the HCP.

Fruit Growers Supply Company will conduct protocol surveys to detect the presence of northern spotted owls in activity centers supported by CSAs. Survey results will be reviewed and approved by the Service to ensure compliance with the "Protocol for surveying proposed management activities that may impact northern spotted owls" (USDI FWS, 2011a), or current northern spotted owl survey protocols approved by the Service. Fruit Growers Supply Company will conduct protocol surveys during two consecutive years, unless a northern spotted owl or owl pair is detected during the first year. If a northern spotted owl or owl pair is detected during the first year of surveys, and resident status is determined, this will indicate occupancy of the activity center, and no follow-up survey is required the second year. The surveys will be repeated at 4-year intervals for the duration of the permit to document and identify trends in occupancy and reproductive status of activity centers supported by CSAs on the FGS ownership. If there are no detections for two consecutive years at more than 40 percent of the CSAs (nine CSAs) within a 4-year period, then FGS will notify the Service and California Department of Fish and Game (CDFG), and enter into a discussion about why the sites are unoccupied and whether any alternative actions within the HCP commitments could promote occupancy. Alternatives such as delayed harvest in nearby activity centers where take is authorized, or establishment of an alternative CSA with similar conservation value could be proposed. If an alternative CSA is identified and approved through written concurrence by the Service, then FGS may conduct timber harvest operations within the unoccupied CSA without further restriction, other than as specified in other sections of this HCP (i.e., the CSA will no longer be considered a conservation or mitigation area).

Monitoring Type:	Effectiveness monitoring.
Sites:	All CSAs established on the FGS ownership.
Sampling Frequency:	Protocol surveys during breeding period for two consecutive years at 4-year intervals.

Objectives:	Determine northern spotted owl occupancy and reproductive status at activity centers supported by CSAs on the FGS ownership.
Methods:	Protocol surveys during the breeding period for northern spotted owl.
Reporting:	Annual reporting of results of any surveys conducted in the preceding year.

***Monitoring for Barred Owls in CSAs*.**

The objective of threat management measures for barred owls is to prevent barred owls from displacing northern spotted owls and becoming established. Detections of barred owls could reflect a range expansion and increased risk of barred owls becoming established. Under the HCP, FGS will survey activity centers supported by the CSAs for barred owls. If barred owls are detected, FGS will work closely with the Service to implement appropriate barred owl control measures as necessary. Following implementation of any control measures, another individual could quickly move into the area. To monitor the effectiveness of the control strategy and minimize the potential for additional barred owls to become established following control actions FGS will, upon request by the Service, conduct annual surveys for barred owls within 1 mile of the detection site. Annual surveys will continue until no barred owls are detected for 3 consecutive years, or until the Service no longer requests additional surveys, after which the survey frequency will revert to the standard protocol of 2 consecutive years every 4 years.

Monitoring Type:	Effectiveness monitoring.
Sites:	Activity centers supported by CSAs on the FGS ownership in which barred owls have been detected and control measures have been implemented.
Sampling Frequency:	Annual protocol surveys during breeding period until no detections for 3 consecutive years or the Service determines that surveys are no longer necessary.
Objectives:	(1) Determine occurrence of barred owls in CSAs. (2) Demonstrate effectiveness of any barred owl control actions.
Methods:	Service-approved protocol surveys for barred owls.
Reporting:	Annual reporting of results of any surveys conducted in the preceding year.

1.4.3.3 Northern Spotted Owl Monitoring Adaptability

The monitoring outlined in the previous sections uses monitoring protocols that represent current, peer-reviewed, and accepted methods at the time of HCP development. It is possible that other monitoring methods may be developed during the term of the HCP, which would provide for better or more cost-effective assessment of compliance with and effectiveness of the conservation measures. FGS and the Service may mutually agree to modify the monitoring protocols listed in this HCP to better monitor the effectiveness of the conservation measures and ensure compliance with the terms of the conservation program at any time.

1.4.4 Reporting Requirements

FGS will regularly submit reports to the Service and CDFG to document its compliance with the terms of the HCP and report the results of effectiveness monitoring. FGS reporting obligations can be separated into three categories:

1. Annual reports
2. Periodic analyses
3. Event-driven analyses

1.4.4.1 Annual Reports

FGS will submit an annual report to the Service and CDFG on HCP activities occurring in the preceding year. At a minimum, the annual report will include:

- Any incidental take of northern spotted owls;
- List of the active THPs and their locations, and identification of THPs in which take minimization and avoidance measures for northern spotted owls were implemented;
- The amount of suitable habitat within the core area and home range of each activity center on the ‘take’ list that has been harvested or otherwise converted to nonhabitat;
- Dates, locations, and results of northern spotted owl surveys conducted in association with THPs;
- Dates, locations, and results of northern spotted owl surveys in CSAs in that year and preceding years; and
- Dates, locations, and results of barred owl surveys in that year and preceding years.

FGS will submit each year’s annual report by March 31 of the following year.

1.4.4.2 Periodic Analysis

FGS will periodically analyze northern spotted owl habitat in the CSAs. As part of the effectiveness monitoring program, FGS will conduct a baseline stand inventory of its lands within CSAs within 2 years of permit issuance and every 10 years thereafter. The inventory results will include:

- Maps of locations of stands that were inventoried;
- For each CSA, the amount and location of suitable northern spotted owl habitat in accordance with the definitions used in this HCP; and
- Estimates of snag, downed woody debris, and hardwood densities.

Results of the inventories and analysis of habitat for northern spotted owl will be included in the annual report for the year in which the inventories are completed.

1.4.4.3 Event-driven Analysis

During the term of the ITP, FGS will not conduct timber operations on its lands in CSAs unless specific habitat requirements are exceeded. If FGS proposes to conduct timber operations in a CSA, including wildfire management and salvage operations, FGS will inventory areas proposed for harvest to document pre-harvest stand conditions (including amount of hardwoods, downed woody debris, and snags) during THP preparation and obtain Service approval prior to operations in the CSA. Following completion of timber operations in a CSA, FGS will analyze habitat conditions for northern spotted owl in CSAs where timber operations have occurred. The post-harvest analysis will include:

- The amount and location of nesting, roosting and foraging habitat within the CSA prior to timber operations;
- The amount and location of nesting, roosting and foraging habitat within the CSA following timber operations;
- Results of stand level inventories of harvested stands in CSAs before and after timber operations; and
- Densities of snags, downed woody debris, and hardwoods in harvested CSAs before and after timber operations.

Results of the post-harvest analyses will be included in the annual report for the year in which the analyses are completed.

1.4.5 Changed and Unforeseen Circumstances

Section 10 regulations (as codified in [50 CFR, Sections 17.22(b)(2) and 17.32(b)(2)]) require that an HCP specify the procedures to be used for dealing with changed and unforeseen circumstances that may arise during the implementation of the HCP. In addition, the No Surprises Rule ([63 Federal Register 8859, February 23, 1998 as codified in 50 CFR 17.22 (b)(5), 17.32 (b)(5), and 222.307(g)]) describes the obligations of the permittee and the Services. The purpose of the No Surprises Rule is to provide assurance to the non-Federal landowners participating in habitat conservation planning under the ESA that no additional land restrictions or financial compensation will be required for species adequately covered by a properly implemented HCP, in light of unforeseen circumstances, without the consent of the permittee.

1.4.5.1 Changed Circumstances

Changed circumstances are defined in 50 CFR 17.3 and 222.102 as changes in circumstances affecting a species or geographic area covered by an HCP that can reasonably be anticipated by plan developers and the Service, and for which contingency plans can be prepared (e.g., the new listing of species, a fire, or other natural catastrophic event in areas prone to such event). If additional conservation and mitigation measures are deemed necessary to respond to changed circumstances, and these additional measures were already provided for in the plan's operating conservation program (e.g., the conservation management activities or mitigation measures expressly agreed to in the HCP or IA), then the permittee will implement those measures as specified in the plan. However, if such measures were not provided for in the plan's operating conservation program, the Service will not require these additional measures without the consent of the permittee, provided that the HCP is being "properly implemented" (properly implemented means the commitments and the provisions of the HCP and the IA have been or are being fully implemented). At no time does the ITP authorize Covered Activities to put a species in jeopardy.

For the purposes of this HCP, changed circumstances are those changes affecting a species or geographic area covered by the HCP that can reasonably be anticipated and planned for by FGS and the Service at the time of the HCP's preparation. In discussions with the Service, NMFS, and CDFG, FGS identified several reasonably foreseeable circumstances under which changes could occur during the term of the ITP that could result in a substantial and adverse change in the status of a species covered by the HCP. Foreseeable conditions that could result in "changed circumstances" as defined in applicable Federal regulations and policies that may affect terrestrial covered species are identified below.

- Global climate change, resulting in increased fire risk, flooding, drought, incidence of pests or pathogens, increase in the number or density of invasive species, or restriction in the range of Covered Species at a regional or local scale. These issues are individually addressed in the sections below as they would pertain to changed circumstances in the Plan Area.

- Listing of species that are currently unlisted but occur within the HCP Plan Area.

- A change in the listing status (including de-listing) of a Covered Species through a formal status review by the Service and NMFS.

- Designation or revision of critical habitat for covered species or species listed after the start of the term of the ITP that may be affected by a Covered Activity.

- Stand replacing fire that (alone or in combination with other events such as blow-down) downgrades suitable habitat within the core area or home range of an activity center supported by a CSA on the FGS ownership to non-habitat, such that the CSA no longer provides demographic support to the Federal conservation strategy or meets the biological objectives of the HCP.

- Blow-down that (alone or in combination with other events such as fire) downgrades suitable habitat within the core area or home range of an activity center supported by a CSA on the FGS ownership to non-habitat, such that the CSA no longer provides demographic support to the Federal conservation strategy or meets the biological objectives of the HCP.

- Stand modification (e.g., changes in average diameter or canopy coverage) due to pests or pathogens, or their control, that (alone or in combination with other events such as fire and blow-down) downgrades suitable habitat within the core area or home range of an activity center supported by a CSA on the FGS ownership to non-habitat, such that the CSA no longer provides demographic support to the Federal conservation strategy or meets the biological objectives of the HCP.

- Introduction or invasion by exotic plant or animal species (e.g., barred owl) that affect Covered Species or their habitat.

The potential for each of these circumstances is reasonably foreseeable. As described in this subsection, FGS also has considered the potential for earthquakes to have effects that could constitute "changed circumstances." FGS's strategy for addressing each of these changed circumstances is described in the following. If changed circumstances occur, FGS will implement the supplemental prescriptions set forth in the HCP and summarized below.

Global Climate Change

According to the Service (USDI FWS 2008a), the potential effects of increasing atmospheric concentrations of carbon dioxide and other "greenhouse gases," and the observed increase in the average temperature of the Earth's atmosphere and oceans, have been the subject of considerable technical analysis and political debate. There is growing consensus that climate change is occurring and additional change is predicted. Global climate change has the potential to influence fire risk and the incidence of exotic species, flooding, drought, and disease at a regional and local scale. The impacts of these proximal events (e.g., fire, flood) due to global climate change are addressed in the following subsections as they would pertain to changed circumstances in the Plan Area.

There is considerable uncertainty associated with projecting future climate change. This is partly due to uncertainties about future emissions of greenhouse gases and to differences among climate models and simulations (Stainforth et al. 2005, Duffy et al. 2006). There are no known climate change simulations for the Klamath-Siskiyou region, but the results of numerous climate change simulations for California and the Pacific Northwest have been published. Together, these simulations describe a range of plausible outcomes from increased emissions of greenhouse gases.

The projected effects of climate change on local and regional temperatures, precipitation, vegetation, and fire are described below. Much of the following discussion was taken from the 12-Month Finding on a Petition to List the Siskiyou Mountains Salamander (*Plethodon stormi*) and Scott Bar Salamander (*Plethodon asupak*) as Threatened or Endangered (73 FR 4380; January 24, 2008). The 12-month finding on this petition is particularly relevant to the FGS HCP because the range of both of these species overlaps the Plan Area; thus, the analysis represents the best available information on the effects of global climate change in the Plan Area.

All of the studies that were reviewed predicted continued increases in average surface temperatures in California and the Pacific Northwest in response to increased emissions of greenhouse gases (Leung and Ghan 1999, Snyder et al. 2002, Electric Power Research Institute [EPRI] 2003, Hayhoe et al. 2004, Cayan et al. 2006, Duffy et al. 2006, Maurer 2007, Salathé et al. submitted). The magnitude of projected increases in annual average temperature varied widely among studies, depending on the models and emissions scenarios used, from 3 to 10.4°F, by the year 2100 (EPRI 2003, Hayhoe et al. 2004, Cayan et al. 2006, Maurer 2007). Simulations consistently project more pronounced temperature increases in California during the summer months than during other times of the year, 3.9 to 14.9 °F by 2100 (Hayhoe et al. 2004, Cayan et al. 2006, Maurer 2007). Some simulations projected more rapid temperature increases at higher elevations than at lower ones (Leung and Ghan 1999, Salathé et al. submitted). Most researchers attributed this difference to a snow albedo feedback effect; this occurs when increased surface temperatures cause earlier and faster snow melt, which, in turn, allows more absorption of heat by the ground and further increases in surface temperatures.

Reviews of a large number and variety of climate change simulations found that projected changes to precipitation in California were highly variable but clustered around no change or a slight increase in annual precipitation (Cayan et al. 2006, Maurer 2007). Warming temperatures are consistently projected to increase the proportion of precipitation that falls as rain rather than as snow in California and the Pacific Northwest (Leung and Ghan 1999, Snyder et al. 2002, Hayhoe et al. 2004, Cayan et al. 2006, Maurer 2007). Earlier and more rapid snowmelt and decreases in the proportion of precipitation that falls as snow are expected to cause declines in spring snowpacks (Hayhoe et al. 2004, Cayan et al. 2006, Maurer 2007). Declines in spring snowpacks have already occurred in some areas and are correlated with global warming trends (Mote 2003). However, despite regional warming over the past half century, the glaciers of Mount Shasta have continued to expand following a contraction during a prolonged drought in the early twentieth century (Howat et al. 2007). Some areas will experience increased cloud cover as surface temperatures continue to increase (Croke et al. 1999).

Vegetation modeling by Lenihan et al. (2003a, 2003b) projected that increased emissions of greenhouse gases will cause large-scale replacement of evergreen conifer forest (e.g., Douglas fir-white fir) with mixed evergreen forest (e.g., Douglas-fir-tanoak) in the Klamath- Siskiyou region. This redistribution of vegetation types is predicted to occur under conditions created by two contrasting climate change models (Lenihan et al. 2003a).

Loarie et al. (2008) projected that up to 66 percent of California's endemic flora would experience >80 percent reductions in range size as a result of anticipated climate changes. While this is a worst-case scenario based on high levels of CO2 emissions in the future, a global climate model with high sensitivity to atmospheric greenhouse gas levels, and no dispersal component, the models ignore several factors that would exacerbate the projected impacts of climate change, including specialization to restricted soil types and the spread of invasive species. Because Yreka phlox is restricted to ultramafic soil types and has limited dispersal capabilities, global climate change could result in a reduction in the range of this species. However, it is difficult to speculate as to the extent of range reduction that could occur within the Plan Area and the complete loss of local populations is not anticipated. The conservation strategy for Yreka phlox addresses this potential for a range reduction by allowing seeds to be collected on FGS lands for long-term storage and development of techniques to reestablish populations, consistent with the Federal recovery strategy.

Despite variability in climate change simulations, consistent projections for warmer summers, reduced spring snowpacks, and earlier and more rapid snowmelt suggest that forests in California and the Pacific Northwest will experience longer fire seasons and more frequent, extensive, and severe fires in the future (Flannigan et al. 2000, Lenihan et al. 2003a, Whitlock et al. 2003, McKenzie et al. 2004). Whether or not these fire predictions will occur is unknown due to inconsistent predictions for precipitation, including increased cloud cover and rainfall. However, the planned response to changed circumstances related to wildfire is described below in the Fire and Wind section.

Listing of Species that are Currently Unlisted

The preamble to the No Surprises rule states that the listing of a species as endangered or threatened could constitute a changed circumstance.

If a species that is not a Covered Species under the HCP ("Non-Covered Species") is listed the Federal ESA subsequent to the effective date of the ITP, and the Non-Covered Species is affected by the Covered Activities, such listing will constitute a changed circumstance. If a Non-Covered Species that may be affected by a Covered Activity is listed under the Federal ESA during the term of the ITP, the Section 10 Permits will be reevaluated by the Service. The HCP Covered Activities may be modified, as necessary, to ensure that the activities covered under the HCP are not likely to jeopardize or result in the take of Non-Covered Species. FGS shall implement the modifications to the HCP Covered Activities determined by the Service in consultation with FGS to avoid the likelihood of jeopardy to or take of the Non-Covered Species. FGS shall continue to implement such modifications until such time as they apply for and the Service approves an Amendment of the Section 10 Permit, in accordance with applicable statutory and regulatory requirements, to cover the Non-Covered Species or until the Service

notifies FGS in writing that the modifications to the HCP Covered Activities are no longer required to avoid the likelihood of jeopardy of Non-Covered Species.

Change in the Listing Status of Covered Species

It is conceivable that the listing status of a Covered Species could be changed (i.e., from Threatened to Endangered) through a formal status review during the term of the ITP. Because conservation measures for these species are included in this HCP and these species are "Covered" by the ITP being issued, a change in the listing status of these species would not be considered a changed circumstance and will not have the effect of causing additional land, mitigation, restrictions, or compensation to be required of FGS if this HCP is being implemented in compliance with the take authorization conditions for that species. Notwithstanding the above, the ITP may be suspended or revoked if continuation of the ITP would result in jeopardy.

If the listing status of a Covered Species is downgraded (i.e., from Endangered to Threatened) or the species is de-listed during the term of the ITP through a formal status review, then the HCP may be modified, as appropriate, to reduce or eliminate required measures for that species, if the Service concludes that such measures did not contribute, in whole or in part, to the decision to de-list the species and that modification of such measures is not likely to lead to or contribute to re-listing of the species. FGS will continue to implement the HCP in accordance with all applicable provisions until such time the company applies for and the Service approves an Amendment of the ITP.

Designation or Revision of Critical Habitat for Covered or Non-Covered Species

Critical habitat has been designated for some of the federally listed species covered by this HCP. If in the future, critical habitat that is currently designated for a Covered Species is revised, or critical habitat is newly designated for a Covered Species, and such designated or revised critical habitat may be affected by one or more Covered Activities, or if critical habitat is designated or revised for a Non-covered species and such designated or revised critical habitat may be affected by one or more Covered Activities, such revision or designation of critical habitat would constitute a changed circumstance, and the Section 10 permit will be reevaluated by the affected Service in consultation with FGS. If the affected Service concludes that one or more Covered Activities would adversely modify designated or revised critical habitat, the Covered Activity(ies) shall be modified to the extent necessary to avoid adverse modification. The affected Service shall work with FGS and with the other Service to limit any modifications to the Covered Activities to those that necessary to avoid adverse modification of critical habitat and are the least disruptive to FGS's on-going timber operations. FGS shall either implement the modifications to the Covered Activities identified by affected Service until the affected Service notifies FGS in writing that the modifications to the Covered Activities are no longer required to avoid adverse modification of critical habitat, or FGS may relinquish the Permits in accordance with applicable Service regulations. Notwithstanding the above, the ITPs may be suspended or revoked if continuation of the Permits would result in adverse modification of any newly designated or revised critical habitat.

Fire and Wind

Fire frequency, intensity, and size within the Plan Area have changed since the fire-suppression era (1950 to present) (Fry and Stephens, 2006). Prior to the fire-suppression era, fires occurred frequently; and in most of the vegetation assemblages covering large portions of the Klamath Mountains, they were of generally low to moderate and mixed severity (Skinner et al., 2006). Fires occurring in the fire-suppression era are less frequent and have greater intensity, resulting in a more homogeneous effect on the habitat by damaging and removing all vegetation (Fry and Stephens, 2006). These are often considered "stand-replacing" fires. Stand-replacing fires can cause immediate long-term changes that affect watershed processes, terrestrial and aquatic species and their habitats, and timber. Fire suppression is not a covered activity. The strategy for responding to and suppressing forest fires is generally established by CAL FIRE and USFS. FGS has little ability to influence such strategy.

A blow-down event in a CSA that downgrades suitable habitat for northern spotted owls to non-habitat could have adverse effects on this species, although, in some cases, trees blown down by wind can benefit northern spotted owls by providing habitat for their prey base.

Alteration of forest stands in the CSAs due to fire and wind (alone or in combination with other factors such as pest damage), can adversely affect habitat quantity and quality for northern spotted owls, reducing the effectiveness of the CSAs in meeting the biological objectives of the HCP. Because fire and wind have similar effects (i.e., tree removal and subsequent alteration of terrestrial habitats), they are considered as a group in terms of defining what may constitute a changed circumstance.

For northern spotted owls, it is important that enough suitable habitat is maintained within the CSAs to provide demographic support to the Federal conservation strategy and meet the objectives of the HCP. For this reason, the conditions for allowable harvest in a CSA (see section 5.3.1.1 of the HCP) are used to identify when the CSA may no longer provide demographic support of the Federal conservation strategy and could constitute a changed circumstance.

Changed Circumstances with Respect to Protection of the Northern Spotted Owl

The terrestrial species conservation program for northern spotted owl (see section 5.3.1.1 of the HCP) includes specific conditions under which harvest activities can be conducted in CSAs. The harvest restrictions are based on habitat targets for the CSA as a whole (regardless of ownership, established to promote a high probability of occupancy by northern spotted owl nesting pairs at these known activity centers with high conservation value to the Federal conservation strategy. If a stand replacing fire or damage due to wind results in a downgrade of suitable habitat within the core area or home range of an activity center supported by a CSA on the FGS ownership to non-habitat, such that the conditions for allowable harvest in the CSA (see section 5.3.1.1 of the HCP) can no longer be met over the term of the ITP, this will indicate that the CSA may no longer meet the objectives of the HCP and may constitute a changed circumstance. In the event that fire or wind affects a CSA by alteration of suitable northern spotted owl habitat, FGS will provide the Service with information regarding the habitat alteration due to fire or wind within

30 days of detection. FGS, in consultation with the Service, will determine if a changed circumstance has occurred, based on the quantity and quality of habitat for northern spotted owls that remains in the CSA or could develop over the term of the ITP. Based on the fire history database maintained by the USFS, it is reasonably foreseeable that up to four CSAs could be adversely affected by stand replacing fires during the term of the ITP, potentially resulting in a changed circumstance. The frequency of adverse effects due to wind cannot be estimated, but is anticipated to be less than the incidence of stand-replacing fires. If a changed circumstance affecting a CSA due to fire or wind occurs, FGS will apply the following supplemental prescriptions within affected CSAs.

1. Trees damaged or killed outright by fire or wind, including those in WLPZs or Stream Management Zones (SMZs), will be considered by FGS for salvage.

2. Salvage of trees downed or dead by fire or wind within CSAs must comply with State law, other terms of this HCP (i.e., on unstable areas), and be approved by the Service prior to removal.

3. Reforestation of any CSA affected by the fire or wind will be implemented as soon as reasonably possible. Equipment Exclusion Zones will be avoided during any reforestation activities associated with fire or wind.

4. FGS will enter into discussions with the Service regarding alternatives that would maintain the approximate conservation value provided by the affected CSA(s) under the original conservation strategy. Alternatives could include, but are not limited to, delayed harvest around nearby activity centers where take is authorized, or establishment of an alternative CSA with similar conservation value. If an alternative CSA is identified and approved through written concurrence by the Service, then FGS may conduct timber harvest operations within the fire or wind damaged CSA without further restriction, other than as specified in other sections of the HCP (i.e., the CSA will no longer be considered a conservation or mitigation area).

Pest or Pathogen Infestation

Insects and diseases can usually be kept under control through careful forest management and proper treatments. Natural control of insects can take place through climatic conditions, parasites, or predators via biological control. Defoliators, borers, bark beetles, and various terminal and root feeders, along with sucking insects, are common types of insects in California forests. However, large outbreaks of insects or pathogens are uncommon in the Plan Area.

Introduced pathogens can also lead to the decline of native tree species. One example is Sudden Oak Death (SOD) caused by *Phytophthora ramorum*. In 14 coastal California counties and Curry County, Oregon, *P. ramorum* has caused outbreaks of SOD, killing more than 1 million native oak and tanoak trees (California Oak Mortality Task Force [COMTF], 2008). Under a worst case circumstance, as infected trees die, the niche they occupied becomes colonized by other forest tree species. Because there are no known incidences of SOD within the Plan Area, and the Plan Area is in an area considered to have a very low risk of establishment and spread of

SOD (COMTF, 2008), the disease is not expected to have a measurable adverse effect on the Covered Species or on the functional attributes of the HCP.

Site quality and nutrient availability play a key role in forest health and vigor and susceptibility to insect or pathogen damage. Since much of the Plan Area is of moderate site quality, infestations are less likely to occur within the healthy forests that occupy these sites. Criteria for changed circumstances apply only to pest and pathogen damage that occurs in CSAs established around northern spotted owl activity centers.

The conservation measures identified in section 5.3.1.1 of the HCP provide protection against most pest or pathogen invasions by promoting forest health. However, prolonged drought as a result of global climate change could alter the resistance of native forests to various pests or pathogens. If stand modification due to pests or pathogens, or their control, (alone or in combination with other factors such as fire and wind) downgrades suitable habitat within the core area or home range of an activity center supported by a CSA on the FGS ownership to non-habitat, such that the conditions for allowable harvest in the CSA can no longer be met over the term of the ITP, this will indicate that the CSA may no longer meet the objectives of the HCP and may constitute a changed circumstance. FGS will provide the Service with information regarding the damage within 30 days of detection and, in consultation with the Service, will determine if a changed circumstance has occurred, based on the quantity and quality of habitat for northern spotted owls that remains in the CSA or could develop over the term of the ITP. If a changed circumstance affecting a CSA due to pests or pathogens occurs, FGS will apply the following supplemental prescriptions within affected CSAs.

1. Trees damaged or killed outright by pests or pathogens in a CSA, including those in WLPZs and SMZs, will be considered by FGS for salvage.

2. Salvage of trees damaged or killed by pests or pathogens within CSAs must comply with State law and be approved by the Service prior to removal.

3. Reforestation of any CSA affected by pests or pathogens, or their control, will be implemented as soon as reasonably possible. Equipment Exclusion Zones will be avoided during any reforestation activities associated with pests or pathogens.

4. FGS will enter into discussions with the Service regarding alternatives that would maintain the approximate conservation value provided by the affected CSA(s) under the original conservation strategy. Alternatives could include, but are not limited to, delayed harvest around nearby activity centers where take is authorized, or establishment of an alternative CSA with similar conservation value. If an alternative CSA is identified and approved through written concurrence by the Service, then FGS may conduct timber harvest operations within the pest or pathogen damaged CSA without further restriction, other than as specified in other sections of the HCP (i.e., the CSA will no longer be considered a conservation or mitigation area).

Invasive Species

The Service anticipates that barred owls will colonize suitable habitat within the Plan Area within the term of the ITP. Because barred owls select habitat similar to that occupied by northern spotted owls, it is likely that newly established barred owl territories will overlap and may displace northern spotted owls within some of the known activity centers. The function of CSAs in providing conservation support to high value activity centers will be compromised in direct proportion to the number of barred owls that colonize the CSAs. Displacement of northern spotted owls from a CSA is considered a changed circumstance and may require implementation of barred owl control measures. This low threshold for triggering barred owl management is necessary because offspring produced at established barred owl territories, regardless of location within CSAs or not, will increase the threat to northern spotted owl territories supported by CSAs.

To maintain the functionality of the Terrestrial Species Conservation Program, FGS will monitor the CSAs and other activity centers on its ownership for barred owl presence. If barred owls are detected in any CSA or activity center on the FGS ownership, FGS will notify the Service within 10 days of detection. FGS will enter into discussions with the Service regarding alternative management actions for barred owls. Such actions could include, but are not limited to, control of barred owls through removal and study of barred owl/northern spotted owl interactions. As part of the ITP issuance, FGS will apply for a Federal Depredation Permit for barred owls as needed. FGS will help to facilitate (e.g., through providing access to and across its ownership) implementation of barred owl control measures deemed appropriate by the Service at the time of detection.

Earthquakes

The Plan Area is located in an area that is not known for earthquakes. Earthquakes are quite uncommon and are generally of a relatively insignificant magnitude, typically 2 to 3 on the Richter scale. Occasionally, greater magnitude events occur, but they are impossible to predict. In the forest environment, earthquakes of magnitude 6 or less on the Richter scale produce little, if any, visible change, and apparently have little impact on wildlife or fishery habitat.

While it may be speculated that localized landslides or other earth movements resulted from these earthquakes, there are no data to document that this occurred within the Plan Area.

An earthquake of such magnitude (greater than magnitude 6 on the Richter scale) that may substantially alter habitat status or require additional conservation or mitigation measures in excess of those already included in the Plan is not reasonably foreseeable during the life of the Plan, and would be considered an “unforeseen circumstance.”

1.4.5.2 Unforeseen Circumstances

Unforeseen circumstances are changes in circumstances affecting a species or geographic area covered by the HCP that could not reasonably have been anticipated by FGS and the Service at the time the HCP was developed and negotiated, and that result in a substantial and adverse

change in the status of a Covered Species (50 CFR 17.3 and 222.102). The Service bears the burden of demonstrating that unforeseen circumstances exist, using the best scientific and commercial data available. All changes not described above as "changed circumstances" that would result in a substantial and adverse change in the status of a Covered Species are considered unforeseen circumstances.

In case of an unforeseen event, FGS will immediately notify the Service. In determining whether such an event constitutes an unforeseen circumstance, the Service shall consider, but not be limited to, the following factors: size of the current range of the affected species; percentage of range adversely affected by the HCP; percentage of range conserved by the HCP; ecological significance of that portion of the range affected by the HCP; level of knowledge about the affected species and the degree of specificity of the species' conservation program under the HCP; and whether failure to adopt additional conservation measures would appreciably reduce the likelihood of survival and recovery of the affected species in the wild.

If the Service determines that additional conservation and mitigation measures are necessary to respond to the unforeseen circumstances, and the HCP is being properly implemented, the additional measures required will be, to the maximum extent practicable, as close as possible to the terms of the original HCP, and must be limited to modifications within any conserved habitat area or to adjustments within lands or waters that already are set-aside in the HCP's operating conservation program. Additional conservation and mitigation measures shall not involve the commitment of additional land or financial compensation, or restrictions on the use of land or other natural resources otherwise available for development or use under the original terms of the HCP without the consent of the permit holder.

1.4.6 Funding

FGS has been a business entity since 1907 and has an established track record as a forest products company. In general, FGS will finance the HCP with revenues from its ongoing timber harvest operations. Accordingly, as harvesting is planned and carried out, it will provide the funds needed to carry out the HCP's measures to mitigate the impacts of take.

As described throughout the HCP, and as warranted in the IA, FGS has committed to expend the necessary funds to fulfill its obligations under the plan. After the issuance of the ITP by the Service, FGS will post a security deposit as an additional form of assurance that adequate funding will be provided for the HCP.

Further, by January 1st of each calendar year during the term of the ITP, and following the adoption of FGS company budget by its Board of Directors (which normally occurs by the end of November of the prior year), FGS will provide the Service with a Yearly Expenditure Report (YER). The YER will, when appropriate, identify the HCP tasks undertaken the prior year, and the funds expended to implement those tasks. The YER will also identify: (1) HCP tasks FGS intends to implement in the upcoming calendar year (e.g., monitoring, surveying), (2) out-of-pocket expenditures related to those tasks (e.g., hiring of outside specialists), (3) funds budgeted for those purposes, and (4) whether the budgeted funds are THP-related or not. FGS must

provide this information to the Service for their review and concurrence before any activity authorized by the HCP may commence.

1.4.7 Modifications and Amendments

There are two types of changes that may be made to the HCP and/or the HCP Permits and/or its associated documents:

- Minor Modifications
- Amendments

Minor Modifications and Amendments shall be processed in accordance with the provisions of the IA and all applicable legal requirements, including but not limited to the ESA, NEPA, and any applicable Federal regulations.

1.4.7.1 Minor Modifications

Minor Modifications to the HCP are changes provided for under the operating conservation program. Minor Modifications do not (1) modify the scope or nature of activities or actions covered by the Section 10(a)(1)(B) permit; (2) result in operations under the HCP that are significantly different from those contemplated or analyzed in connection with the Plan as approved; (3) result in adverse impacts on the environment that are new or significantly different from those analyzed in connection with the Plan as approved; or (4) result in additional take not analyzed in connection with the HCP as approved. As noted above, Minor Modifications shall be processed in accordance with the provisions of the IA and all applicable legal requirements, including but not limited to the ESA, NEPA, and any applicable Federal regulations.

Minor Modifications to the HCP may include, but are not limited to, the following:

1. Correcting any maps or exhibits in mapping or boundary lines.

2. Modifying existing or establishing new avoidance or minimization measures that incorporate new nomenclature or technology. Any new or modified measures will not be substantially different in nature from existing measures and will achieve equivalent or greater protection for Covered Species.

3. Making minor changes to monitoring or reporting protocols.

4. Revising mitigation area enhancement and management techniques.

5. Making minor modifications to the HCP that are consistent with the biological goals and objectives of the HCP, and that the Service has analyzed and agreed to.

It is anticipated that FGS may, over the term of the ITP, sell or acquire additional timberlands in drainages where they currently have ownership. Sales and acquisitions of lands to be covered by

the HCP shall be subject to the provisions of the IA and all applicable legal requirements, including but not limited to the ESA, NEPA, and any applicable Federal regulations.

1.4.7.2 Amendments to the HCP

Amendments to the HCP include, but are not limited to changes that affect the scope of the HCP and conservation strategy, increase the amount of take, add new species, or change significantly the boundaries of the HCP. Amendments to the HCP require an amendment to the Section 10(a)(1)(B) permits and to the Service decision documents, including NEPA documents, biological opinions, and findings and recommendations documents. Amendments will also require additional public review and comment. As noted above, Amendments shall be processed in accordance with the provisions of the IA and all applicable legal requirements, including but not limited to the ESA, NEPA, and any applicable Federal regulations.

The following describes several types of changes that would require an Amendment to the HCP.

1. The listing under the ESA of a new species within the Plan Area that is not an HCP Covered Species but may be affected by HCP Covered Activities, and for which the permittee seeks coverage under the HCP and Section 10(a)(1)(B) permit.

2. Significant changes to the HCP including, but not limited to the following:

    a. Changes to the method for calculating compensation for incidental take, which would increase the levels of incidental take permitted for the HCP.

    b. A material change in the level of funding except as otherwise provided for in the HCP to account for all adjustments for inflation and changed circumstances.

3. Changes to the Covered Activities that were not addressed in the HCP as originally adopted, and which otherwise do not meet the provisions for Minor Modifications above.

4. Extending the term of the ITP past the 50-year term.

5. Changes in the Plan Area through acquisition of properties that exceed the limit of 10 percent of the Initial Plan Area (15,218 acres).

6. Changes in the Plan Area through the sale of properties that provide suitable habitat for any of the Covered Species or mitigation for impacts to these species on the remaining ownership and the new owner(s) do not wish to assume the obligations of the ITP through the process identified below in section 1.4.7.6.

1.4.7.3 Amendments to the Section 10(a)(1)(B) Permits

Amendments to the HCP will require an amendment to the Section 10(a)(1)(B) permit. Amendments to the Section 10(a)(1)(B) permit shall be processed in accordance with the

provisions of the IA and all applicable legal requirements, including but not limited to the ESA, NEPA, and any applicable Federal regulations.

1.4.7.4 Permit Transfer

All or a portion of the ITP may be transferred to a third party in accordance with the current statutory and regulatory requirements governing such transfers. Currently, regulations governing ITP transfers are codified at 50 C.F.R. 13.25(b). If the sale or transfer of a single or multiple parcels over the term of the ITP cumulatively involves more than 10 percent of the Initial Plan Area (15,218 acres) and the new owner(s) do not wish to accept transfer of the ITP, then FGS must apply for an Amendment to the HCP and ITP (see section 1.4.7.2). For the "No Surprises" assurances for Yreka phlox to be extended to the new owner(s), the new owner(s) must continue to implement the conservation measures specified in the HCP.

If the sale or transfer involves land committed as mitigation under the HCP (i.e., CSAs) and the new owner(s) do not wish to transfer the ITP, then FGS must provide mitigation on the remainder of its ownership that is equivalent in value to the mitigation areas being sold or transferred. In consultation with the Service, FGS will select and maintain CSAs around activity centers that provide an equivalent level of mitigation based on total conservation value. FGS will adhere to the Plan measures (meeting the biological goals and objectives) on the remaining Plan Area for the original term of the ITP (50 years from issuance).

If the sale or transfer involves land where incidental take of owls is authorized under the HCP (i.e., 'take' sites) and the new owner(s) do not wish to transfer the ITP, then FGS must provide mitigation for the take of owls at the 3:1 mitigation ratio provided for in the Terrestrial Species Conservation Strategy. In consultation with the Service, FGS will select and maintain CSAs around activity centers on the remaining ownership that meet the 3:1 mitigation ratio based on total conservation value. FGS's mitigation commitment does not relieve the new owner's obligation under the Federal ESA.

FGS, however, will not be required to establish additional CSAs for mitigation on its ownership if the new owner(s) apply for and receive authorization for transfer of the ITP or if the land sold or transferred is mitigation for the take sites (i.e., at a 3:1 ratio based on conservation value). FGS will adhere to the Plan measures (meeting the biological goals and objectives) on the remaining Plan Area for the original term of the ITP (50 years from issuance).

1.4.7.5 Early Termination

In the event of early termination of the HCP and ITP, FGS will carry out all outstanding mitigation obligations as follows:

- FGS will mitigate any incidental take that has occurred as a result of habitat modification by maintaining one or more CSAs that provide an overall conservation value equal to at least three (3) times the conservation value of the activity centers where take has occurred for the original term of the ITP.

Under the HCP, incidental take through habitat modification is authorized at 43 known activity centers that provide 18 percent of the total conservation value of known activity centers in the Action Area. The impacts of this taking are mitigated by the development, protection, and enhancement of suitable northern spotted owl habitat on the FGS ownership within 24 CSAs that provide 55 percent of the total conservation value of known activity centers in the Action Area (a 3:1 ratio). This same mitigation ratio (3:1) will be used in the event of early termination to identify the appropriate level of mitigation for incidental take that has occurred prior to termination of the HCP and ITP.

The level of incidental take that has occurred prior to termination of the HCP will be based on the amount (acreage) and location of suitable northern spotted owl habitat within the core and home range of known activity centers within the Action Area that are rendered unsuitable. In the event of early termination of the HCP and ITP, FGS will field verify the extent of habitat conversion for activity centers where incidental take is authorized to determine, in consultation with the Service, the level of take that has occurred prior to termination of the HCP and ITP. The sum of the conservation value of those activity centers where incidental take due to habitat modification has occurred is the level of impact that must be mitigated at a 3:1 ratio. In consultation with the Service, FGS will select an adequate number of CSAs from those established in the Plan to meet the 3:1 mitigation ratio based on total conservation value. FGS will adhere to the Plan measures (harvest restrictions and habitat commitments) (see Table 1) in the selected CSAs for the original term of the ITP (50 years from issuance).

2.0 STATUS OF THE SPECIES

2.1 Northern Spotted Owl

2.1.1 Legal Status

The northern spotted owl was listed as threatened on June 26, 1990 due to widespread loss and adverse modification of suitable habitat across the owl's entire range and the inadequacy of existing regulatory mechanisms to conserve the owl (USDI FWS 1990a). The U.S. Fish and Wildlife Service recovery priority number for the northern spotted owl is 6C, on a scale of 1C (highest) to 18 (lowest) (USDI FWS 1983a, 1983b, 2004a). This number reflects a high degree of threat, a low potential for recovery, and the owl's taxonomic status as a subspecies. The "C" reflects conflict with development, construction, or other economic activity. The northern spotted owl was originally listed with a recovery priority number of 3C, but that number was changed to 6C in 2004 during the 5-year review of the species (USDI FWS 2004a).

2.1.2 Life History

2.1.2.1 Taxonomy

The northern spotted owl is one of three subspecies of spotted owls currently recognized by the American Ornithologists' Union. The taxonomic separation of these three subspecies is supported by genetic (Barrowclough and Gutiérrez 1990, Barrowclough et al. 1999, Haig et al. 2004), morphological (Gutiérrez et al. 1995), and biogeographic information (Barrowclough and

Gutiérrez 1990). The distribution of the Mexican subspecies (*S. o. lucida*) is separate from those of the northern and California (*S. o. occidentalis*) subspecies (Gutiérrez et al. 1995). Recent studies analyzing mitochondrial DNA sequences (Haig et al. 2004, Chi et al. 2004, Barrowclough et al. 2005) and microsatellites (Henke et al., unpubl. data) confirmed the validity of the current subspecies designations for northern and California spotted owls. The narrow hybrid zone between these two subspecies, which is located in the southern Cascades and northern Sierra Nevadas, appears to be stable (Barrowclough et al. 2005).

2.1.2.2 Physical Description

The northern spotted owl is a medium-sized owl and is the largest of the three subspecies of spotted owls (Gutiérrez et al. 1995). It is approximately 18 inches to 19 inches long and the sexes are dimorphic, with males averaging about 13 percent smaller than females. The mean mass of 971 males taken during 1,108 captures was 1.28 pounds (out of a range of 0.95 pound to 1.52 pounds), and the mean mass of 874 females taken during 1,016 captures was 1.46 pounds (out of a range of 1.1 pounds to 1.95 pounds) (P. Loschl and E. Forsman, pers. comm. cited in USDI FWS 2008a). The northern spotted owl is dark brown with a barred tail and white spots on its head and breast, and it has dark brown eyes surrounded by prominent facial disks. Four age classes can be distinguished on the basis of plumage characteristics (Forsman 1981, Moen et al. 1991). The northern spotted owl superficially resembles the barred owl, a species with which it occasionally hybridizes (Kelly and Forsman 2004). Hybrids exhibit physical and vocal characteristics of both species (Hamer et al. 1994).

2.1.2.3 Current and Historical Range

The current range of the northern spotted owl extends from southwest British Columbia through the Cascade Mountains, coastal ranges, and intervening forested lands in Washington, Oregon, and California, as far south as Marin County (USDI FWS 1990a). The range of the northern spotted owl contacts the range of the range of the California spotted owl in northern California near the southern end of the Cascade Range (Thomas et al. 1990, USDI FWS 1992b, Barrowclough et al. 1999, Haig et al. 2001). The range of the northern spotted owl is partitioned into 12 physiographic provinces (see Figure 1) based on recognized landscape subdivisions exhibiting different physical and environmental features (Thomas et al. 1993). These provinces are distributed across the species' range as follows:

- Four provinces in Washington: Eastern Washington Cascades, Olympic Peninsula, Western Washington Cascades, Western Washington Lowlands

- Five provinces in Oregon: Oregon Coast Range, Willamette Valley, Western Oregon Cascades, Eastern Oregon Cascades, Oregon Klamath

- Three provinces in California: California Coast, California Klamath, California Cascades

The northern spotted owl is extirpated or uncommon in certain areas such as southwestern Washington and British Columbia. Timber harvest activities have eliminated, reduced or fragmented northern spotted owl habitat sufficiently to decrease overall population densities

across its range, particularly within the coastal provinces where habitat reduction has been concentrated (Thomas and Raphael 1993).

2.1.2.4 Behavior

Locomotion

Northern spotted owls spend virtually their entire lives beneath the forest canopy (Courtney et al. 2004). It is adapted to maneuverability beneath the forest canopy rather than strong, sustained flight, and mostly makes numerous short flights during the day (Gutiérrez et al. 1995). Foraging is accomplished by moving from perch to perch through the forest, perching and waiting for prey activity and then pouncing on prey once it is located by sight or sound (Forsman 1976, 1980; Forsman et al. 1984; Gutiérrez et al. 1995).

Roosting and Thermoregulation

Northern spotted owls seek sheltered roosts to avoid inclement weather, summer heat, and predation (Forsman 1976, 1980; Barrows and Barrows 1978; Barrows 1981; Forsman et al. 1984; Ting 1998). During warm weather, northern spotted owls seek roosts in shady recesses of understory trees and occasionally will even roost on the ground (Barrows and Barrows 1978; Barrows 1981; Forsman et al. 1984; Gutiérrez et al. 1995). In winter, they roost relatively high near the bole of canopy trees with overhanging branches to shelter themselves from precipitation, or when sunny, will seek roosts with sun exposure (Sisco 1984). Both adults and juveniles have been observed drinking water, primarily during the summer, and is thought to be associated with thermoregulation (Gutiérrez et al. 1995).

Daily Activity Pattern

Northern spotted owls are primarily noctural (Forsman et al. 1984). They forage between dawn and dusk and sleep during the day with peak activity occurring during the two hours after sunset and the two hours prior to sunrise (Forsman et al. 1984, Gutiérrez et al. 1995, Delaney et al. 1999). They will sometimes take advantage of vulnerable prey near their roosts during the day (Laymon 1991, Sovern et al. 1994).

Agonistic Behavior and Territoriality

Northern spotted owls are territorial. They become alert when roosting whenever large birds fly over the canopy or when potential predators enter their nesting or roosting stands (Forsman 1976, Gutiérrez et al. 1995). They will actively defend their nests and young from predators (Forsman 1976, Gutiérrez et al. 1995). Northern spotted owls will regularly confront other northern spotted owls with aggressive vocal displays (Forsman 1976, 1980, Forsman et al. 1984, Gutiérrez et al. 1995, Franklin et al. 1996). Territorial defense is primarily effected by hooting, barking and whistle type calls. However, home ranges of adjacent pairs overlap (Forsman et al. 1984, Solis and Gutiérrez 1990) suggesting that the area defended is smaller than the area used for foraging. It appears that they learn to recognize their neighbor’s voices and respond to them much less vigorously (Fitton 1991, Waldo 2002). Some northern spotted owls are not territorial

but either remain as residents within the territory of a pair or move among territories (Gutiérrez 1996). These birds are referred to as "floaters." Floaters have special significance in northern spotted owl populations because they may buffer the territorial population from decline (Franklin 1992). Little is known about floaters other than that they exist and typically do not respond to calls as vigorously as territorial birds (Gutiérrez 1996).

Pair Behavior

Northern spotted owls are monogamous and usually form long-term pair bonds. "Divorces" occur but are relatively uncommon. There are no known examples of polygyny in this owl, although associations of three or more birds have been reported (Gutiérrez et al. 1995).

2.1.2.5 Habitat Relationships

Home Range

Home-range sizes vary geographically, generally increasing from south to north, which is likely a response to differences in habitat quality (USDI FWS 1990a). Estimates of median size of their annual home range (the area traversed by an individual or pair during their normal activities (Thomas and Raphael 1993) vary by province and range from 2,955 acres in the Oregon Cascades (Thomas et al. 1990) to 14,211 acres on the Olympic Peninsula (USDI FWS 1994a). Zabel et al. (1995) showed that these provincial home ranges are larger where flying squirrels (*Glaucomys sabrinus*) are the predominant prey and smaller where wood rats (*Neotoma* spp.) are the predominant prey. Home ranges of adjacent pairs overlap (Forsman et al. 1984, Solis and Gutiérrez 1990), suggesting that the defended area is smaller than the area used for foraging. Within the home range there is a smaller area of concentrated use during the breeding season (~20% of the home range), often referred to as the core area (Bingham and Noon 1997). Northern 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). Northern spotted owls use smaller home ranges during the breeding season and often dramatically increase their home range size during fall and winter (Forsman et al. 1984, Sisco 1990).

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

Habitat Use and Selection

Forest types that support the northern spotted owl across its geographic range include Douglas-fir, western hemlock (*Tsuga heterophylla*), grand fir (*Abies grandis*), white fir, Pacific silver fir (*Abies amabilis*), Shasta red fir (*Abies magnifica shastensis*), Sitka spruce (*Picea sitchensis*), mixed evergreen, mixed conifer hardwood (Klamath montane), redwood (*Sequoia sempervirens*) 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 near the northern edge of

the range and up to approximately 6,000 feet at the southern edge (Forsman et al. 1984, Franklin and Dyrness 1988, Thomas et al. 1990, Davis and Lint 2005). The upper elevation limit at which northern spotted owls occur corresponds to the transition to subalpine forest, which is characterized by relatively simple structure and severe winter weather (Forsman 1976, Forsman et al. 1984).

Northern spotted owls generally rely on older forested habitats because such forests contain the structures and characteristics required for nesting, roosting, and foraging. Features that support nesting and roosting typically include a moderate to high canopy closure (60 to 90 percent); a multi-layered, multi-species canopy with large overstory trees (generally greater than 30 inches dbh); a high incidence of large trees with various deformities (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 northern spotted owls to fly (Thomas et al. 1990). Nesting and roosting northern spotted owls consistently occupy stands with a high degree of canopy closure that may provide thermoregulatory benefits (Weathers et al. 2001), and protection from predators and adverse weather conditions. Patches of nesting habitat, in combination with roosting habitat, must be sufficiently large and contiguous to maintain northern spotted owl core areas and home ranges, and must be proximate to foraging habitat.

Northern spotted owls nest almost exclusively in trees. Like roosts, nest sites are found in forests having complex structure dominated by large diameter trees (Forsman et al. 1984, Hershey et al. 1998). Even in forests that have been previously logged, northern spotted owls select forests having a structure (i.e., larger trees, greater canopy closure) different than forests generally available to them (Folliard 1993, Buchanan et al. 1995, Hershey et al. 1998). Nesting habitat can also function as roosting, foraging, and dispersal habitat.

Roosting habitat differs from nesting habitat in that it need not contain those specific structural features used for nesting, such as cavities, broken tops, and mistletoe platforms. Roost sites selected by northern spotted owls have more complex vegetation structure than forests generally available to them (Barrows and Barrows 1978, Forsman et al. 1984, Solis and Gutiérrez 1990). These habitats are usually multi-layered forests having high canopy closure and large diameter trees in the overstory. Roosting habitat will also function as foraging and dispersal habitat, but not as nesting habitat due to lack of nesting structures.

Foraging habitat for northern spotted owls provides a food supply for survival and reproduction. Foraging habitat is the most variable of all habitats used by territorial northern spotted owls (USDI FWS 1992b). Descriptions of foraging habitat have ranged from complex structure (Solis and Gutiérrez 1990) to forests with lower canopy closure and smaller trees than forests containing nests or roosts (Gutiérrez 1996). Foraging activity is positively associated with tree height diversity (North et al. 1999), canopy closure (Irwin et al. 2000, Courtney et al. 2004), snag volume, density of snags greater than 20 in dbh (North et al. 1999, Irwin et al. 2000, Courtney et al. 2004), density of trees greater than or equal to 31 in dbh (North et al. 1999), volume of woody debris (Irwin et al. 2000), and young forests with some structural characteristics of old forests (Carey et al.1992, Irwin et al. 2000). Northern spotted owls select old forests for foraging in greater proportion than their availability at the landscape scale (Carey et al. 1992, Carey and

Peeler 1995, Forsman et al. 2004), but will forage in younger stands with high prey densities and access to prey (Carey et al. 1992, Rosenberg and Anthony 1992, Thome et al. 1999). Foraging habitat contains some roosting habitat attributes but can consist of more open and fragmented forests or, especially in the southern portion of the range, some younger stands may have high prey abundance and structural attributes similar to those of older forests (e.g., moderate tree density, subcanopy perches at multiple levels, multi-layered vegetation, residual older trees). Foraging habitat can also function as dispersal habitat.

Dispersal habitat is essential to maintaining stable populations by filling territorial vacancies when resident northern spotted owls die or leave their territories, and for providing adequate gene flow across the range of the species. Dispersal habitat includes forest types that support either the transience phase of dispersal or the colonization phase of dispersal. Habitat supporting the transience phase of dispersal consists, at a minimum, of stands with adequate tree size and canopy closure to provide protection from avian predators and at least minimal foraging opportunities. Dispersal habitat may include younger and less diverse forest stands than foraging habitat, such as even-aged, pole-sized stands, but such stands should contain some roosting structures and foraging habitat to allow for temporary resting and feeding for dispersing juveniles (USDI FWS 1992a). Habitat supporting the colonization phase of dispersal is generally equivalent to roosting and foraging habitat, although it may be in smaller amounts than that needed to support nesting pairs. Forsman et al. (2002) found that northern 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).

Northern 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 northern spotted owls also occur in younger forest stands, particularly in areas where hardwoods provide a multi-layered structure at an early age (Thomas et al. 1990; Diller and Thome 1999). In mixed conifer forests in the eastern Cascades in Washington, 27 percent of nest sites were in old-growth forests, 57 percent were in the understory reinitiation phase of stand development, and 17 percent were in the stem exclusion phase (Buchanan et al. 1995). In the western Cascades of Oregon, 50 percent of northern spotted owl nests were in late-seral/old-growth stands (greater than 80 years old), and none were found in stands less than 40 years old (Irwin et al. 2000).

In the Western Washington Cascades, northern spotted owls roosted in mature forests dominated by trees greater than 19.7 inches dbh with greater than 60 percent canopy closure more often than expected during the non-breeding season. Northern spotted owls also used young forest (trees of 7.9 inches to 19.7 inches dbh with greater than 60 percent canopy closure) less often than expected based on the availability of this habitat (Herter et al. 2002).

In the Coast Ranges, Western Oregon Cascades and the Olympic Peninsula, radio-marked northern spotted owls selected old-growth and mature forests for foraging and roosting and used young forests less than predicted based on availability (Forsman et al. 1984, Carey et al. 1990,

Forsman et al. 2005). Glenn et al. (2002) studied northern spotted owls in young forests in western Oregon and found little preference among age classes of young forest.

Habitat use is influenced by prey availability. Ward (1990) found that northern spotted owls foraged in areas with lower variance in prey densities (that is, where the occurrence of prey was more predictable) within older forests and near ecotones of old forest and brush seral stages. Zabel et al. (1995) showed that northern spotted owl home ranges are larger where flying squirrels are the predominant prey and smaller where wood rats are the predominant prey.

Recent landscape-level analyses in portions of the Oregon Coast and California Klamath provinces suggest that a mosaic of late-successional habitat interspersed with other seral conditions may benefit northern spotted owls more than large, homogeneous expanses of older forests (Meyer et al. 1998, Franklin et al. 2000, Zabel et al. 2003). In the Oregon Klamath and Western Oregon Cascade provinces, Dugger et al. (2005) found that apparent survival and reproduction was positively associated with the proportion of older forest near the territory center (within 2,395 feet). Survival decreased dramatically when the amount of non-habitat (e.g., non-forest areas, sapling stands) exceeded approximately 50 percent of the home range (Dugger et al. 2005). The authors concluded that they found no support for either a positive or negative direct effect of intermediate-aged forest (i.e., forest stages between sapling and mature, with total canopy cover greater than 40 percent) on either the survival or reproduction of northern spotted owls. It is unknown how these results were affected by the low habitat fitness potential in their study area, which Dugger et al. (2005) stated was generally much lower than those in Franklin et al. (2000) and Olson et al. (2004), and the low reproductive rate and survival in their study area, which they reported were generally lower than those studied by Anthony et al. (2006). Olson et al. (2004) found that reproductive rates fluctuated biennially and were positively related to the amount of edge between late-seral and mid-seral forests and other habitat classes in the central Oregon Coast Range. Olson et al. (2004) concluded that their results indicate that while mid-seral and late-seral forests are important to northern spotted owls, a mixture of these forest types with younger forest and non-forest may be best for northern spotted owl survival and reproduction in their study area.

2.1.2.6 Reproductive Biology

The northern spotted owl is relatively long-lived, has a long reproductive life span, invests significantly in parental care, and exhibits high adult survivorship relative to other North American owls (Forsman et al. 1984, Gutiérrez et al. 1995). Northern spotted owls are sexually mature at 1 year of age, but rarely breed until they are 2 to 5 years of age (Miller et al. 1985, Franklin 1992, Forsman et al. 2002). Breeding females lay one to four eggs per clutch, with the average clutch size being two eggs; however, most northern spotted owl pairs do not nest every year, nor are nesting pairs successful every year (Forsman et al. 1984, USDI FWS 1990b, Anthony et al. 2006), and renesting after a failed nesting attempt is rare (Gutiérrez 1996). The small clutch size, temporal variability in nesting success, and delayed onset of breeding all contribute to the relatively low fecundity of this species (Gutiérrez 1996).

Courtship behavior usually begins in February or March, and females typically lay eggs in late March or April. The timing of nesting and fledging varies with latitude and elevation (Forsman

et al. 1984). After they leave the nest in late May or June, juvenile northern 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, USDI FWS 1990a). During the first few weeks after the young leave the nest, the adults often roost with them during the day. By late summer, the adults are rarely found roosting with their young and usually only visit the juveniles to feed them at night (Forsman et al. 1984). Telemetry and genetic studies indicate that close inbreeding between siblings or parents and their offspring is rare (Haig et al. 2001, Forsman et al. 2002). Hybridization of northern spotted owls with California spotted owls and barred owls has been confirmed through genetic research (Hamer et al. 1994, Gutiérrez et al. 1995, Dark et al. 1998, Kelly 2001, Funk et al. 2008).

2.1.2.7 Dispersal Biology

Natal dispersal of northern spotted owls typically occurs in September and October with a few individuals dispersing in November and December (Miller et al. 1997, Forsman et al. 2002). Natal dispersal occurs in stages, with juveniles settling in temporary home ranges between bouts of dispersal (Miller et al. 1997, Forsman et al. 2002). The median natal dispersal distance is about 10 miles for males and 15.5 miles for females (Forsman et al. 2002). Dispersing juvenile northern spotted owls experience high mortality rates, exceeding 70 percent in some studies (Miller 1989, USDI FWS 1990a). Known or suspected causes of mortality during dispersal include starvation, predation, and accidents (Miller 1989, USDI FWS 1990a, Forsman et al. 2002). Parasitic infection may contribute to these causes of mortality, but the relationship between parasite loads and survival is poorly understood (Hoberg et al. 1989, Gutiérrez 1989, Forsman et al. 2002). Successful dispersal of juvenile northern spotted owls may depend on their ability to locate unoccupied suitable habitat in close proximity to other occupied sites (LaHaye et al. 2001).

There is little evidence that small openings in forest habitat influence the dispersal of northern spotted owls, but large, non-forested valleys such as the Willamette Valley apparently are barriers to both natal and breeding dispersal (Forsman et al. 2002). The degree to which water bodies, such as the Columbia River and Puget Sound, function as barriers to dispersal is unclear, although radio telemetry data indicate that northern spotted owls move around large water bodies rather than cross them (Forsman et al. 2002). Analysis of the genetic structure of northern spotted owl populations suggests that gene flow may have been adequate between the Olympic Mountains and the Washington Cascades, and between the Olympic Mountains and the Oregon Coast Range (Haig et al. 2001).

Breeding dispersal occurs among a small proportion of adult northern spotted owls; these movements were more frequent among females and unmated individuals (Forsman et al. 2002). Breeding dispersal distances were shorter than natal dispersal distances and also are apparently random in direction (Forsman et al. 2002). In California spotted owls, a similar subspecies, the probability for dispersal was higher in younger owls, single owls, paired owls that lost mates, owls at low quality sites, and owls that failed to reproduce in the preceeding year (Blakesley et al. 2006). Both males and females dispersed at near equal proportions and distances (Blakesley et al. 2006). Dispersal resulted in improved territory quality in 72 percent of cases (Blakesley et al. 2006).

2.1.2.8 Food Habits

Northern spotted owls are mostly nocturnal, although they also forage opportunistically during the day (Forsman et al. 1984, Sovern et al. 1994). The composition of the northern spotted owl's diet varies geographically and by forest type. Generally, flying squirrels are the most prominent prey for northern spotted owls in Douglas-fir and western hemlock forests (Forsman et al. 1984) in Washington and Oregon, while dusky-footed wood rats (*Neotoma fuscipes*) are a major part of the diet in the Oregon Klamath, California Klamath, and California Coastal provinces (Forsman et al. 1984, 2001, 2004, Ward et al. 1998, Hamer et al. 2001). Depending on location, other important prey include deer mice (*Peromyscus maniculatus*), tree voles (*Arborimus longicaudus*, *A. pomo*), red-backed voles (*Clethrionomys* gapperi), 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 northern spotted owl diet (Forsman et al. 1984, 2004, Ward et al. 1998, Hamer et al. 2001).

Other prey species such as the red tree vole (*Arborimus longicaudus)*, red-backed voles, mice, rabbits and hares, birds, and insects may be seasonally or locally important (reviewed by Courtney et al. 2004). For example, Rosenberg et al. (2003) showed a strong correlation between annual reproductive success of northern spotted owls (number of young per territory) and abundance of deer mice ($r^2 = 0.68$), despite the fact they only made up 1.6±0.5 percent of the biomass consumed. However, it is unclear if the causative factor behind this correlation was prey abundance or a synergistic response to weather (Rosenberg et al. 2003). Ward (1990) also noted that mice were more abundant in areas selected for foraging by owls. Nonetheless, northern 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 northern spotted owl diet should not be underestimated (Forsman et al. 1984, 2001, 2004).

2.1.2.9 Population Dynamics

The northern spotted owl is relatively long-lived, has a long reproductive life span, invests significantly in parental care, and exhibits high adult survivorship relative to other North American owls (Forsman et al. 1984, Gutiérrez et al. 1995). The northern spotted owl's long reproductive life span allows for some eventual recruitment of offspring, even if recruitment does not occur each year (Franklin et al. 2000).

Annual variation in population parameters for northern spotted owls has been linked to environmental influences at various life history stages (Franklin et al. 2000). In coniferous forests, mean fledgling production of the California spotted owl, a closely related subspecies, was higher when minimum spring temperatures were higher (North et al. 2000), a relationship that may be a function of increased prey availability. Across their range, northern spotted owls have previously shown an unexplained pattern of alternating years of high and low reproduction, with highest reproduction occurring during even-numbered years (e.g., Franklin et al. 1999). Annual variation in breeding may be related to weather (i.e., temperature and precipitation; Wagner et al. 1996 and Zabel et al. 1996 *In*: Forsman et al. 1996) and fluctuation in prey abundance (Zabel et al. 1996).

A variety of factors may regulate northern spotted owl population levels. These factors may be density-dependent (e.g., habitat quality, habitat abundance) or density-independent (e.g., climate). Interactions may occur among factors. For example, as habitat quality decreases, density-independent factors may have more influence on survival and reproduction, which tends to increase variation in the rate of growth (Franklin et al. 2000). Specifically, weather could have increased negative effects on northern spotted owl fitness for those owls occurring in relatively lower quality habitat (Franklin et al. 2000). A consequence of this pattern is that at some point, lower habitat quality may cause the population to be unregulated (have negative growth) and decline to extinction (Franklin et al. 2000).

Olson et al. (2005) used open population modeling of site occupancy that incorporated imperfect and variable detectability of northern spotted owls and allowed modeling of temporal variation in site occupancy, extinction, and colonization probabilities (at the site scale). The authors found that visit detection probabilities average less than 0.70 and were highly variable among study years and among their three study areas in Oregon. Pair site occupancy probabilities declined greatly on one study area and slightly on the other two areas. However, for all owls, including singles and pairs, site occupancy was mostly stable through time. Barred owl presence had a negative effect on these parameters (see barred owl discussion in the New Threats section below). However, there was enough temporal and spatial variability in detection rates to indicate that more visits would be needed in some years and in some areas, especially if establishing pair occupancy was the primary goal.

2.1.3 Threats

2.1.3.1 Reasons for Listing

The northern spotted owl was listed as threatened throughout its range "due to loss and adverse modification of suitable habitat as a result of timber harvesting and exacerbated by catastrophic events such as fire, volcanic eruption, and wind storms" (USDI FWS 1990a). More specifically, threats to the northern spotted owl included low populations, declining populations, limited habitat, declining habitat, inadequate distribution of habitat or populations, isolation of provinces, predation and competition, lack of coordinated conservation measures, and vulnerability to natural disturbance (USDI FWS 1992a). These threats were characterized for each of the 12 provinces within the range of the northern spotted owl as severe, moderate, low or unknown (USDI FWS 1992a; see Figure 1). Declining habitat was recognized as a severe or moderate threat to the northern spotted owl throughout its range, isolation of populations was identified as a severe or moderate threat in 11 provinces, and a decline in population was a severe or moderate threat in 10 provinces. Together, these three factors represented the greatest concerns about range-wide conservation of the northern spotted owl. Limited habitat was considered a severe or moderate threat in nine provinces, and low populations were a severe or moderate concern in eight provinces, suggesting that these factors were also a concern throughout the majority of the northern spotted owl's range. Vulnerability to natural disturbances was rated as low in five provinces.

The degree to which predation and competition might pose a threat to the northern 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 northern spotted owls (Courtney et al. 2004). However, great horned owls (*Bubo virginianus*), an effective predator on northern spotted owls, are closely associated with fragmented forests, openings, and clearcuts (Johnson 1992, Laidig and Dobkin 1995). As mature forests are harvested, great horned owls may colonize fragmented forests, thereby increasing northern spotted owl vulnerability to predation.

2.1.3.2 New Threats

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

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

- "Currently the primary source of habitat loss is catastrophic wildfire, although the total amount of habitat affected by wildfires has been small (a total of 2.3% of the range-wide habitat base over a 10-year period)." (Courtney and Gutiérrez 2004)

- "Although the panel had strong differences of opinion on the conclusiveness of some of the evidence suggesting [barred owl] displacement of [northern spotted owls], and the mechanisms by which this might be occurring, there was no disagreement that [barred owls] represented an operational threat. In the questionnaire, all 8 panel members identified [barred owls] as a current threat, and also expressed concern about future trends in [barred owl] populations." (Courtney and Gutiérrez 2004)

Barred Owls (Strix varia)

With its recent expansion to as far south as Marin County, California along the Coast Range and Kings Canyon National Park in the southern Sierra Nevada (Gutiérrez et al. 2004), the barred owl's range now completely overlaps that of the northern spotted owl. Barred owls may be affecting northern spotted owls through competition for resources, direct harm through aggressive behavior, and hybridization. Barred owls may be competing with northern spotted owls for prey (Hamer et al. 2001) or habitat (Hamer et al. 1989, Dunbar et al. 1991, Herter and Hicks 2000, Pearson and Livezey 2003). In addition, barred owls physically attack northern spotted owls (Pearson and Livezey 2003), and in at least one situation, a barred owl may have killed a northern spotted owl (Leskiw and Gutiérrez 1998). Evidence that barred owls are causing negative effects on northern spotted owls is largely indirect, based primarily on

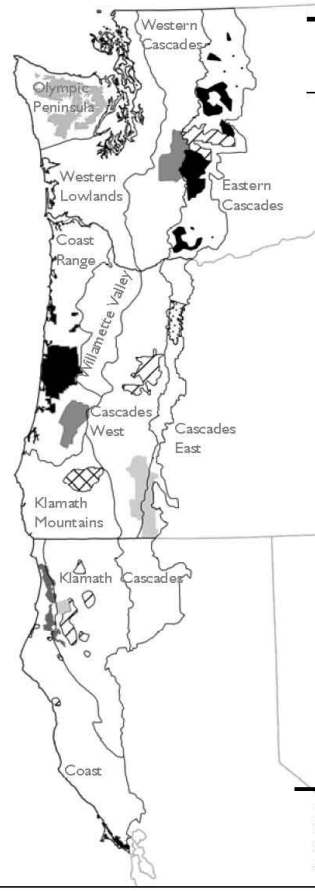
retrospective examination of long-term data collected on northern spotted owls (Kelly et al. 2003, Pearson and Livezey 2003, Olson et al. 2005). Recent research has shown that the two species of owls share similar habitats and are likely competing for food resources (Hamer et al. 2001, 2007; Singleton et al. 2010). Research on barred owls and their interactions with northern spotted owls is lacking, but necessary to determine the specific effects barred owls may have on northern spotted owls and their habitat. Because the effects of barred owls on northern spotted owls have been realized while solely conducting research and monitoring of northern spotted owls, the effects of barred owls are likely underestimated. 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, though they are generalists, likely compete with northern spotted owls for prey resources (Hamer et al. 2001, 2007; Gutiérrez et al. 2007; Livezey and Fleming 2007). The only study comparing northern spotted owl and barred owl food habits in the Pacific Northwest indicated that barred owl diets overlap strongly (76 percent) with northern spotted owl diets (Hamer et al. 2001, 2007). Barred owl diets are more diverse than northern spotted owl diets and include species associated with riparian and other moist habitats (e.g. fish, invertebrates, frogs, and crayfish), along with more terrestrial and diurnal species (Smith et al. 1983; Mazur and James 2000; Hamer et al. 2001, 2007; Gronau 2005). Because barred owls took a much lower proportion of the four primary prey species taken by northern spotted owls (Hamer et al. 2001, 2007), barred owls may only be opportunistically taking northern spotted owl prey and not necessarily selecting for the same prey species (Gutiérrez et al. 2007). Even though barred owls may be taking northern spotted owls' primary prey only as a generalist, northern spotted owls may be affected by a sufficient reduction in the density of these prey items due to barred owls, leading to a depletion of prey to the extent that the northern spotted owl cannot find an adequate amount of food to sustain maintenance or reproduction (Gutiérrez et al. 2007, Livezey and Fleming 2007).

Barred owls were initially thought to be more closely associated with early successional forests than northern spotted owls, based on studies conducted on the west slope of the Cascades in Washington (Hamer 1988, Iverson 1993). However, recent studies conducted in the Pacific Northwest show that barred owls frequently use mature and old-growth forests (Pearson and Livezey 2003, Gremel 2005, Schmidt 2006). In the fire prone forests of eastern Washington, a telemetry study conducted on barred owls showed that barred owl home ranges were located on lower slopes or valley bottoms, in closed canopy, mature, Douglas-fir forest, while northern 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). More recently, Singleton et al. (2010) found that barred owls preferred multispecies, structurally diverse forests with high canopy closure dominated by large overstory trees similar to northern spotted owls, however, barred owls also showed a preference for lower topographical areas and gentler slopes not usually preferred by northern spotted owls. Additionally, the two species use the same types of nests (Devereux and Mosher 1984, Forsman et al. 1984, Hamer 1988, Postupalsky et al. 1997). Although there are no estimates for home range sizes of barred owls in Oregon or California (Gutiérrez et al. 2007), northern spotted owl home ranges in Washington can be up to eight times larger than those of barred owls (Singleton et al. 2010).

The presence of barred owls has been reported to reduce northern spotted owl site occupancy, reproduction, and survival. The occupancy of historical territories by northern spotted owls in Washington and Oregon was significantly lower ($p < 0.001$) after barred owls were detected within 0.5 miles of the territory center but was "only marginally lower" ($p = 0.06$) if barred owls were located more than 0.5 miles from the northern spotted owl territory center (Kelly et al. 2003). Pearson and Livezey (2003) found that there were significantly more barred owl site-centers in unoccupied northern spotted owl circles than occupied northern spotted owl circles (centered on historical northern spotted owl site-centers) with radii of 0.5 miles ($p = 0.001$), 1 mile ($p = 0.049$), and 1.8 miles ($p = 0.005$) in Gifford Pinchot National Forest. In Olympic National Park, Gremel (2005) found a significant decline ($p = 0.01$) in northern spotted owl pair occupancy at sites where barred owls had been detected, while pair occupancy remained stable at northern spotted owl sites without barred owls. Olson et al. (2005) found that the annual probability that a northern spotted owl territory would be occupied by a pair of northern 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. Contrastingly, Bailey et al. (2009), when using a two-species occupancy model, showed no evidence that barred owls excluded northern spotted owls from territories in Oregon. Most recently, preliminary results from a barred owl and northern spotted owl radio-telemetry study in Washington reported two northern spotted owls fleeing their territories and traveling six and 15 miles, believed to be as a result of frequent direct encounters with barred owls (Irwin et al. 2010). Both northern spotted owls were subsequently found dead (Irwin et al. 2010).

Olson et al. (2004) found that the presence of barred owls had a significant negative effect on the reproduction of northern 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 northern spotted owls in one study (Iverson 2004) was unfounded because of small sample sizes (Livezey 2005). It is likely that all of the above analyses underestimated the effects of barred owls on the reproduction of northern spotted owls because northern spotted owls often cannot be relocated after they are displaced by barred owls (E. Forsman, pers. comm., cited in USDI FWS 2008a). Anthony et al. (2006) found significant evidence for negative effects of barred owls on apparent survival of northern 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. When examining current literature, Gutiérrez et al. (2007) found that productivity of barred owls and northern spotted owls are similar where their ranges do not overlap, leading to the assumption that barred owls likely produce more young overall than northern spotted owls, or have a higher success rate. Barred owls in a 3-year study in western Washington (Hamer 1988) produced more young than a sympatric group of northern spotted owls.



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

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

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

Barred owls and northern spotted owls occasionally hybridize and produce fertile young (Hamer et al. 1994, Kelly and Forsman 2004), although it is relatively uncommon (Gutiérrez et al. 2007). In a recent analysis of more than 9,000 banded northern spotted owls throughout their range, 47 hybrids were detected (Kelly and Forsman 2004). 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). However, because hybridization is often more prevalent when one species is rare or limiting or when one species is a recent invader of new habitat (Randler 2002), the likelihood of barred owls mating with northern spotted owls may become more likely, especially as barred owls become more common (Gutiérrez et al. 2007).

Monitoring and management of northern spotted owls has become more complicated due to their possible reduced detectability when barred owls are present (Kelly et al. 2003, Courtney et al. 2004, Olson et al. 2005, Crozier et al. 2006). Olson et al. (2005) found that the presence of barred owls had a significant negative effect on the detectability of northern spotted owls, and that the magnitude of this effect did not vary among years. In a study simulating presence of barred owls, Crozier et al. (2006) determined that the presence of barred owls might negatively affect responsiveness of northern spotted owls. Both northern spotted owls and California spotted owls responded less frequently in areas having high numbers of barred owls (Crozier et al. 2006). Lower response and calling of northern spotted owls could interfere with their ability to establish and defend territories. Evidence that northern spotted owls were responding less frequently during surveys led the Service and its many research partners to update the northern spotted owl survey protocol, with the updated draft protocol being released in February 2010. The changes were based on the probability of detecting northern spotted owls when barred owls are present (USDI FWS 2010a). No systematic surveys for barred owls have been conducted within the range of the northern spotted owl (Gutiérrez et al. 2007), but should be considered to determine the rate and extent of expansion and overlap with the northern spotted owl, and the interaction between the two species to aid in management (Livezey and Fleming 2007).

In areas where population sizes are extremely small, barred owls may pose an even larger threat. In British Columbia, Canada, relocation of barred owls has proven unsuccessful when one barred owl that was relocated 62 miles across three mountain ranges returned to the same location in which it was captured within one year (Pynn 2010). Biologists eventually lethally controlled 12 barred owls that represented competition to the remaining six northern spotted owls occurring in the wild after these relocation efforts were unsuccessful (Pynn 2010).

Evidence suggests that barred owls are exacerbating the northern spotted owl population decline, particularly in Washington, portions of Oregon, and the northern coast of California (Dark et al. 1998; Gutiérrez et al. 2004, 2007; Courtney et al. 2004; Olson et al. 2005). There is no evidence that the increasing trend in barred owls has stabilized in any portion of the northern spotted owl's range in the western United States, and "there are no grounds for optimistic views suggesting that barred owl impacts on northern spotted owls have been already fully realized" (Gutiérrez et al. 2004).

Wildfire

Studies indicate that the effects of wildfire on northern spotted owls and their habitat are variable, depending on fire intensity, severity and size. Within the fire-adapted forests of the northern spotted owl's range, northern spotted owls likely have adapted to withstand fires of variable sizes and severities. However, fire is often considered a primary threat to northern spotted owls because of its potential to rapidly alter habitat (Bond et al. 2009) and is a major cause of habitat loss on Federal lands (Courtney et al. 2004). Bond et al. (2002) examined the demography of the three spotted owl subspecies after wildfires, in which wildfire burned through spotted owl nest and roost sites in varying degrees of severity. Post-fire demography parameters for the three subspecies were similar or better than long-term demographic parameters for each of the three subspecies in those same areas (Bond et al. 2002). In a study of fire effects of seven radiomarked California spotted owls in the southern Sierra Nevada of California, Bond et al. (2009) found that most owls foraged in high-severity burned forest more than all other burn categories, and actually avoided unburned forest within one kilometer of the center of their foraging areas. In a preliminary study conducted by Anthony and Andrews (2004) in the Oregon Klamath Province, their sample of northern 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.

At the time of listing there was recognition that large-scale wildfire posed a threat to the northern spotted owl and its habitat (USDI FWS 1990b, 1992b). New information suggests fire may be more of a threat than previously thought. It has been estimated that the rate of habitat loss due to stand-replacing fire within Federal lands managed under the Northwest Forest Plan (NWFP; USDA FS and USDI BLM 1994b) was almost 140,000 acres between 1993-2004 (Moeur et al. 2005). Up until 2005, the overall total amount of habitat loss from wildfires was relatively small, estimated at approximately 1.2 percent on Federal lands (Lint 2005), but this estimation does not take into account habitat lost during the more recent large fires (i.e. 2007, 2008).

During the 2008 fire season, greater than one million acres burned in northern and central California. More than 2,700 individual fires were ignited, mostly due to lightning from a storm that passed through the state in mid-June. These fires encompassed 203,320 acres of the neighboring STNF in Trinity County, affecting approximately 100 northern spotted owl activity centers (USDI FWS unpubl. data). Within the Mendocino National Forest (MNF), nearly 100,000 acres burned in the Yolla Bolly Complex during the 2008 fire season. The MNF estimates that approximately 59,354 acres of the Yolla Bolly Wilderness adjacent to the project area burned, mostly at low intensity, but also included isolated patches of stand replacing fires, the two largest being 1,900 and 550 acres. Also within the MNF, the Soda Complex burned 9,100 acres during the 2008 fire season.

Several large fires burned in the eastern Cascade Range during the 1994 fire season, negatively affecting multiple northern spotted owl territories (Bevis et al. 1997, Gaines et al. 1997). In 1994, the Hatchery Complex fire burned 43,498 acres in the Wenatchee National Forest in Washington's eastern Cascades, affecting six northern spotted owl activity centers (Gaines et al. 1997). Northern spotted owl habitat within a 1.8-mile radius of the activity centers was reduced by eight 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 northern spotted owls was assumed to have occurred at one site, and northern spotted owls were present at only one of the six sites one year after the fire. In 1994, two wildfires burned in the Yakama Indian Reservation in Washington's eastern Cascades, affecting the home ranges of two radio-tagged northern spotted owls (King et al. 1998). Although the amount of home ranges burned was not quantified, northern spotted owls were observed using areas that burned at low and medium intensities. No direct mortality of northern spotted owls was observed, even though thick smoke covered several northern spotted owl site-centers for a week. It appears that, at least in the short term, northern spotted owls may be resilient to the effects of wildfire—a process with which they have evolved. Hanson et al. (2009) believes northern spotted owls are actually suffering adverse consequences from a deficit of fire, which creates habitat necessary for an abundance of their key prey species. More research is needed to further understand the relationship between fire and northern spotted owl habitat use. In a recent paper, Hanson et al. (2009) propose that the fire risk was overestimated in the Recovery Plan, and the effects of fire and silvicultural treatment tools should be further researched.

West Nile Virus

West Nile virus (WNV), caused by a virus in the family Flaviviridae, has killed millions of wild birds in North America since it arrived in 1999 (Caffrey and Peterson 2003, Marra et al. 2004). Mosquitoes are the primary carriers (vectors) of the virus that causes encephalitis in humans, horses, and birds. Mammalian prey may also play a role in spreading WNV among predators, like northern spotted owls. WNV has caused high levels of mortality in North American hawks and owls (Hull et al. 2010). Owls and other predators of mice can contract the disease by eating infected prey (Garmendia et al. 2000, Komar et al. 2003), and possibly through feces (Kipp et al. 2006). One captive northern spotted owl in Ontario, Canada, is known to have contracted WNV and died (Gancz et al. 2004), but there are no documented cases of the virus in wild northern spotted owls. During a four year study to detect antibody response of California spotted owls, northern goshawk (*Accipter gentilis*), and great gray owl (*Strix nebulosa*) in the Sierra Nevada mountains, no antibody response to WNV was found even though 10-60% of the species' populations were sampled (Hull et al. 2010). This finding is attributed to either low exposure of WNV to these species in the study area or high mortality rates of the species to WNV (Hull et al. 2010).

Health officials expect that WNV eventually will spread throughout the entire range of the northern spotted owl (Blakesley et al. 2004), but it is unknown how the virus will ultimately affect northern spotted owl populations. Susceptibility to infection and the mortality rates of infected individuals vary among bird species (Blakesley et al. 2004), but most owls appear to be quite susceptible. For example, eastern screech-owls (*Otus asio*) breeding in Ohio that were exposed to WNV experienced 100 percent mortality (T. Grubb pers. comm. in Blakesley et al. 2004). In California, 23.1% of western screech owls (*Otus kennicottii*) randomly collected dead by the public, tested positive for WNV, while 12.5% of great horned owls tested positive for WNV (Wheeler et al. 2009). Barred owls, in contrast, showed lower susceptibility (B. Hunter pers. comm. in Blakesley et al. 2004).

Blakesley et al. (2004) offer two possible scenarios for the likely outcome of northern spotted owl populations being infected by WNV. One scenario is that a range-wide reduction in northern 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 northern spotted owl's current range. WNV remains a potential threat of uncertain magnitude and effect (Blakesley et al. 2004).

Sudden Oak Death

Sudden oak death was recently identified as a potential threat to the northern spotted owl (Courtney et al. 2004). This disease is caused by the fungus-like pathogen, *Phytopthora ramorum* that was recently introduced from Europe and is rapidly spreading. The disease is now known to extend over 404 miles from south of Big Sur, California to Curry County, Oregon (Rizzo and Garbelotto 2003), and has reached epidemic proportions in oak (*Quercus* spp.) and tanoak (*Lithocarpus densiflorus*) forests along approximately 186 miles of the central and northern California coast (Rizzo et al. 2002). It has also been found near Brookings, Oregon, killing tanoak and causing dieback of closely associated wild rhododendron (*Rhododendron* spp.) and evergreen huckleberry (*Vaccinium ovatum*) (Goheen et al. 2002). It has been found in several different forest types and at elevations from sea level to over 2,625 feet. Sudden oak death poses a threat of uncertain proportion because of its potential impact on forest dynamics and alteration of key prey and northern spotted owl habitat components (e.g., hardwood trees, canopy closure and nest tree mortality), especially in the southern portion of the northern spotted owl's range (Courtney et al. 2004). During a study completed between 2001 and 2003 in California, one-third to one-half of the hikers present in the study area carried infected soil on their shoes (Davidson et al. 2005), creating the potential for rapid spread of the disease.

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 northern spotted owl at the time of listing. Recent studies show no indication of reduced genetic variation and past bottlenecks in Washington, Oregon, or California (Barrowclough et al. 1999, Haig et al. 2004, Henke et al. unpublished data). However, in Canada in 2004, the breeding population was estimated to be less than 33 pairs and annual population decline as high as 35 percent (Harestad et al. 2004). Currently only six northern spotted owls are known to exist in the wild in British Columbia, where captive raising of young and captive breeding is currently being practiced to ensure the owl's survival (Pynn 2010). Canadian populations may be more adversely affected by issues related to small population size including inbreeding depression, genetic isolation, and reduced genetic diversity (Courtney et al. 2004). Low and persistently declining populations throughout the northern portion of the species range (see "Population Trends" below) may be at increased risk of losing genetic diversity.

Hybridization of northern spotted owls with California spotted owls and barred owls has been confirmed through genetic research (Hamer et al. 1994, Gutiérrez et al. 1995, Dark et al. 1998, Kelly 2001, Funk et al. 2008).

Climate change

The International Panel on Climate Change (IPCC), a scientific intergovernmental body established by the World Meteorological Organization and the United Nations Environment Programme to assess scientific information and consequences of climate change, concluded that climate change is occurring and is caused by human activities (Forster et al. 2007). The global average temperature has risen approximately 1.08 degrees Fahrenheit (°F) during the 20th Century (IPCC 2001). Within this time, the Pacific Northwest has seen annual average temperature increases of 1.08 to 3.06 °F (Parson et al. 2000). Snow-season length and depth of snowpack are very likely to decrease in most of North America (Christenson et al. 2007), and has already been shown in several studies (Mote et al. 2005 and Regonda et al. 2005 cited in Vicuna and Dracup 2007, Trenberth et al. 2007). Snowmelt-driven runoff is predicted to occur as much as two months earlier in the western United States (Rauscher et al. 2008).

California, in particular, will suffer significant consequences as a result of climate change [California Climate Action Team (CCAT) 2006]. Climate change is already affecting wildlife throughout California (Parmesan and Galbraith 2004), and its effects will continue to increase. Depending on the model and assumptions, scientists project the average annual temperature in California to rise between 4 and 10.5 °F above the current average temperature by the end of the century (Schneider and Kuntz-Duriseti 2002, Turman 2002, Hayhoe et al. 2004). The Grinnell Resurvey Project in Yosemite National Park and surrounding areas have already recorded a substantial increase in monthly minimum temperatures of more than 5.4 °F over 100 years, which is much greater than the average for the state of California (Moritz 2007). This temperature increase is also reflected in tree ring data and analyses of vegetation change (Millar et al. 2004). Seventeen species monitored in the Grinnell Resurvey Project showed range contractions (Moritz 2007). Most of these range contractions involved mid to high elevation taxa (Moritz 2007), coupled with the upward elevation movement of formerly low-elevation species (Moritz et al. 2008).

Climate change, a potential additional threat to northern spotted owl populations, is not explicitly addressed in the NWFP. Climate change could have direct and indirect effects on northern spotted owls and their prey. Based upon a global meta-analysis, Parmesan and Yohe (2003) discussed several potential implications of global climate change to biological systems, including terrestrial flora and fauna. Results indicated that 62 percent of species exhibited trends indicative of advancement of spring conditions. In bird species, trends were manifested in earlier nesting activities. Because the northern spotted owl exhibits a limited tolerance to heat relative to other bird species (Weathers et al. 2001), subtle changes in climate have the potential for significant negative effects. However, the direct effects of climate change to the species are unknown.

Climate change is expected to make unpredictable changes to many species' habitat. Changes in water availability to plants may affect tree growth and distribution of flora (Skinner 2007). Added stress, such as drought, to tree species and changes in the distribution of diseases and insects may make them more vulnerable, and may compound the susceptibility to high severity fire (Skinner 2007). The recent expansion of the mountain pine beetle (*Dendroctonus ponderosae Hopkins*) is an example of range expansion of insects that are affecting large

amounts of North American forests (Skinner 2007). The dramatic increase in tree mortality due to these insects increases the potential for intense fires (Skinner 2007). Changes in the fire regime are expected to occur due to warmer temperatures increasing the probability of severe fire and length of fire season (Skinner 2007). Westerling et al. (2006) showed that large wildfire activity has increased suddenly since mid-1980's, with higher large-wildfire frequency, longer wildfire durations, and longer wildfire seasons. A greater number of fires with more fires escaping initial attack suppression are expected (Fried et al. 2004). However, Hanson et al. (2009) believe northern spotted owls are actually suffering adverse consequences from a deficit of fire, which creates habitat necessary for an abundance of their key prey species. Of all burn severity categories, Bond et al. (2009) found that California spotted owls mostly foraged in high-severity burned forest, actually avoiding unburned forest within one kilometer of the center of their foraging areas.

As shown by paleoecological record, dramatic changes in species distributions can take place over only a few decades to a century during periods of rapid climate variation (Peteet 2000, Davis and Shaw 2001). Current communities of plants are likely to dissolve and create new associations as species ranges adjust (Davis 1986, Whitlock 1992). The current assemblages are managed for favorable conditions for the northern spotted owl; however, the influence of a warming climate may make it more difficult to sustain appropriate habitat without considering climate (Skinner 2007). Winter precipitation was the most important climate variable based on northern spotted owl distribution models used by Carroll (in press), further suggesting that negative effects on survival and recruitment may occur due to climate change. Range shifts due to climate change may affect the effectiveness of reserves for northern spotted owls, increasing the importance of higher elevation reserves that were created before the NWFP (Carroll, in press).

Disturbance-Related Effects

The effects of noise on northern spotted owls are largely unknown, and whether noise is a concern has been a controversial issue. The effect of noise on birds is extremely difficult to determine due to the inability of most studies to quantify one or more of the following variables: 1) timing of the disturbance in relation to nesting chronology; 2) type, frequency, and proximity of human disturbance; 3) clutch size; 4) health of individual birds; 5) food supply; and 6) outcome of previous interactions between birds and humans (Knight and Skagan 1988). 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 northern spotted owls to disturbance is limited, research indicates that recreational activity can cause Mexican spotted owls to vacate otherwise suitable habitat (Swarthout and Steidl 2001) and helicopter overflights can reduce prey delivery rates to nests (Delaney et al. 1999). Additional effects from disturbance, including altered foraging behavior and decreases in nest attendance and reproductive success, have been reported for other raptors (White and Thurow 1985, Anderson et al. 1989, McGarigal et al. 1991).

Northern spotted owls may also respond physiologically to a disturbance without exhibiting a significant behavioral response. In response to environmental stressors, vertebrates secrete stress hormones called corticosteroids (Campbell 1990). Although these hormones are essential for survival, extended periods with elevated stress hormone levels may have negative effects on reproductive function, disease resistance, or physical condition (Carsia and Harvey 2000, Saplosky et al. 2000). In avian species, the secretion of corticosterone is the primary non-specific stress response (Carsia and Harvey 2000). The quantity of this hormone in feces can be used as a measure of physiological stress (Wasser et al. 1997). Recent studies of fecal corticosterone levels of northern spotted owls indicate that low intensity noise of short duration and minimal repetition does not elicit a physiological stress response (Tempel and Gutiérrez 2003, 2004). However, prolonged activities, such as those associated with timber harvest, may increase fecal corticosterone levels depending on their proximity to northern spotted owl core areas (Wasser et al. 1997, Tempel and Gutiérrez 2004).

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

2.1.4 Conservation Needs of the Northern Spotted Owl

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

2.1.4.1 Habitat-specific Needs

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

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

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

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

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

2.1.4.2 Habitat-independent Needs

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

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

2.1.4.3 Conservation Strategy

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

- Species that are well distributed across their range are less prone to extinction than species confined to small portions of their range.

- Large blocks of habitat, containing multiple pairs of the species, are superior to small blocks of habitat with only one to a few pairs.

- Blocks of habitat that are close together are better than blocks far apart.

- Habitat that occurs in contiguous blocks is better than habitat that is more fragmented.

- Habitat between blocks is more effective as dispersal habitat if it resembles suitable habitat.

2.1.4.4 Federal Contribution to Recovery

Since it was signed on April 13, 1994, the NWFP has guided the management of Federal forest lands within the range of the northern spotted owl (USDA FS and USDI BLM 1994a, 1994b). The NWFP was designed to protect large blocks of old growth forest and provide habitat for species that depend on those forests including the northern spotted owl, as well as to produce a predictable and sustainable level of timber sales. The NWFP included land use allocations which would provide for population clusters of northern spotted owls (i.e., demographic support) and maintain connectivity between population clusters. Certain land use allocations in the plan contribute to supporting population clusters: Late-Successional Reserves (LSRs), Managed Late-successional Areas (MLSAs), and Congressionally Reserved Areas (CRAs). Riparian Reserves (RRs), Adaptive Management Areas (AMAs) and Administratively Withdrawn Areas (AWAs) 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 (i.e., 100-acre owl cores, 15 percent late-successional provision; USDA FS and USDI BLM 1994a, USDI FWS 1994b) which would persist into future managed timber stands.

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

The Forest Ecosystem Management Assessment Team predicted, based on expert opinion, the northern spotted owl population would decline in the Matrix land use allocation over time, while the population would stabilize and eventually increase within LSRs as habitat conditions improved over the next 50 to 100 years (Thomas and Raphael 1993; USDA FS and USDI BLM 1994a, 1994b). Based on the results of the first decade of monitoring, Lint (2005) could not determine whether implementation of the NWFP would reverse the northern spotted owl's declining population trend because not enough time had passed to provide the necessary measure of certainty. However, the results from the first decade of monitoring do not provide any reason to depart from the objective of habitat maintenance and restoration as described in the NWFP (Lint 2005, Noon and Blakesley 2006). Bigley and Franklin (2004) suggested that more fuels treatments are needed in east-side forests to preclude large-scale losses of habitat to stand-replacing wildfires. Other stressors that occur in suitable habitat, such as the range expansion of the barred owl (already in action) and infection with WNV (which may or may not occur) may complicate the conservation of the northern spotted owl. Recent reports about the status of the northern spotted owl offer few management recommendations to deal with these emerging threats. The arrangement, distribution, and resilience of the NWFP land use allocation system may prove to be the most appropriate strategy in responding to these unexpected challenges (Bigley and Franklin 2004).

Under the NWFP, the agencies anticipated a decline of northern spotted owl populations during the first decade of implementation. Recent reports (Courtney et al. 2004, Anthony et al. 2006) identified greater than expected northern 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 northern spotted owls at the meta-population scale. However, at the territory scale, there is evidence of negative effects to northern spotted owl fitness due to reduced habitat quantity and quality. Also, there is no evidence to suggest that dispersal habitat is currently limiting (Courtney et al. 2004, Lint 2005). Even with the population decline, Courtney et al (2004) noted that there is little reason to doubt the effectiveness of the core principles underpinning the NWFP conservation strategy.

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

estimates are showing a decline.

In May, 2008, the Service published the 2008 Final Recovery Plan for the Northern Spotted Owl (USDI FWS 2008a). The recovery plan identified 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 northern spotted owl (USDI FWS 2008a). To address these threats, the recovery strategy had the following three essential elements: barred owl control, dry-forest landscape management strategy, and managed owl conservation areas (MOCAs) (USDI FWS 2008a). The recovery plan listed recovery actions that address research of the competition between spotted and barred owls, experimental control of barred owls to better understand the impact the species is having on northern spotted owls, and, if recommended by research, management of barred owls (USDI FWS 2008a). In addition, the recovery plan recommended a research and monitoring program be implemented to track progress toward recovery, inform changes in recovery strategy by a process of adaptive management, and ultimately determine when delisting is appropriate (USDI FWS 2008a). The three primary elements of this program included 1) the monitoring of northern spotted owl population trends, 2) an inventory of northern spotted owl distribution, and 3) a comprehensive program of barred owl research and monitoring (USDI FWS 2008a). The recovery plan estimated that recovery of the northern spotted owl could be achieved in approximately 30 years (USDI FWS 2008a).

In 2011, the Service published the Revised Recovery Plan for the Northern Spotted Owl (USDI FWS 2011b). The 2011 Revised Recovery Plan, like the 2008 Recovery Plan, identifies barred owls and habitat loss due to timber harvest and wildfire as major threats to the northern spotted owl. To address these threats, the present recovery strategy has the following four essential elements: completion and application of rangewide habitat modeling, habitat conservation and active forest management, barred owl management, and research and monitoring (USDI FWS 2011b). The revised recovery plan lists 34 recovery actions that address overall recovery through maintenance and restoration of suitable habitat for northern spotted owls, monitoring of avian diseases, development and implementation of a delisting monitoring plan, and management of the barred owl (USDI FWS 2011b). Implementation of the full suite of recovery actions will involve participation from the States, Federal agencies, non-Federal landowners, and the public. Recovery Actions 10 and 20 are especially reliant on the participation of private landowners and pertain to the FGS HCP. The intent of Recovery Action 10 is to conserve spotted owl sites and high value spotted owl habitat, regardless of land ownership. Recovery Action 20 requests the cooperation of CAL FIRE and individual stakeholders to evaluate the potential recovery role of spotted owl sites and high-quality habitat on nonfederal lands in California, and to evaluate and implement appropriate conservation tools, such as HCPs, to assist with supporting spotted owl recovery actions outlined in the recovery plan.

2.1.4.5 Conservation Efforts on Non-Federal Lands

In the report from the Interagency Scientific Committee (Thomas et al. 1990), the draft recovery plan (USDI FWS 1992b), and the report from the Forest Ecosystem Management Assessment Team (Thomas and Raphael 1993), it was noted that limited Federal ownership in some areas constrained the ability to form a network of old-forest reserves to meet the conservation needs of

the northern 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 northern spotted owl. The Service's primary expectations for private lands are for their contributions to demographic support (pair or cluster protection) to Federal lands, or their connectivity with Federal lands. In addition, timber harvest within each state is governed by rules that provide protection of northern spotted owls or their habitat to varying degrees.

There are 17 current or completed HCPs that have incidental take permits issued for northern spotted owls—eight in Washington, three in Oregon, and four in California. 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 northern 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 northern spotted owl. The period of time that the HCPs will be in place ranges from 5 to 100 years; however, most of the HCPs are of fairly long duration. While each HCP is unique, there are several general approaches to mitigation of incidental take:

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

Washington. In 1996, the State Forest Practices Board adopted rules (Washington Forest Practices Board 1996) that would contribute to conserving the northern spotted owl and its habitat on non-Federal lands. In Spotted Owl Special Emphasis Areas, suitable owl habitat inside management circles established for territorial spotted owls is regulated under the default component of the Forest Practices Rules. Outside the Spotted Owl Special Emphasis Areas, the best 70 acres of habitat around the site center is protected from harvest during the nesting season. Outside the nesting season there are no owl-related protections that constrain harvest of suitable habitat in spotted owl management circles. 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 northern spotted owl conservation (Hanson et al. 1993, Buchanan et al. 1994). The 1996 rule package was developed by a stakeholder policy group and then reviewed and approved by the Forest Practices Board (Buchanan and Swedeen 2005). Northern spotted owl-related HCPs in Washington generally were intended to provide demographic or connectivity support (USDI FWS 1992b).

Oregon. The Oregon Forest Practices Act provides for protection of 70-acre core areas around sites occupied by an adult pair of northern spotted owls capable of breeding (as determined by recent protocol surveys), but it does not provide for protection of northern spotted owl habitat beyond these areas (Oregon Department of Forestry 2007). In general, no large-scale northern spotted owl habitat protection strategy or mechanism currently exists for non-Federal lands in Oregon. The three northern spotted owl-related HCPs currently in effect cover more than

300,000 acres of non-Federal lands. These HCPs are intended to provide some nesting habitat and connectivity over the next few decades.

California. The California Forest Practice Rules (CFPRs,) which govern timber harvest on private lands, require surveys for northern spotted owls in suitable habitat and provide protection around activity centers (CALFIRE 2007). Under the CFPRs, 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 (CALFIRE 2007). The CDFG initially reviewed all THPs to ensure that take was not likely to occur. The Service took over that review function in 2000. In 2008, the Service handed over the THP review process to CALFIRE. Upon request, the Service may provide technical assistance to CALFIRE if deemed necessary.

The CFPRs requires private landowners to maintain 500 acres and 1,336 acres of suitable (nesting, roosting and foraging) northern spotted owl habitat within an activity center's 0.7- mile core and 1.3-mile home range, respectively. Additionally, within 500 feet of the active nest site or pair activity center, the characteristics of functional nesting habitat must be maintained. Harvest of suitable habitat is allowed if more than 500 acres and 1,336 acres within the 0.7-mile core and 1.3-mile home range, respectively, are currently present. Additionally, under the current CFPRs, if an activity center is determined to be unoccupied all habitat within the home range can be removed without compensatory mitigation.

There are several short-comings of the current CFPRs. The CFPRs define suitable northern spotted owl habitat based on CWHR classification system, which could lead to retention of relatively low quality habitat. For example, 4D is considered suitable nesting/roosting habitat, but encompasses a broad range of tree diameters (11 to 24 inches dbh) and canopy cover (60 to 100 percent). The CFPRs do not specify how much of the total northern spotted owl habitat within the core and home range should be maintained as nesting, roosting and foraging. Conceivably, most of the northern spotted owl habitat within the core and home range could be low quality foraging habitat and harvest could be allowed under the CFPRs. Furthermore, the CFPRs follow the guidance in the 1992 Protocol for Surveying Management Activities that May Impact Northern Spotted Owls for determining unoccupied status. According to that protocol, an historic activity center may be considered unoccupied if no responses have been obtained after three years of surveys. New research information available on northern spotted owl site occupancy indicates that sites may be unoccupied (or northern spotted owls fail to respond due to the presence of barred owls) for more than three years and then subsequently are utilized by nesting northern spotted owls.

The Service's experience with interior California THP review from 2000 to 2009 indicates that the CFPRs regulating timber harvest during the 1990s did not necessarily prevent significant effects to activity centers resulting from the continued reduction of habitat quality within northern spotted owl home ranges overlapping THPs. Extensive review has suggested that in many cases, the cumulative effects of repeated entries within northern spotted owl home ranges reduces habitat quality and leads to reduced occupancy rates and apparent site abandonment. In a large proportion of the Service's technical assistance letters to CALFIRE and industrial timberland owners during the past five years, the Service has noted the lack of northern spotted owl responses at historic territories and habitat conditions considered inadequate to support

continued occupancy and reproduction following repeated entries within northern spotted owl home ranges under the CFPRs.

In 2008, the YFWO developed take avoidance guidance for CALFIRE which included documentation of the criteria and habitat thresholds currently used by the Service in making take evaluations for northern spotted owls on private lands in the interior region (USDI FWS 2008c). In 2009, in order to document the scientific rationale behind the Service guidelines, the YFWO issued a science support document titled "Regulatory and Scientific Basis for the U.S. Fish and Wildlife Service Guidance for Evaluation of Take for Northern Spotted Owls on Private Timberlands in California's Northern Interior Region." Generally, the guidelines describe the range of conditions associated with occupied northern spotted owl activity centers. The Service recommends maintenance of 250 acres of nesting/roosting and 150 acres of foraging habitat within the northern spotted owl territory (i.e., core area). The northern spotted owl territory is established by placing a 0.5 mile radius circle around a nest site, which equates to 502 acres. Additionally, maintenance of 935 acres of foraging habitat is recommended within the northern spotted owl outer ring of the home range (i.e., 0.5 to 1.3-mile radius around the nest site). The northern spotted owl home range is established by placing a 1.3 mile radius circle around a nest site which equates to 3,396 acres. The habitat thresholds and definitions in the Service guidance provide the quantity and quality of habitat associated with occupancy and reproduction at northern spotted owl cores. Although these new guidelines were developed by the Service and based upon the best scientific information available at the time, CALFIRE cannot mandate the use of a different standard than those described in the CFPRs.

Several large industrial owners operate under northern spotted owl management plans that have been reviewed by the Service and that specify basic measures for northern spotted owl protection. Four HCPs authorizing take of northern spotted owls have been approved; these HCPs cover more than 669,000 acres of non-Federal lands in California. Implementation of these plans is intended to provide for northern spotted owl demographic and connectivity support to NWFP lands.

2.1.5 Current Condition of the Northern Spotted Owl

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

2.1.5.1 Range-wide Habitat

The 1992 Draft Northern Spotted Owl Recovery Plan estimated approximately 8.3 million acres of northern spotted owl habitat remained range-wide (USDI FWS 1992b). However, reliable habitat baseline information for non-Federal lands is not available (Courtney et al. 2004). The Service has used information provided by the USFS, Bureau of Land Management, and National Park Service to update the habitat baseline conditions on Federal lands for northern spotted owls on several occasions since the northern spotted owl was listed in 1990. The estimate of 7.4 million acres used for the NWFP in 1994 (USDA FS and USDI BLM 1994a) was believed to be representative of the general amount of northern spotted owl habitat on these lands. This

baseline has been used to track relative changes over time in subsequent analyses, including those presented here.

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

NWFP Lands Analysis 1994 – 2001

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

Range-wide Analysis 1994 – March 30, 2011

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

In 1994, about 7.4 million acres of suitable northern spotted owl habitat were estimated to exist on Federal lands managed under the NWFP. As of March 30, 2011**,** the Service had consulted on the proposed removal/downgrading of approximately 188,971 acres (Table 2) or 2.6 percent of 7.4 million acres (Table 3) of northern spotted owl suitable habitat on Federal NWFP lands. Of the total Federal acres consulted on for removal/downgrading, approximately 160,566 acres or 2.2 percent of 7.4 million acres of northern spotted owl habitat were removed/downgraded as

a result of timber harvest. These changes in suitable northern spotted owl habitat are consistent with the expectations for implementation of the NWFP (USDA FS and USDI BLM 1994a).

Habitat loss from Federal NWFP lands due to management activities has varied among the individual provinces with most of the impacts concentrated within the Non-Reserve relative to the Reserve land-use allocations (Table 3). When habitat loss is evaluated as a proportion of the affected acres range-wide, the most pronounced losses have occurred within Oregon (79%), especially within its Klamath Mountains (40%) and Cascades (East and West) (38%) Provinces (Table 3), followed by much smaller habitat losses in Washington (10%) and California (11%) (Table 3). When habitat loss is evaluated as a proportion of provincial baselines, the Oregon Klamath Mountains (20.3%), Cascades East (13%) and the California Cascades (5.5%) all have proportional losses greater than the range-wide mean (5.4%) (Table 3).

From 1994 through February 14, 2011, habitat lost due to natural events was estimated at approximately 207,262 acres range-wide (Table 3). This estimate doesn't include acres of habitat lost from the 2008 fires and a couple of 2009 fires on the Shasta-Trinity, Mendocino, and Six Rivers National Forests because emergency consultations have not been completed on these fires. About two-thirds of this loss was attributed to the Biscuit Fire that burned over 500,000 acres in southwest Oregon (Rogue River basin) and northern California in 2002. This fire resulted in a loss of approximately 113,451 acres of northern spotted owl habitat, including habitat within five LSRs (Table 3[7]). Approximately 18,630 acres of northern spotted owl habitat were lost due to the B&B Complex and Davis Fires in the East Cascades Province of Oregon in 2003 (Table 3[7]).

Because there is no comprehensive northern spotted owl habitat baseline for non-NWFP Federal lands and non-Federal lands, there is little available information regarding northern spotted owl habitat trends on these lands. Yet, we do know that Service consultations conducted since 1992, have documented the eventual loss of 472,772 acres (Table 2) of habitat on non-NWFP Federal lands and non-Federal lands. Approximately 63 percent of these losses have yet to be realized because they are part of large-scale, long-term HCPs/Safe Harbor Agreements (SHAs). Combining effects on Federal and non-Federal lands, the Service had consulted on the proposed removal of approximately 661,743 acres of northern spotted owl habitat range-wide, resulting from all management activities, as of March 30, 2011 (Table 2).

Table 2. Range-wide Aggregate of Changes to NRF[1] Habitat Acres from Activities Subject to Section 7 Consultations and Other Causes from 1994 to March 30, 2011.

Land Ownership	Consulted On Habitat Changes[2]		Other Habitat Changes[3]	
	Removed/ Downgraded	Maintained/ Improved	Removed/ Downgraded	Maintained/ Improved
NWFP (FS,BLM,NPS)	188,971	512,961	207,262	5,481
Bureau of Indian Affairs / Tribes	108,210	28,372	2,398	0
Habitat Conservation Plans/Safe Harbor Agreements	295,889	14,430	N/A	N/A
Other Federal, State, County, Private Lands	68,673	21,894	279	0
Total Changes	**661,743**	**577,657**	**209,939**	**5,481**

Notes:

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

Table 3. Aggregate Results of All Adjusted, Suitable Habitat (NRF[1]) Acres Affected by Section 7 Consultation on NWFP Lands for the Northern Spotted Owl; Baseline and Summary of Effects by State, Physiographic Province and Land Use Function from 1994 to March 30, 2011.

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

Notes:

1. Nesting, roosting, foraging (NRF) habitat. In California, suitable habitat is divided into two components; nesting - roosting (NR) habitat, and foraging (F) habitat. The NR component most closely resembles NRF habitat in Oregon and Washington. Due to differences in reporting methods, effects to suitable habitat compiled in this, and all subsequent tables include effects for nesting, roosting, and foraging (NRF) for 1994-6/26/2001. After 6/26/2001 suitable habitat includes NRF for Washington and Oregon but only nesting and roosting (NR) for California.

2. Defined by the NWFP as the 12 physiographic provinces, as presented in Figure 3&4-1 on page 3&4-16 of the FSEIS. The WA Western Lowlands and OR Willamette Valley provinces are not listed as they are not expected to contribute to recovery.
3. 1994 FSEIS baseline (USDA FS and USDI BLM 1994b).
4. Includes both effects reported in USDI FWS (2001) and subsequent effects reported in the Northern Spotted Owl Consultation Effects Tracking System (web application and database.)
5. Land-use allocations intended to provide large blocks of habitat to support clusters of breeding pairs. (LSR, MLSA, CRA)
6. Land-use allocations intended to provide habitat to support movement of spotted owls among reserves. (AWA, AMA, MX)
7. Acres for all physiographic provinces, except the Oregon Klamath Mountains, are from the Scientific Evaluation of the Status of the Northern Spotted Owl (Courtney et al. 2004) and subsequent effects entered into the Northern Spotted Owl Consultation Effects Tracking System. Acres for the Oregon Klamath Mountains province are from the biological assessment entitled: Fiscal year 2006-2008 programmatic consultation: re-initiation on activities that may affect listed species in the Rogue-River/South Coast Basin, Medford BLM, and Rogue-Siskiyou National Forest and from subsequent effects entered into the Northern Spotted Owl Consultation Effects Tracking System.

Other Habitat Trend Assessments

In 2005, the Washington Department of Wildlife released the report, "An Assessment of Northern Spotted Owl Habitat on Non-Federal Lands in Washington between 1996 and 2004" (Pierce et al. 2005). This study estimates the amount of northern spotted owl habitat in 2004 on lands affected by State and private forest practices. The study area is a subset of the total Washington forest practice lands, and statistically-based estimates of existing habitat and habitat loss due to fire and timber harvest are provided. In the 3.2-million acre study area, Pierce et al. (2005) estimated there was 816,000 acres of suitable northern spotted owl habitat in 2004, or about 25 percent of their study area. Based on their results, Pierce et al. (2005) estimated there were less than 2.8 million acres of northern spotted owl habitat in Washington on all ownerships in 2004. Most of the suitable owl habitat in 2004 (56%) occurred on Federal lands, and lesser amounts were present on State-local lands (21%), private lands (22%) and tribal lands (1%). Most of the harvested northern spotted owl habitat was on private (77%) and State-local (15%) lands. A total of 172,000 acres of timber harvest occurred in the 3.2 million-acre study area, including harvest of 56,400 acres of suitable northern spotted owl habitat. This represented a loss of about 6 percent of the owl habitat in the study area distributed across all ownerships (Pierce et al. 2005). Approximately 77 percent of the harvested habitat occurred on private lands and about 15 percent occurred on State lands. Pierce and others (2005) also evaluated suitable habitat levels in 450 northern spotted owl management circles (based on the provincial annual median northern 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 northern spotted owl territories (Pierce et al. 2005).

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

2.1.5.2 Northern spotted Owl Numbers, Distribution, and Reproduction Trends

There are no estimates of the size of the northern spotted owl population prior to settlement by Europeans. Northern spotted owls are believed to have inhabited most old-growth forests or stands throughout the Pacific Northwest, including northwestern California, prior to beginning of modern settlement in the mid-1800s (USDI FWS 1989). According to the final rule listing the

northern spotted owl as threatened (USDI FWS 1990a), approximately 90 percent of the roughly 2,000 known northern 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 northern spotted owls on private lands in northern California was slightly higher (Forsman et al. 1984, USDI FWS 1989, Thomas et al. 1990).

The current range of the northern spotted owl extends from southwest British Columbia through the Cascade Mountains, coastal ranges, and intervening forested lands in Washington, Oregon, and California, as far south as Marin County (USDI FWS 1990a). The range of the northern spotted owl is partitioned into 12 physiographic provinces (Figure 1) based on recognized landscape subdivisions exhibiting different physical and environmental features (Thomas et al. 1993). The northern spotted owl has become rare in certain areas, such as British Columbia, southwestern Washington, and the northern coastal ranges of Oregon.

There are few northern spotted owls remaining in British Columbia. Chutter et al. (2004) suggested immediate action was required to improve the likelihood of recovering the northern spotted owl population in British Columbia. As a result, in 2007, personnel in British Columbia captured and brought into captivity 16 wild northern spotted owls (USDI FWS 2008a). Prior to initiating the captive-breeding program, the population of northern spotted owls in Canada was declining by as much as 10.4 percent per year (Chutter et al. 2004). Currently, only six northern spotted owls are known to exist in the wild in British Columbia (Pynn 2010). Biologists plan to capture two of the remaining single males for their captive breeding program (Pynn 2010). The other four northern spotted owls comprise two pairs and will continue to remain in the wild, with any offspring removed for captive breeding. Provincial biologists have lethally controlled 12 barred owls that represented competition for the last remaining northern spotted owls. The amount of previous interaction between northern spotted owls in Canada and the United States is unknown.

As of July 1, 1994, there were 5,431 known site-centers of northern spotted owl pairs or resident singles: 851 sites (16 percent) in Washington, 2,893 sites (53 percent) in Oregon, and 1,687 sites (31 percent) in California (USDI FWS 1995). By June 2004, the number of territorial northern spotted owl sites recognized by Washington Department of Fish and Wildlife was 1,044 (Buchanan and Swedeen 2005). The actual number of currently occupied northern spotted owl locations across the range is unknown because many areas remain unsurveyed (USDI FWS 1992a, Thomas et al. 1993). In addition, many historical sites are no longer occupied because northern spotted owls have been displaced by barred owls, timber harvest, or severe fires, and it is possible that some new sites have been established due to reduced timber harvest on Federal lands since 1994. The totals in USDI FWS (1995) represent the cumulative number of locations recorded in the three States, not population estimates.

Because the existing survey coverage and effort are insufficient to produce reliable range-wide estimates of population size, demographic data are used to evaluate trends in northern spotted owl populations. Analysis of demographic data can provide an estimate of the finite rate of population change (λ) (lambda), which provides information on the direction and magnitude of population change. A λ of 1.0 indicates a stationary population, meaning the population is neither increasing nor decreasing. A λ of less than 1.0 indicates a decreasing population, and a λ

of greater than 1.0 indicates a growing population. Demographic data, derived from studies initiated as early as 1985, have been analyzed periodically (Anderson and Burnham 1992, Burnham et al. 1994, Forsman et al. 1996, Anthony et al. 2006) to estimate trends in the populations of the northern spotted owl.

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

Table 4. Northern spotted owl demographic study areas (adapted from Forsman et al. 2011).

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

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

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

The weighted mean λ_{RJS} for all of the 11 study areas was 0.971 (standard error [SE] = 0.007, 95 percent confidence interval [CI] = 0.960 to 0.983), which indicated an average population decline of 2.9 percent per year from 1985 to 2006. This is a lower rate of decline than the 3.7 percent reported by Anthony et al. (2006), but the rates are not directly comparable because Anthony et al. (2006) examined a different series of years and because two of the study areas in their analysis were discontinued and not included in Forsman et al. (2011). Forsman et al. (2011) explains that the indication populations were declining was based on the fact that the 95 percent confidence intervals around the estimate of mean lambda did not overlap 1.0 (stable) or barely included 1.0.

The mean λ_{RJS} 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 northern spotted owl (Forsman et al. 2011). The weighted mean estimate λ_{RJS} 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 (Forsman et al. 2011). These data suggest that demographic rates for northern 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 northern 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). Northern 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) 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). In addition, declines in adult survival for study areas in Oregon have occurred predominately within the last five years and were not observed in the previous analysis by Anthony et al. 2006. Forsman et al. (2011) express concerns by the collective declines in adult survival across the subspecies range because northern spotted owl populations are most sensitive to changes in adult survival.

2.2 Fisher

2.2.1 Legal Status

In 2004, the U.S. Fish and Wildlife Service (Service) concluded a 12-month finding (USDI FWS 2004b) for a petition to list the West Coast (Washington, Oregon, and California) population of the fisher (*Martes pennanti*). The finding determined that West Coast fishers constitute a distinct population segment (DPS) and that their listing is warranted but precluded by higher priority listing actions.

2.2.2 Life History

2.2.2.1 Taxonomy

The fisher is a member of the order *Carnivora*, family *Mustelidae* (weasels), subfamily *Mustelinae*, genus *Martes* (martens, fishers, and sables), subgenus *Pekania* (Anderson 1994). It is the largest member of the genus *Martes* and is the only extant species in the subgenus *Pekania* (Anderson 1994). The fisher's range overlaps extensively with that of the American marten (*M. americana*), which is the only other North American member of the genus *Martes* (Anderson 1994).

Three subspecies of fisher have been recognized in the literature: *M. p. pennanti* in eastern and central North America, *M. p. columbiana* in central and western Canada and the Rocky Mountains of the United States, and *M. p. pacifica* on the West Coast of North America (Goldman 1935, Hall 1981). A morphological analysis of specimens from across the range of the fisher, however, did not support recognition of separate subspecies (Hagmeier 1959). Genetic studies have found patterns of population subdivision similar to the 3 subspecies but have not determined whether the subspecies designations are taxonomically valid (Kyle et al. 2001; Drew et al. 2003) or have rejected the subspecies designations (Knaus et al. 2011).

2.2.2.2 Physical Description

The fisher has a long body, short legs, a long bushy tail, and a pointed face with forward eyes and rounded ears (Powell and Zielinski 1994). Fishers are usually deep brown to black and the face, neck, and shoulders are often grizzled with gray, silver, or gold (Powell 1993). The chest and abdomen typically have irregular white or cream markings. Fishers often have a sleeker appearance during their fall molt than during other seasons (Powell and Zielinski 1994). The species is commonly confused with the American marten, which is smaller and lighter in color and has more pointed ears and a shorter tail relative to the length of the body (Lofroth et al. 2010).

Male fishers are approximately 20% longer and 50 to 100% heavier than females (Lofroth et al. 2010). Adult males are 35 to 47 inches long and weigh 7.7 to 12.1 pounds, while adult females are 29 to 37 inches long and weigh 3.3 to 5.5 pounds (USDI FWS 2004b). Fishers also exhibit regional variation in body mass. Fishers in western North America typically weigh less than those in the eastern United States (USDI FWS 2004b). Individuals in the northern portions of western North America are typically heavier than those in the southern portions (Aubry and Lewis 2003, Lofroth et al. 2010).

2.2.2.3 Current and Historical Range

At the time of European settlement, the fisher's range extended across the northern forests of North America and south along the Appalachian, Rocky, and Pacific Coast mountains (Powell and Zielinski 1994; Figure 2). The range of the West Coast population of fishers included the Hozameen, Okanagan, and Cascade Ranges of British Columbia; the Cascade and Coast Ranges

of Washington, Oregon, and northern California; the Klamath-Siskiyou Mountains of Oregon and California; and the Sierra Nevada of California (Powell and Zielinski 1994).

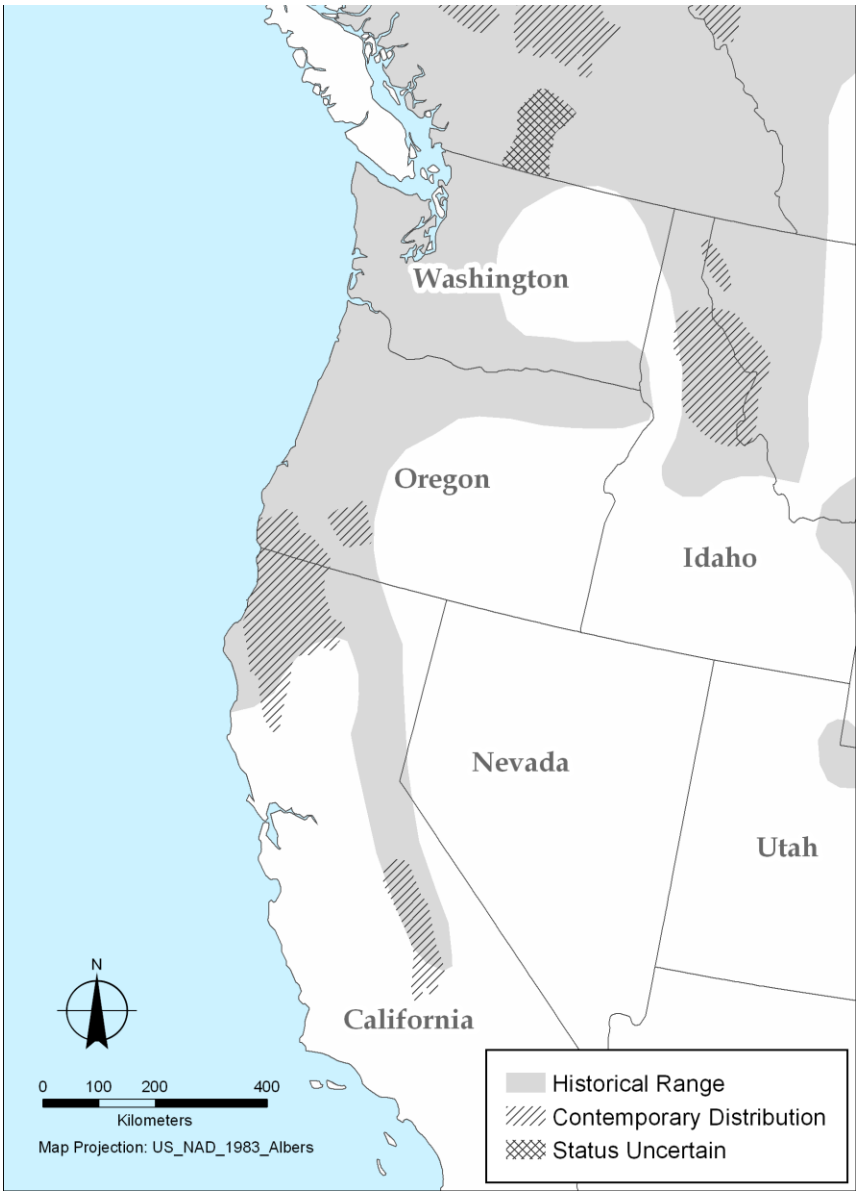


Figure 2. Contemporary distribution of fisher in the western United States and southern British Columbia compared to the historical distribution as depicted by Gibilisco (1994). Figure adapted from Lofroth et al. (2010).

Trapping, predator control, and habitat destruction during the late 1800s and early 1900s extirpated fishers from large portions of their range in the United States and eastern Canada (Douglas and Strickland 1987, Powell and Zielinski 1994). Within the Pacific Coast region, fishers were extirpated from Washington and portions of British Columbia, Oregon, and California (Lofroth et al. 2010).

Fishers are still absent from portions of their historical range (e.g., the southern Appalachian Mountains) but regrowth of forests, reduced trapping, and reintroduction programs have facilitated population recoveries in some areas (Powell and Zielinski 1994, Lofroth et al. 2010). The fisher's range and distribution in the Pacific Coast region have been substantially reduced. Fishers native to Washington are currently rare or extinct. Fishers have been reintroduced to the Olympic Peninsula but successful establishment of the population has not yet been verified (Lewis et al. 2010, Washington Department of Fish and Wildlife 2011). Oregon currently has 2 genetically isolated populations: a native population in the Siskiyou Mountains and a reintroduced population in the Cascade Range (Aubry and Lewis 2003). California has 2 disjunct native populations: one in the southern Sierra Nevada and one in the northwestern part of the State (Powell and Zielinski 1994, Zielinski et al. 1995). Fishers in southwestern Oregon and northwestern California occur as a series of interconnected local populations (USDI FWS 2010b); hereafter, these are collectively referred to as the southwestern Oregon/northwestern California population. Fishers have been translocated to the northern Sierra Nevada but successful establishment of the population has not yet been verified (CDFG 2011).

2.2.2.4 Behavior

Locomotion

Fishers have 5 toes on each of their large feet (Powell and Zielinski 1994). They walk with either their whole foot or just their toes and have an undulating, weasel-like, gait (Powell 1993). Deep snow can restrict fishers' movements and possibly influences their habitat associations, distribution, and reproduction (Powell and Zielinski 1994, Krohn et al. 2004).

The fisher's partially retractable claws and slightly specialized anatomy enable them to climb trees and descend head-first (Powell 1993, Lofroth et al. 2010). Fishers climb trees to access cavities or prey and have been observed traveling from tree to tree (Coulter 1966). However, the species is less arboreal than is commonly thought (Powell 1993, Powell and Zielinski 1994).

Daily Activity Pattern

Fishers have 1 to 3 activity periods per day (Powell 1993). They are active during daytime or nighttime, but are least active during mid-day and often have peaks in activity near sunrise and sunset (Arthur and Krohn 1991, Powell 1993). Fisher activity patterns appear to be influenced by a variety of factors beyond time of day, such as gender, breeding status, development of offspring, ambient temperature, and snow conditions (Leonard 1980, Arthur and Krohn 1991, Weir and Corbould 2007).

Fishers use snags, logs, and other structures for resting when they are not foraging or traveling (Lofroth et al. 2010). Individuals typically remain inactive at a rest site for several hours to several days at a time (Powell and Zielinski 1994).

Fishers are able to rapidly move long distances but travel an average of approximately 3 to 4 miles per day (Powell 1993). As with activity patterns, the mobility of fishers is influenced by season, offspring development, and other factors (Powell 1993).

Agonistic Behavior and Territoriality

Fishers are solitary except when mating, defending their territory, or rearing kits (Powell 1993). Fishers are territorial toward members of the same sex. Home ranges do not generally overlap for members of the same sex but the large home ranges of males often overlap those of multiple females (Powell 1993). Fishers appear to primarily maintain their territories through scent marking (Powell and Zielinski 1994). Agonism has rarely been documented for fishers (Powell and Zielinski 1994). However, kits are often aggressive toward each other at about 3 months of age and mothers often become aggressive toward their kits after they are about 4 months old (Coulter 1966, Powell 1993). Indirect evidence suggests that adult males occasionally fight during the breeding season, when many males trespass into neighboring territories to find estrous females (Leonard 1986, Powell 1993). Male fishers appear to select between 2 reproductive strategies. Some males maintain their territories during the breeding season, perhaps in order to defend access to females within them, while others abandon their territories and roam in search of estrous females (Aubry et al. 2004).

2.2.2.5 Habitat Relationships

Home Range Size

Rigorous comparisons of fisher home range estimates are not possible due to differences in sampling efforts and analytical methods among studies. General comparisons, however, may still be of interest. Mean fisher home range sizes across North America varied from 3,954 to 30,147 acres for males and from 988 to 13,096 acres for females (USDI FWS 2004b). Mean home range sizes for fishers in western North America closely resembled these (Lofroth et al. 2010). Throughout North America, the home ranges of males are, on average, nearly 3 times larger than those of females (Powell and Zielinski 1994, Lofroth et al. 2010). Mean home range sizes from 7 study areas in California ranged from 1,829 to 14,357 acres for males and from 420 to 5,807 acres for females (Lofroth et al. 2010).

Habitat Relationships

<u>Denning and Resting Sites</u>

Dens and rest sites likely provide fishers with protection from predators and weather, access to foraging areas, and a place to safely consume prey (Powell 1993, USDI FWS 2004b, Lofroth et al. 2010). Fishers typically use 3 dens per litter of kits (Arthur and Krohn 1991, Paragi et al. 1996, Higley and Matthews 2006) and only occasionally reuse rest sites (Powell and Zielinski 1994). Thus, a well distributed network of suitable denning and resting sites is a key feature of fisher home ranges (USDI FWS 2004b). Suitable dens and rest sites are likely more limiting than foraging habitat for fishers (Powell 1993, Powell and Zielinski 1994).

All natal dens are located in cavities in trees or snags, but platforms in trees (e.g., mistletoe brooms or rodent nests), the interiors of hollow logs, and spaces under woody debris may be used for maternal dens (Powell and Zielinski 1994, Lofroth et al. 2010). Fishers also use a

variety of structures for resting, including cavities in trees or snags, large branches, hollow logs, mistletoe clumps, platform nests, rocks, holes in the ground, and slash and brush piles (Powell and Zielinski 1994, Lofroth et al. 2010). Fishers rested primarily in live trees and secondarily in snags and coarse down wood (Lofroth et al. 2010). Fishers on managed timberlands in northwestern California primarily rested on mistletoe brooms but also used large lateral branches, mammal nests, and tree cavities (Self and Kerns 2001, Simpson Resource Company 2003).

Fishers in western North America use both conifers and hardwoods for denning but appear to favor hardwoods (Lofroth et al. 2010). Black oaks (*Quercus kelloggii*) are often used for denning in California (Lofroth et al. 2010). Most (91%) hardwoods used for denning in western North America are alive, whereas live and dead conifers are used almost equally (Lofroth et al. 2010). Fishers in the southern Sierra Nevada usually rested in black oaks and other hardwoods; fishers near the northern California coast primarily used Douglas-firs; and fishers in the Klamath Mountains mostly rested in hardwoods, followed by conifers, snags, and logs (Zielinski et al. 2004b, Higley and Matthews 2006).

Trees used for denning and resting are typically large. The average diameter at breast height (dbh) of trees used for denning and resting in western North America ranged between 18 and 73 inches and 22 and 46 inches, respectively (Lofroth et al. 2010). Conifer trees used for denning and resting are usually larger than hardwoods used (Lofroth et al. 2010). In California, conifers, conifer snags, and hardwoods used for denning averaged 46, 46, and 25 inches dbh, respectively (Truex et al. 1998). The sizes of trees used for resting in California were similar to those used for denning (46, 47, and 27 inches dbh for conifers, conifer snags, and hardwoods; Zielinski et al. 2004b). The diameters of trees used for denning and resting in western North America were, on average, 1.7 to 2.8 and 1.5 to 1.7 times larger, respectively, than those of other nearby trees (Lofroth et al. 2010). Logs used for denning and resting in western North America were also generally large; ranges of means among studies were 22 to 65 inches for dens and 16 to 52 inches for resting (Lofroth et al. 2010).

Areas immediately surrounding fisher denning and resting locations in western North America are generally characterized by the presence of large trees and snags, large-diameter hardwoods, coarse woody debris, dense multi-layered canopies, and steep slopes near water (USDI FWS 2004b, Lofroth et al. 2010). Rest sites in western North America usually had denser canopies, larger trees, more large trees and snags, and a greater abundance of coarse woody debris than was generally available (Lofroth et al. 2010). Fishers in California also tended to rest at sites with more hardwoods than were generally available.

Habitats Used by Active Fishers and Prey

Habitats used for foraging, traveling, and other activities resemble denning and resting habitat but include a broader range of conditions (USDI FWS 2004b, Lofroth et al. 2010). Throughout their range, fishers generally favor areas with dense canopy cover and avoid open or sparsely-canopied areas (Powell 1993, Powell and Zielinski 1994, Lofroth et al. 2010). Fishers also occur in areas with sparse canopy cover, particularly on managed lands in northern California, but their population performance in these areas is unknown (Powell and Zielinski 1994). Rosenberg and

Raphael (1986) characterized fishers in northern California as sensitive to the sizes of forest stands. Survey stations at which fishers were detected in both northern and southern California have generally been located in more structurally complex forests than those at which fishers were not detected (Lofroth et al. 2010). Fishers in northern California were also more likely to be detected at sites with a greater component of hardwoods, greater shrub or overstory tree cover, and greater densities of snags and coarse woody debris (Lofroth et al. 2010). Fishers in the southern Sierra Nevada were usually detected in areas with greater canopy cover, a component of hardwoods and large trees (greater than about 24 inches), and close proximity to a stream (Green 2007).

Fishers have broad diets that include prey species with a wide variety of habitat associations. Nonetheless, certain habitat elements are important to many of the fisher's prey: (1) large conifers and hardwoods are the primary sources of seeds for many birds and small mammals; (2) many of the fisher's prey rely on shrubs for food, cover, or nest sites, and shrubs and other understory plants provide fruit for fishers; (3) snags and coarse woody debris are used by many birds and small mammals for cover, foraging, caching food, nesting, and other functions, and large, well-decayed logs are often important to truffles (a key food resource for many small mammals); and (4) interconnected, multi-layered canopies are important for arboreal mammals and many bird species (Lofroth et al. 2010).

Landscape Composition

Home ranges and landscapes occupied by fishers typically consist of a mosaic of vegetation types and structural stages, but with a large component of mid- to late-successional forest (Powell and Zielinski 1994, Lofroth et al. 2010). Fishers in western North America appear to generally avoid landscapes with large amounts of non-forest (Lofroth et al. 2010). The home ranges of fishers in California contained a variety of vegetation types and structural stages but were mostly composed of conifer or conifer-hardwood forest with dense canopy cover and mid- to late-successional structure (Zielinski et al. 2004a).

Abiotic Habitat Features

Studies have identified a variety of abiotic features associated with the presence or absence of fishers, including elevation, terrain ruggedness, solar insolation, slope angle or position, and proximity to streams or roads (Powell and Zielinski 1994, Lofroth et al. 2010, Zielinski et al. 2010). It is often unclear whether these features directly influence habitat use by fishers or are simply associated with other important variables, such as vegetation conditions or prey availability.

Fishers are generally found at low- to mid-elevations in the Pacific States (e.g., less than about 5,000 feet; Powell 1993, Powell and Zielinski 1994, Lofroth et al. 2010). Elevation is likely a proxy for the distribution of snow depth and suitable vegetation conditions, rather than a direct influence on fisher-habitat relationships (Powell and Zielinski 1994, Lofroth et al. 2010). Throughout its range, the fisher appears to avoid higher elevations and other areas with deep snow, which is thought to restrict the species' movements (Powell and Zielinski 1994). In areas with intermediate snow depths, fishers may partly favor densely-canopied forests for their

interception of snow (Powell and Zielinski 1994, Weir 1995). Elevation also influences the distribution of vegetation composition and structure in western mountains. For example, major vegetation types in the Klamath Mountains and Sierra Nevada of California tend to occur as lateral bands distributed according to elevational controls on climate and natural disturbance regimes (Sawyer 2006, Fites-Kaufmann et al. 2007).

Numerous studies have found that fishers favor riparian areas or other areas near streams (Powell and Zielinski 1994, Lofroth et al. 2010). In areas where they differ from uplands, riparian areas provide important habitat for many birds and small mammals due to the presence of shrubs, herbs, hardwoods, and other moisture- or disturbance-associated plants and their function as corridors for movement for some species (Doyle 1990, Knopf and Samson 1994, Boyce and Payne 1997, Anthony et al. 2003). Riparian areas may also function as corridors for movements by fishers (Powell and Zielinski 1994). In some landscapes, large proportions of suitable denning and resting structures and habitat may be located in riparian areas (Lofroth et al. 2010).

2.2.2.6 Reproductive Biology

The fisher's breeding season extends from February through April but can occur as early as January and as late as May (Powell and Zielinski 1994). Fishers usually give birth between mid-March and early April, although parturition can also occur a month earlier or later than this (Powell 1993). Females become estrous for about 1 week 3 to 9 days after giving birth (Powell 1993). Males become more active early in the breeding season and often foray into other males' territories in search of estrous females (Arthur and Krohn 1991, Powell 1993). Due to delayed implantation, fishers give birth nearly 1 year after conception (Powell 1993). The average litter size for fishers is 2 to 3 kits (Powell 1993). Males do not assist females with care of the offspring and may even pose a threat to young fishers (Powell 1993).

Fishers use cavities in trees or snags to give birth (Powell 1993, Lofroth et al. 2010). Kits are born blind and have tightly closed ears and sparse hair (Coulter 1966). Mothers may move kits to multiple den locations before weaning them at approximately 10 weeks old (Arthur and Krohn 1991, Powell 1993). After weaning, mothers and kits become more mobile but often use the same den for 2 or more days at a time (Arthur and Krohn 1991, Paragi et al. 1996, Aubry and Raley 2006). Kits typically establish their own home ranges by about 1 year of age (Powell 1993).

Male fishers produce sperm at 1 year of age but do not appear to be effective breeders until after their first year (Powell 1993). Females can breed at 1 year of age but do not produce a litter until at least their second year due to delayed implantation (Powell and Zielinski 1994). Older females may breed more frequently than younger females (Weir and Corbould 2008).

2.2.2.7 Natal Dispersal

Juvenile fishers usually disperse from their natal areas during their first fall or winter (Lofroth et al. 2010). Fishers are capable of moving long distances but appear to have relatively poor dispersal abilities (Lofroth et al. 2010). The duration of dispersal by fishers is influenced by multiple factors, including gender and the availability of unoccupied, suitable habitat (Lofroth et

al. 2010). Inferences about dispersal by fishers, however, are generally limited by small sample sizes.

Juvenile fishers may disperse shorter distances in areas with high mortality and a low density of other fishers (Arthur et al. 1993). In Maine, which has high trapping mortality and a low density, the mean minimum distance moved by dispersing fishers was 7 miles (Arthur et al. 1993). In contrast, fishers in a higher-density population in Massachusetts dispersed a mean minimum distance of 20 miles (York 1996).

Juvenile dispersal appears to be male-biased in western North America (Lofroth et al. 2010). For example, in the Oregon Cascades, the average dispersal distance for males (18 miles) was nearly 5 times that of females (3.7 miles) (Aubry and Raley 2006).

2.2.2.8 Food Habits

Fishers are opportunistic, generalist predators (Powell and Zielinski 1994, Lofroth et al. 2010). Fisher diets typically include birds, mammals, reptiles, insects, fruit, and carrion (Powell and Zielinski 1994, Lofroth et al. 2010). Porcupines (*Erethizon dorsatum*) and snowshoe hares (*Lepus americanus*) are key contributors to fisher diets in much of North America but appear to be absent from the diet in California (Zielinski et al. 1999, Golightly et al. 2006). Fishers in California tend to have more diverse diets than do other western fishers (Zielinski et al. 1999, Golightly et al. 2006). Small and medium size mammals, including carnivores, rodents, and insectivores, were most often present in the scats of fishers in California (Zielinski et al. 1999, Golightly et al. 2006). Birds, reptiles, insects, truffles, and ungulate carrion also appeared to be important components of fisher diets in the State (Zielinski et al. 1999, Golightly et al. 2006).

Seasonal changes in fisher diets are generally minor (Powell and Zielinski 1994), although ungulate carrion was present in substantially more scats during winter than during other seasons in the southern Sierra Nevada (Zielinski et al. 1999). Sexual differences in the diets of fishers also appear to be weak (Powell and Zielinski 1994). However, males, which are larger, may capture larger mammalian prey more frequently than do females (Lofroth et al. 2010). Perhaps due to their poorer hunting ability, juvenile fishers in the eastern United States ate more fruits than did adults (Giuliano et al. 1989).

2.2.2.9 Population Biology

Fishers have low annual reproductive capacity and reproductive rates can strongly fluctuate among years (Lofroth et al. 2010). The annual reproductive rate of adult female fishers (proportion that denned) in western North America averaged 64% and ranged between 39 and 89% (Lofroth et al. 2010). The annual reproductive rates in a study on managed timberlands in northern California were 22 and 80% during 2 breeding seasons (51% for both years combined; Reno et al. 2008). Only a portion of breeding females successfully wean kits. For example, the annual reproductive rate in a northern California study was 85% but only 68% of females successfully weaned 1 or more kits (Higley and Matthews 2006). Annual fluctuations in reproduction could be influenced by a variety of factors, including snow depths or the age structure of the population's females (Powell and Zielinski 1994, Weir and Corbould 2008).

Trapping and other human activities are the primary causes (68%) of mortality in some eastern North American populations, whereas natural factors cause the majority (54%) of mortalities in western North America (Lofroth et al. 2010). Predation is the primary natural source of mortality in western North America (Lofroth et al. 2010); bobcats, large carnivores, and raptors are the fisher's main predators (Powell and Zielinski 1994, Higley and Matthews 2009). Starvation, choking on food, injuries received from prey or conspecifics, are also sources of natural mortality for fishers (Powell and Zielinski 1994, Lofroth et al. 2010). Anthropogenic factors that contribute to individual fisher mortality and fitness include; contaminants, pest control programs, non-target poisoning, collision with vehicles, and accidental trapping in manmade structures (Folliard 1997, Truex et al. 1998, Gabriel et al. 2011, Sweitzer et al. 2011). Diseases and parasites are thought to be uncommon in fishers (Powell 1993, Powell and Zielinski 1994, Lofroth et al. 2010). A recent study in northern California, however, found exposure by fishers to several diseases including canine distemper virus and parvovirus (Brown et al. 2008). Although the full ecology of canine distemper virus and parvovirus in fishers is not fully understood, both viruses have caused mortality and morbidity in fishers and many other susceptible mustelids (Gabriel 2010). In 2009, in an insular population of fishers in the southern Sierra Nevada Mountains in California, an epizootic of distemper virus caused four mortalities within a short period of time (Gabriel 2010). Some of the reported diseases suppress immune function in other species and thus, could act synergistically with other factors to cause mortality of fishers. For example, the protozoan *Toxoplasma gondii* has been documented as a cause of mortality as well as an immunosuppressive pathogen in fishers (Gabriel 2010).

An emerging conservation concern is how the widespread use of anticoagulant rodenticides may be affecting fishers. Prevalence of exposure to anticoagulant rodenticides in fishers from California and Washington is quite high, with 80% of 71 sampled fishers testing positive (Gabriel 2012). It is unknown at this time whether exposure to these toxicants has an additive sublethal or chronic effect on an individual fisher or population; however, four fisher mortalities from California were directly attributed to anticoagulant rodenticides toxocosis (Gabriel 2012). To date, no direct consumption of anticoagulant rodenticides has been detected in fisher stomach contents, thus suggesting that exposure to these toxicants may be from secondary poisoning from consumption of prey or carrion exposed to anticoagulant rodenticides (Gabriel 2012).

The life expectancy of fishers is approximately 10 years but individuals as old as 12 have been reported (Powell 1993, Lofroth et al. 2010). Nonetheless, only a small proportion of fishers in wild, unharvested populations are more than 6 or 7 years-old (Lofroth et al. 2010). Studies in 2 areas of northern California found that 45 and 55% of individuals were not yet of reproductive age (i.e., less than 2 years-old), 52 and 35% were 2 to 6 years-old, 3% and 10% were 7 or 8 years-old, and no individuals were older than 8 years (Brown et al. 2006, Reno et al. 2008). It is possible, however, that these studies' use of live-trapping to determine fishers' ages biased their results toward younger animals (Lofroth et al. 2010). The age structures of fisher populations likely fluctuate among years in response to a variety of factors, including age-specific survivorship, population density, and prey availability (Powell and Zielinski 1994, Lofroth et al. 2010).

Estimates of annual survivorship, sex ratios, and age structure vary across the fisher's range and are closely associated with the occurrence of commercial trapping (Powell and Zielinski 1994, Lofroth et al. 2010). Mean annual survivorship was 0.82 for males and 0.74 for females in 3 untrapped populations in western North America (Lofroth et al. 2010). In contrast, male survivorship was, on average, 34% lower than that of females in commercially trapped populations in eastern North America. Age-specific survivorship also appears to be sensitive to commercial trapping (Lofroth et al. 2010). In Maine, juvenile survivorship during the trapping period was nearly half that of the nontrapping period (38 vs. 72%; Krohn et al. 1994).

Powell and Zielinski (1994) hypothesized that populations of fishers and other mustelids are characterized by episodes of local extinction and recolonization. If true, small population sizes and geographic isolation could prevent recolonization of depopulated areas (see section 2.2.3).

2.2.3 Threats

2.2.3.1 Reasons for Legal Status

The Service's 12-month finding for a petition to list the West Coast DPS concluded that listing was warranted but precluded by pending proposals for other species with higher listing priorities (USDI FWS 2004b). The Service determined that listing was warranted due to multiple past and present threats to the DPS, including: (1) over-trapping and incidental captures; (2) loss and fragmentation of habitat; (3) other problems associated with spread of roads and other human developments, such as vehicle collisions and behavioral disturbance; (4) disease and predation; and (5) small, isolated populations. The Service considered the combined magnitude of these threats to be non-imminent but high. The remainder of this section summarizes relevant sections of the Service's 12-month finding.

Commercial trapping, particularly during the late 1800s and early 1900s, contributed to dramatic declines in the fisher's abundance, distribution, and range. Trapping continues to be a primary cause of fisher mortality in areas where it is still legal. Commercial trapping has been prohibited in California, Oregon, and Washington since the 1930s and 1940s. However, fishers are sometimes incidentally captured in traps set for other species. Incidental captures often maim or kill fishers. Even small numbers of mortalities from trapping could prevent local recovery of populations or recolonization of historically occupied areas.

Historical logging was a primary cause of the fisher's decline and harvesting continues to threaten the species in some parts of its range. Depending on how and where it occurs, logging can alter fisher habitat by fragmenting or reducing forests or by modifying forest composition and structure. Fishers are generally associated with dense canopy cover, large and deformed trees, and large snags and logs. These features, along with understory cover, are also important to the fisher's prey communities. The impacts of logging on fishers partly depend on the degree to which these structural characteristics are reduced. Habitat fragmentation and loss might also negatively affect fishers by creating barriers to dispersal and other movements.

Fire suppression, together with logging, livestock grazing, and other factors, has facilitated increased forest densities in drier, more fire-prone portions of the fisher's range. Increased

canopy cover and greater abundances of dead woody materials in these forests might benefit some fishers. However, increased forest densities have substantially heightened the risk of large, stand-replacing wildfires. Large, stand-replacing fires could threaten large areas of fisher habitat.

Although not discussed in the 12-month finding, it is also important to note that increased forest densities have contributed to declines in oaks and other shade-intolerant hardwoods in some areas of California (Sugihara et al. 2006). Loss or reduction of hardwoods could negatively affect some populations by reducing denning and resting structures for fishers and mast for prey. Additionally, increased densities of small and medium size trees have accelerated declines of large conifers in some forests (Dolph et al. 1995, Smith et al. 2005, Ritchie et al. 2008).

The 12-month finding concluded that outbreaks of insects and diseases that affect trees are probably not a major threat to fisher habitat on the West Coast. However, at uncharacteristic high levels, insects and disease can cause broad-scale loss of overstory trees and vegetation diversity that may fragment or remove forested environments capable of supporting fishers. Sudden Oak Death, for example, could pose a significant future threat to fisher populations strongly associated with oaks and other hardwoods (e.g., the southwestern Oregon/northern California population).

Increases in the number and distribution of residential areas, roads, and other human developments likely strongly contributed to the fisher's extirpation from, and failure to recolonize, the central and northern Sierra Nevada. Expanding human populations are projected to result in increased land conversion in forested areas of the West Coast. Increased roads and other human developments could reduce and fragment fisher habitat, disrupt fisher movements, and bring the species into greater contact with vehicles, recreationists, and trapping. Collisions with vehicles are a major cause of fisher mortality in some areas and vehicles or recreationists may alter the behavior or distribution of fishers. Additionally, several fishers have been found dead in water storage tanks associated with human developments.

Major outbreaks of disease have not been documented for fisher populations but fishers are susceptible to diseases that have strongly impacted other mustelids. Predation appears to be a primary source of mortality for some fisher populations. Disease and predation potentially threaten West Coast fishers due to their occurrence as small, isolated populations.

West Coast fishers are at risk of extinction due to small population size and associated factors, such as isolation, low reproductive capacity, and demographic and environmental stochasticity. California and southwestern Oregon have the only known native populations of fishers on the West Coast. Native fishers are currently rare or absent in Washington and most of Oregon. Fishers were reintroduced to the southern Cascades of Oregon but the population is small and isolated. Fishers were reintroduced to the Olympic Peninsula of Washington and northern Sierra Nevada of California subsequent to the 12-month finding but their status is still being determined (Lewis et al. 2010, Washington Department of Fish and Wildlife 2011, CDFG 2011).

2.2.3.2 Additional Threats

Climate Change

Projected climate changes and their general effects are described in sections 1.4.5.1 (Changed Circumstances) and 2.1.3.2 (New Threats). Projected effects that could influence West Coast fisher populations include changes to forest composition and structure, prey communities, snow packs, and natural disturbance regimes. The effects of projected changes are difficult to predict for fishers because they would likely affect the species in complex and synergistic ways (Safford 2007). Some projected changes could benefit fishers. For example, reduced, earlier-melting snow packs might enable fishers to travel more easily or exploit higher-elevation areas. Projected increases in the abundance and distribution of oaks and other hardwoods in California's mountains could also benefit fishers by increasing denning and resting structures and mast for prey. Other projected changes could negatively affect West Coast fishers. For example, increased occurrence of catastrophic wildfires in some forests could reduce or fragment habitat for fishers. Climate change is also expected to cause the extinction of many wildlife species. Extinctions, along with species-specific responses to climate change, would likely have complex, unpredictable effects on the composition and abundance of the fisher's prey communities.

2.2.4 Conservation Needs of the Fisher

2.2.4.1 Habitat Needs

1. Large blocks of suitable habitat to support clusters of fisher (i.e., greater than 20 females) throughout the fisher's range;

2. Suitable habitat conditions and spacing between clusters of fisher populations throughout its range to facilitate survival and movement;

3. Suitable habitat distributed across a variety of ecological conditions within the fishers' 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 fisher's range, and a monitoring program to clarify whether these risk reduction methods are effective and to determine how fishers use habitats treated to reduce fuels; and

5. Monitoring and coordinated research to better understand the risk of how uncharacteristically high levels of insect and disease (e.g., sudden oak death) affect fisher habitat.

2.2.4.2 Habitat-independent Needs

1. A coordinated adaptive management effort is needed to ameliorate threats and overcome the fundamental challenges posed by relatively, small isolated populations. These efforts will differ by geographic region because the type, number, and potential synergistic effects of threat

interactions are complex and varied;

2. A coordinated research and adaptive management effort to better understand and manage for the competitive and predatory interactions between fishers and their predators.

3. A coordinated research and monitoring effort to better understand the risk that disease and toxins pose to fishers and methods that may reduce the likelihood or severity of outbreaks and exposure in fisher populations.

2.2.4.3 Conservation Strategy

Region 8 of the Service completed an action plan for the West Coast DPS of the fisher (USDI FWS 2010c). The plan identified the following actions to maintain or improve the West Coast fisher's current status from 2010 to 2014:

1. Develop conservation strategies among Federal, State, and local agencies, as well as private land owners.

2. Develop a systematic survey and monitoring program for fishers throughout their historical range in the Pacific States and ensure that it has long-term institutional support.

3. Conduct research to assist in recovery and conservation planning.

4. Augment existing populations or reintroduce extirpated populations in suitable habitat within the species' historical range.

The Service's action plan acknowledged that 5 years was likely insufficient for demonstrating satisfactory improvements in the numbers or distribution of fishers. Large amounts of time and money from multiple Federal and State agencies will be required to demonstrate growth of existing populations and/or establishment of new populations. The Service did, however, expect to initiate the required programs during the 5-year period.

2.2.4.4 Federal Contribution to Recovery

As described above in section 2.1.4.4, the NWFP was adopted in 1994 to guide the management of 24 million acres of Federal lands in portions of western Washington and Oregon, and northwestern California (USDA Forest Service and USDI Bureau of Land Management 1994a, b). The NWFP represents a 100-year strategy for conservation of the northern spotted owl (*Strix occidentalis caurina*) and other species associated with late-successional and old-growth forests on Federal lands. The NWFP is intended to ultimately provide a network of large block reserves of late-successional habitat, connected through riparian reserves, and surrounded by a matrix of younger more intensively managed forest. As the forests mature the plan could lead to a substantial improvement in current habitat conditions for fishers on Federal lands within the reserve network. However, the assessment of NWFP implementation on fishers within the Plan Area projected only a 63% likelihood of achieving an outcome in which habitat is of sufficient quality, distribution, and abundance to allow the fisher population to stabilize and be well

distributed across Federal lands (FEMAT 1V-173). Habitat modeling by Zielinski et al. (2006) suggested that areas of high predicted value for fishers poorly overlap with the current NWFP Late-Successional Reserve system; particularly in the eastern portion of the Klamath Province, where relatively little high value habitat currently occurs.

The Sierra Nevada Forest Plan Amendment (SNFPA) was adopted in 2001 and a Final Record of Decision (ROD) was issued in 2004 (USDA FS 2000a, 2001, 2004). The final ROD provides the framework guidance and policy document for managing 11 National Forests and about 11 million acres of California's National Forest lands in the Sierra Nevada and Modoc Plateau. The SNFPA includes measures expected to lead to an increase over time of late-successional forest; retention of important wildlife structures such as large-diameter snags and coarse woody debris; and management of about 40% of the Plan Area as old forest emphasis areas. The SNFPA also established a Southern Sierra Fisher Conservation Area with additional requirements intended to maintain and expand the fisher population in the southern Sierra Nevada. Conservation measures for the fisher conservation area include maintaining at least 60% of each watershed in mid-to-late successional forest (at least 11-inch mean dbh) with an average canopy cover of at least 50%. The plan also includes protections for known fisher den sites. However, this measure has limited conservation value in many areas due to the difficulty of locating fisher den sites without radio-telemetry. As part of the ROD, the USFS initiated a regional fisher monitoring program in 2002 to track population trends throughout the southern Sierra Nevada. The primary objective of the program is to use sampling to detect a 20% decline in relative abundance of the population with 80% statistical power.

The USDA Forest Service (USFS) Sensitive Species Policy and the USDI Bureau of Land Management (BLM) manual call for both National Forests and BLM districts to assist and coordinate with other Federal agencies and States to conserve species with viability concerns. The fisher has been identified as a sensitive species by the USFS Pacific Southwest and Pacific Northwest Regions (Regions 5 and 6, respectively) and the Oregon-Washington and California BLM.

Each National Forest operates under a Land and Resource Management Plan (LRMP) and each BLM district operates under a Resource Management Plan (RMP). The NWFP standards and guidelines apply to National Forests and BLM districts within the range of the northern spotted owl except when the standards and guidelines of LRMPs or RMPs are more restrictive or provide greater benefits to species associated with late-successional forest. Most individual Forest LRMPs and BLM district RMPs do not provide any additional protections to fishers or fisher habitat. Therefore, the above discussion regarding the NWFP and SNFPA summarizes the primary regulatory mechanisms in place on National Forest and BLM lands within the range of the West Coast DPS.

Land management plans for the National Parks within the range of the West Coast DPS do not contain specific measures to protect fishers. Nonetheless, areas not developed specifically for recreation or camping are managed toward natural ecosystem composition and function and are expected to maintain fisher habitat. Hunting and trapping are not allowed in the parks. Fisher habitat occurs in National Parks within the range of the West Coast DPS but many of the parks contain large areas at higher elevations than those at which fishers and their habitat generally

occur. The Olympic National Park, Olympic National Forest, and the Washington Department of Fish and Wildlife are currently cooperating and implementing a reintroduction of fishers to suitable lands in the Olympic National Park (Lewis et al. 2010, Washington Department of Fish and Wildlife 2011).

2.2.4.5 Conservation Efforts on Non-Federal Lands

Washington. The State of Washington listed the fisher as endangered (WAC 232-12-297) in 1998. This status provides protection in the form of more stringent fines for poaching and a process for environmental analysis of projects that may affect the species. There are no special regulations to protect habitat for fishers or to conduct surveys for this species prior to obtaining forest activity permits.

The State Forest Practice Rules are the primary regulatory mechanism on non-Federal forest lands in Washington (Title 222 of the Washington Administrative Code). These rules apply to all commercial timber growing, harvesting, or processing activities on non-Federal lands, and give direction on how to implement the Forest Practice Act (Title 76.09 Revised Code of Washington), and Stewardship of Non-Industrial Forests and Woodlands (Title 76.13 RCW). Washington's Forest Practice Rules do not specifically address the fisher's habitat requirements but may provide limited benefit to the species through protection of important habitat elements (e.g., dead woody materials, canopy cover) in some areas.

The Washington Department of Fish and Wildlife (WDFW), in cooperation with the Olympic National Park, US Geological Survey, and others, began to reintroduce fishers onto Park Service lands on the Olympic Peninsula in Washington in January 2008 (Lewis et al. 2010). Three years of planned reintroductions were complete at the end of the 2010 trapping season with a total of 90 fishers (40 males and 50 females) relocated from British Columbia to the park. These fishers will be monitored for a number of years to determine both the extent of their distribution and success in establishing a reproducing population of fishers on the Olympic Peninsula. Successful establishment of this population will not be known for several years.

Oregon. Oregon designated the fisher a protected non-game species and a sensitive species (critical category; Oregon Department of Fish and Wildlife 2008). The Oregon Department of Fish and Wildlife does not allow 'take' (i.e., kill or obtain possession or control) of fishers, but some fishers may be injured or killed by traps set for other species. Training and testing is required of applicants for trapping licenses in order to minimize take of non-target species such as fishers.

The two management plans for Oregon's State Forests generally appear to be of little benefit to fishers. Both plans include provisions to protect some forest reserves, but these are not likely to benefit fishers because of the fragmented nature of the lands.

The Forest Practice Administrative Rules and Forest Practices Act (Oregon Department of Forestry 2000) regulates forest activities on all State, county, and private lands in Oregon. Interim procedures for protecting sensitive resource sites apply only to threatened and endangered species, and to bird species listed as "sensitive" in the rules, and currently do not

apply to fishers. While Oregon's rules governing forest management on non-Federal lands do not directly protect the fisher or its habitat, they may provide some protection for habitat elements important to the species.

California. The State of California classifies the fisher as a furbearing mammal that is protected from commercial harvest. On April 8, 2009, the California Fish and Game Commission accepted a petition initiating a 12-month review of the status of fisher by the CDFG, pursuant to Fish and Game Code Section 2074.6. At its June 23, 2010 meeting, the California Fish and Game Commission determined that listing was not warranted as suggested by CDFG in the "Report to the Fish and Game Commission, A Status Review of the Fisher (*Martes pennanti*) in California", (CDFG 2010).

The California Environmental Quality Act (CEQA) provides regulatory protections for critical habitat and habitat required by federally listed species (e.g., northern spotted owls, marbled murrelets [*Brachyramphus marmoratus*], anadromous salmonids) on state and private lands in California. These protections may provide limited benefits to fishers.

Timber management activities on commercial forestlands in the State are guided by the CFPRs (California Department of Forestry and Fire Protection 2011). The Forest Practice Rules provide protections for species listed as threatened or endangered under the Endangered Species Act or CESA and for species identified by the California Board of Forestry as sensitive, but the fisher is not currently on any of these lists. The Forest Practice Rules also include intent language about reducing significant impacts to non-listed species and maintaining functional wildlife habitat. However, this language is not associated with specific enforceable measures. The CFPRs may provide limited benefit to fishers in some areas; for example, by protecting habitat elements for spotted owls and other species associated with late-successional forests.

The CDFG, in cooperation with the Service and Sierra Pacific Industries, began to translocate fishers to the northern Sierra Nevada in December, 2009. Three years of planned translocations (Callas and Figura 2008) were complete in December of 2011, with a total of 40 fishers (16 males and 24 females) relocated from northwestern California to the northern Sierra Nevada. These fishers will be monitored for seven years to determine both the extent of their distribution and success in establishing a reproducing population of fishers in the northern Sierra Nevada. Successful establishment of this population will not be known for several years.

Tribal. Tribal lands within the range of the West Coast DPS manage their forests under a variety of management plans. Some of these forest management plans (e.g., Warm Springs Reservation of the Confederated Tribes, The Coquille Tribe of Oregon, and The Confederated Tribes and Bands of the Yakama Nation) contain guidelines and habitat protection measures for spotted owls, riparian areas, and dead woody materials that will, at a minimum, provide some of the habitat components important to fishers and their prey. The forest management plan for the Hoopa Valley Indian Reservation in northwestern California includes setting aside habitat and no-harvest reserves and specifically acknowledges needs for conservation and research of fishers on the Reservation.

Habitat Conservation Plans. Some non-Federal lands are managed under Habitat Conservation Plans (HCPs) with strategies that conserve habitat for a variety of species. These HCPs may provide some incidental benefit to fishers. A few HCPs cover areas within the historical range of the fisher, particularly in western Washington and northwestern California. Although the fisher is a covered species in 7 HCPs within Washington and California, the species is currently known to be present only on lands under 2 California HCPs. In most HCPs, areas where late-successional habitat will be protected or allowed to develop are mostly in riparian buffers and smaller blocks of remnant old forest.

2.2.5 Current Condition of the West Coast DPS of the Fisher

2.2.5.1 Current Range and Distribution

The current range and distribution of West Coast fishers is described in section 2.2.2.3 (also see Lofroth et al. 2010).

2.2.5.2 Habitat Trends and Current Conditions

West Coast fishers favor areas containing mid- to late-successional conifer or conifer-hardwood forest, with relatively dense canopy cover, large-diameter trees, snags, and logs, and complex structure, including understory vegetation and down wood (USDI FWS 2004b). The current abundance of these conditions in the Pacific States is substantially lower than during historical periods. Bolsinger and Waddell (1993) found a 31% reduction of old-growth forests in evaluated portions of California, Oregon, and Washington compared to the early 20th century. The Forest Ecosystem Management Assessment Team (1993) reported that: (1) heavy logging has eliminated most late-successional and old-growth forest in the western Washington lowlands and northern Oregon Coast Range; (2) public lands in the Olympic Peninsula, southern Oregon Coast Range, and western Washington and Oregon Cascades still contain substantial amounts of late-successional or old-growth forest but much of it has been highly fragmented by logging; and (3) the Oregon and California Klamath Provinces and the California Cascades also have substantial amounts of late-successional and old-growth forest but it is highly fragmented by logging and natural factors. Franklin and Fites-Kauffman (1996) found that only about 14% of evaluated polygons (landscape units on public lands that were relatively uniform in type and distribution of vegetation patches) in the Sierra Nevada and southern Cascades of California are currently dominated by late-successional or old-growth forest structure and function.

Several recent models have used fisher detection locations and habitat associations to predict the distribution of habitat suitability for the species in California and southwestern Oregon (Carroll et al. 1999; Zielinski et al. 2006, 2010; Davis et al. 2007; Spencer et al. 2011). These models showed that large proportions of northwestern California currently consist of predicted medium- and high-suitability habitat for fishers; that is, areas in which there is a moderate or high probability of detecting the species (Carroll et al. 1999; Zielinski et al. 2006, 2010; Davis et al. 2007). The models have differed somewhat, however, in their projections of habitat suitability in the western versus eastern portions of the Klamath Province. Carroll et al. (1999) showed that most of the high-suitability fisher habitat in the Oregon and California Klamath Provinces is located relatively close to the coast. In contrast, Davis et al. (2007) projected greater amounts of

high-suitability fisher habitat in the central, northern, and eastern portions of the California Klamath Province than in the western portion. Zielinski et al. (2010) did not model fisher habitat near the coast but did project greater concentrations of medium- and high-suitability fisher habitat in the western portion of the California Klamath Province than in the eastern portion. Models indicated that the southern Sierra Nevada currently contains a band of medium- and high-suitability fisher habitat on the range's western slope (Davis et al. 2007, Spencer et al. 2011). Pockets of medium- and high-suitability habitat likely also occur in rugged forested canyons in the northern Sierra Nevada but they are distant from the southern Sierra Nevada fisher population relative to fisher dispersal distances (Davis et al. 2007).

2.2.5.3 Population Densities and Abundances

Estimates of fisher densities and abundances vary among studies and geographic areas. Fisher populations are primarily influenced by the availability of habitat and prey (Powell 1993, Powell and Zielinski 1994). Population estimates for the species are often inaccurate due to large sampling errors and should be cautiously evaluated (Powell 1993, Powell and Zielinski 1994).

In British Columbia, densities of fishers in the highest-suitability habitats were estimated to be between 1.0 and 1.5 fishers per 38.6 mile^2 (Weir 2003). Estimated densities on an industrial forest in the province ranged between 0.8 and 1.3 fishers per 38.6 mile^2 (Weir and Corbould 2006). The late-winter population in British Columbia was conservatively estimated to be between 1,113 and 2,759 individuals (Weir 2003).

Native fishers are absent or rare in Washington. Ninety fishers were relocated from British Columbia to the Olympic Peninsula during 2008 through 2010 (Washington Department of Fish and Wildlife 2011). Monitoring during the coming years will determine whether or not fishers successfully establish themselves in this area.

Fishers were relocated from British Columbia and Minnesota to the southern Oregon Cascades in 1961 and from 1977 to 1981 (Aubry and Lewis 2003, Drew et al. 2003). The population has persisted but there have been no rigorous efforts to estimate its size (Lofroth et al. 2010).

Several density estimates are available for California portions of the southwestern Oregon/northern California fisher population. A density of about 5 females per 38.6 mile^2 was estimated for a study area on the Six Rivers and Shasta-Trinity National Forests (Zielinski et al. 2004a). On the Hoopa Valley Indian Reservation, densities of 52 and 14 fishers (male and female) per 38.6 mile^2 were estimated for 1998 and 2005, respectively (Matthews et al. 2011). The population was not monitored during the period between these years, so the cause of the apparent decline is unknown; however, the rebounding population appears to be stable or increasing based on lambda estimates and age structure shifts (Higley and Matthews 2009). Surveys on adjacent Green Diamond Resource Company lands during a similar period did not detect any major declines, suggesting that the decline on Hoopa lands was localized (Callas and Figura 2008). The density of fishers on Green Diamond lands was estimated to be between 7 and 11 fishers (male and female) per 38.6 mile^2) during 2002 and 2003 (Thompson 2008). Self et al. (2008) estimated that the entire southwestern Oregon/northern California population consists of 4,616 fishers. In a personal communication to the CDFG, C. Carroll estimated that

the population consists of between 1,000 and 3,000 individuals (CDFG 2010).

Density and population estimates are also available for the southern Sierra Nevada. Roughly 8 females per 38.6 mile^2) were estimated to occur on the Sequoia National Forest (Zielinski et al. 2004a). Fishers on the Sierra National Forest were estimated to have a density of 9.5 to 13.4 individuals (male and female) per 38.6 mile^2) (Jordan 2007). Spencer et al. (2008) used 3 different approaches to estimate a population of between 160 and 350 fishers (55 to 120 adult females) in the southern Sierra Nevada. Using 2 approaches, Self et al. (2008) estimated that either 548 or 598 fishers occur in the southern Sierra Nevada. A third paper used expert opinion to estimate a population of between 100 and 500 fishers in the area (Lamberson et al. 2000). In 2002, the Forest Service initiated a monitoring program to track population trends in the Sierra Nevada. The population trend has not yet been analyzed but there was little change in the index of abundance during the program's first 5 years (Truex et al. 2009).

Native fishers appear to be rare or extirpated from the central and northern Sierra Nevada. A program is currently underway (2009 through 2011) to reintroduce a total of 40 fishers to the northern Sierra Nevada and southern Cascades of California (CDFG 2010). The translocated animals will be monitored for 7 years to determine the program's success (Callas and Figura 2008).

3.0 ENVIRONMENTAL BASELINE

Regulations implementing the ESA (50 CFR §402.02) define the environmental baseline as including the past and present impacts of all Federal, State, or private actions and other human activities in the Action Area, the anticipated impacts of all proposed Federal projects in the Action Area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation process. Such activities include, but are not limited to, previous timber harvests and other land management activities.

The environmental baseline encompasses the effects of past and ongoing human and natural factors leading to the current status of the species, its habitat (including designated critical habitat), and ecosystem, within the Action Area. The environmental baseline is a "snapshot" of a species' health at a specified point in time.

3.1 Factors Affecting Species Environment within the Action Area

This analysis describes factors affecting the environment of the northern spotted owl and fisher in the Action Area. The baseline includes State, tribal, local, private and natural factors affecting the species or that will occur contemporaneously with the consultation in progress. Unrelated Federal actions affecting the species or critical habitat that have completed formal or informal consultation are also part of the environmental baseline, as are Federal and other actions within the Action Area that may benefit listed species or their critical habitat.

Existing conditions in the Action Area are largely the result of past management practices and natural disturbance regimes. Many factors have combined to alter the present environment from

conditions that existed prior to Anglo-American settlement of the Klamath and Scott River basins. Human-induced changes related to terrestrial habitat have been the result of timber operations, mining, and grazing. Other factors that have influenced the current conditions related to terrestrial habitat within the Action Area include geology and the past fire regime. The historical vegetative condition is described briefly to provide context. Much of this information was drawn from the Beaver Creek (USDA FS 1996a), Horse Creek (USDA FS 2002), Callahan (USDA FS 1997), and Lower Scott (USDA FS 2000b) ecosystem analyses.

3.1.1 Land Management Activities

3.1.1.1 Timber Operations

Repeated timber operations, mining, grazing, and other land management activities over the past century have left the landscape deficit in late-successional and old-growth forested habitat essential to northern spotted owls for nesting and roosting, and fisher for resting and denning. Through 1971, timber harvest concentrated on old-growth stands. Requirements for logging included snag removal and stream cleaning, which removed denning and nest cavities and reduced canopy cover, thereby hampering the ability of the forest to provide a moderate microclimate for thermoregulation. Large sugar pine and ponderosa pine were the preferred logs because they were easy to mill, and mills were designed to accommodate logs more than 20 inches in diameter. During the 1950s, mills were refurbished to cut dimensional lumber and fir trees became desirable. Since passage of the Forest Practices Act in 1972, timber management has focused on younger, more productive forests. Mandatory protective measures for natural resources have been implemented, including designated stream protection zones, canopy retention standards, stream crossing standards, and other protective best management practices. Despite these protective measures, much of the landscape is still lacking suitable spotted owl and fisher habitat because forest stands have yet to develop the necessary habitat features to provide nesting and roosting sites for owls, and resting and denning sites for fisher.

3.1.1.2 Roads

Early logging operations used steam donkeys (steam powered hoists), log chutes, horses, and other less invasive methods to transport logs. Steam donkeys were eventually replaced with steam engines and railroad track, allowing logs to be transported longer distances. By the late 1930s and 1940s, railroad logging declined and railroad grades were converted to road systems for logging trucks. Extensive new road development and reconstruction of existing roads began in the late 1950s and continued to the mid-1980s by private timber companies and the USFS, primarily for timber harvest.

Throughout the drainages that contain the Plan Area, nearly 4,500 miles of roads have been identified, but only about one-third (about 1,350 miles) of these roads are on FGS lands. The remaining 3,150 miles of road are on lands controlled by the USFS, other governmental agencies, or private interests. FGS is solely responsible for maintenance of more than 1,100 miles of road in the Plan Area. About 250 miles of road on FGS lands are maintained under cooperative road agreements with USFS (co-op roads). Only the approximately 1,100 miles of road for which FGS is solely responsible for maintenance are covered under this HCP.

The density of roads in the individual drainages ranges from 0.6 to 5.9 miles per square mile (mi/mi^2). On the FGS ownership, road density generally ranges from 4 to 7 mi/mi^2 depending on the watershed. The highest road densities are in the Doggett and Lumgrey Creek watersheds in the Klamath River Management Unit, and the Mill and Pat Ford watersheds in the Scott Valley Management Unit, where road densities exceed 7 mi/mi^2. Overall road density on the FGS ownership is 5.4 mi/mi^2.

For roads solely maintained and covered under the FGS HCP, there are approximately 781 miles classified as local or secondary roads and 219 miles classified as arterial main lines. For the purposes of this BO, a local or secondary road will average 12 feet in width, while an arterial main line will average 24 feet in width. Based on this assumption, roads solely maintained by FGS have removed approximately 1,773 acres of habitat. While it cannot be determined from this estimate the quantity or quality of northern spotted owl and fisher habitat that was removed for road construction, it does provide an estimate of habitat no longer available to these species.

3.1.1.3 Mining

Gold mining within the Klamath and Scott watersheds was the primary resource for extraction from the mid-1850s through the 1930s. Hydraulic mining began in the area sometime after 1850, and operations were often concurrent with hard-rock and dredge mining. Giant “monitors” were used to wash away entire hillsides. This form of mining may have existed into the 1930s along with dredge and small-scale, depression-era placer mining. Large-scale dredge mining, however, continued in the upper reaches and tributaries of the Scott River until the 1950s (USDA FS 1997).

Hydraulic mining diverted creeks to supply water to high pressure nozzles that leveled entire hillsides and rearranged much of the riparian areas in the basin. Sluicing and hydraulic mining destroyed riparian areas. Deforestation associated with mining destabilized hillslopes, and increased erosion, flooding, and fires. Deforestation, erosion, and degradation of riparian areas caused by years of mining downgraded and removed habitat used by spotted owls, fisher and their prey species.

3.1.1.4 Grazing

Domestic livestock were brought to northern California more than 150 years ago. Miners and homesteaders raised livestock to supply food for local residents and for transportation to distant markets. As the Scott Valley area became settled and ranches were established, cattle and sheep were moved into the adjacent mountains to forage. In the early 1900s, grazing was largely unregulated, and livestock numbers were as much as five times higher than what is currently permitted on the KNF (USDA FS 1996a, 2000b, 2002). In the past, the longer grazing seasons of February through December (compared to the present April to October grazing season) allowed animals to graze plants in the more sensitive times of spring and early winter. Continued high use of the mountain rangelands created degraded conditions in some areas, and forage production was reduced, potentially reducing habitats used by some spotted owl and

fisher prey species. The land affected by grazing today is a much smaller portion of the KNF (USDA FS 1996a, 2000b, 2002).

3.1.2 Vegetation

Few forested regions have experienced fires as frequently and with such high variability in severity as those in the Klamath Mountains (Taylor and Skinner 1998). The fire regime prior to European settlement (1850) within the Klamath area can be described as having frequent fires with return intervals of 1 to 25 years. Lightning and intentional burning by American Indians were the predominant causes of ignition (USDA FS 1996a, 1997, 2000b, 2002). The pre-European fire regime can be described as having mostly low- to moderate-intensity fires, with only small areas burning at high intensity. Fire return intervals were shorter on exposed sites and longer on sheltered sites. The steepness of the slopes and vegetation that had adapted to a history of frequent fires contributed to the varying intensities. Fire worked as both a thinning agent and an agent of decomposition. Although most vegetation (mixed conifers) promoted lower intensities when burned at frequent intervals, stand-replacing events occurred in some areas. Aspect, stand diameter, elevation, and topography are all factors that influence fire intensity within the Klamath region (Taylor and Skinner 1998, Fry and Stephens 2006, Alexander et al. 2006).

Prior to European settlement, much of the Action Area was maintained in an open mixed conifer forest. Ponderosa pine was the dominant conifer species found in open lower elevation stands on south and west aspects. Douglas fir was most prevalent on moister sites, especially on north and east aspects (USDA FS 1996a, 2002). Due to the historic fire regime, north and east aspects supported denser stands than south and west, but were less dense than current stands (USDA FS 1996a, 2002). True fir was found on colder sites above 5,000 feet elevation, and the mixed conifer forest blended into hardwoods on drier sites below 3,000 feet. Under the historical fire regime, brush fields within the Action Area were periodically replaced, but fire suppression has resulted in much denser and larger vegetation here as well. Depending on the level and types of human activities conducted, these vegetation communities have been altered to varying degrees.

Fire frequency, intensity, and size occurring within the Action Area have changed since the fire-suppression era (1950 to present) (Fry and Stephens 2006). Prior to the fire-suppression era, fires occurred frequently. In most of the vegetation assemblages covering large portions of the Klamath Mountains, they were of generally low to moderate and mixed severity (Skinner et al. 2006). Fires occurring in the fire-suppression era are less frequent and have greater intensity, resulting in a more homogeneous effect on the habitat by damaging and removing all vegetation (Fry and Stephens 2006). Fire suppression has allowed dense conifer stands to develop, and more litter and downed woody material accumulation than that under the historical fire regime (USDA FS 1996a, 2002). The lack of fire favors regeneration of Douglas fir and white fir over pine species. Currently, dense stands of Douglas fir and white fir are found in some areas that were historically open, pine-dominated stands. Although this shift in species composition to favor Douglas fir may be beneficial to spotted owls because they are most highly associated with this tree species, the increase in brush and stand density resulting from years of fire suppression may decrease the owl's foraging ability in some areas. Fisher hunt for a variety of prey species that occupy various forest vegetation types and successional stages, but typically avoid non-

forested environments and early successional forest stands that lack dense canopy cover (Lofroth et al. 2010). More importantly, the increase in fire frequency and severity due to fire suppression has increased the risk of uncharacteristically severe wildfire, which removes habitat for both spotted owls and fishers and creates more homogenous forest conditions compared to what would occur historically in the naturally mosaic landscape.

The following vegetation characteristics (e.g., tree size [dbh], canopy coverage) within the Action Area are described using the vegetation classification system described in the CWHR system (Mayer and Laudenslayer 1988).

3.1.2.1 Upland Forest

The forest communities of FGS's Klamath River and Scott Valley Management Units are dominated by second-growth mixed evergreen forests consisting of three or more species of conifers. Conifer species of the mixed evergreen forest include Douglas-fir, incense-cedar (*Calocedrus decurrens*), white fir, ponderosa pine, and sugar pine. The proportion of these species represented in the overstory depends on site-specific conditions (such as elevation, aspect, precipitation, soils, microclimate conditions, and past management). Small stands consisting of a single species (typically Douglas-fir or ponderosa pine), are scattered throughout the predominately mixed conifer forest landscape. Hardwood species such as canyon live oak (*Quercus chrysolepis*), Pacific madrone (*Arbutus menziesii*), California black oak (*Quercus kelloggii*), and Oregon white oak (*Quercus garryana*) are common in the understory. Forested areas within the Action Area tend to be naturally fragmented due to the diverse geology, topography, and dry conditions that result in areas dominated by hardwoods or chaparral species.

Three major forest types occur in FGS's Grass Lake Management Unit: Sierran Montane Forest, Upper Montane Forest, and Northern Yellow Pine Forest (Kuchler 1988). Sierran and Upper Montane Forest types occur at higher elevations, and Northern Yellow Pine forest at lower elevations. The Northern Yellow Pine forest type, dominated by ponderosa pine and white fir, is the most common forest type in FGS's Grass Lake Management Unit. As a result of fire suppression, stands of white fir have developed in some locations previously dominated by ponderosa pine. In contrast to the forests of FGS's Klamath River and Scott Valley Management Units, hardwood species are largely absent from FGS's Grass Lake Management Unit.

Approximately 11 percent of the ownership is not considered commercial forest land, consisting of either non-stocked forest land (brush and non-commercial species) or non-forest land (bare ground, meadows, rock). The greatest percentage of non-commercial land is in the Scott Valley Management Unit (15.1 percent, primarily non-stocked forest land) followed by Grass Lake (14.3 percent) and the Klamath River (6.7 percent) Management Units.

Forests in the Action Area have been managed for commercial timber production since the early 1900s. Consequently, forests are relatively young (less than 80 years old) with only small, isolated patches of older stands. Prior to the start of large-scale commercial logging, much of the conifer forests in the Action Area and vicinity were older, on average, than current forest stands. However, because this region is fire-prone, it is likely that a mosaic of age classes, including a high percentage of late-seral stages, developed and persisted prior to the advent of commercial

logging. Currently, less than 1 percent of the forested area in FGS's Klamath River, Scott Valley, and Grass Lake Management Units (65, 21, and 29 acres in each management unit, respectively) are in CWHR size class 5 (> 24 inches dbh) and may be considered late-seral stage. From 79 to 93 percent of commercial forest stands are considered mid-seral, with average tree sizes of 6 to 24 inches dbh (CWHR size classes 3 and 4).

3.1.2.2 Riparian Forest

The plant species composition and structure of riparian forest habitat currently occurring along streams in the Action Area varies in relation to factors such as stream characteristics, topography, elevation, and past management. Close to the valley floor, hardwoods (such as willows [*Salix spp.*] and cottonwoods [*Populus spp.*]) predominate. In some of the valley floor areas, the riparian zone composed of hardwoods forms a plant community that is distinct from drier upland areas that support chaparral species. At higher elevations, the riparian zone is characterized as a mix of conifer and hardwood species. The conifer component is similar to adjacent upslope areas; the hardwood component consists of red alders (*Alnus rubra*) and big leaf maple (*Acer macrophyllum*) along the immediate margins of the stream. Along many streams on FGS lands, particularly higher-gradient streams, riparian forest composition is largely indistinguishable from the adjacent upland mixed conifer forest.

Site-specific riparian inventories have not been conducted along all streams in the Plan Area. To provide a general indication of the condition of riparian stands, the FGS hydrology (stream) layer was buffered according to CDFG Coho Recovery Plan specifications (150-foot buffers along Class I streams, 75- to 125-foot buffers along Class II streams, and 25- to 50-foot buffers along Class III streams) and overlain on the FGS 2004 Forest Inventory using Geographic Information System (GIS). The range of buffer width within a given class was dependent on percent slope of adjacent hillsides. Results of this analysis are presented in Tables 4-9 through 4-11 of the HCP, which summarize the number of trees per acre in various size classes in riparian stands along Class I[5], Class II, and Class III streams, respectively.

3.1.3 Climate

The climate in FGS's Klamath River Management Unit can be characterized as temperate Mediterranean, with hot, dry summers and cool, moist winters. Precipitation in the Klamath River watershed varies greatly, from around 20 inches per year in the upper watershed to as much as 100 inches per year near the coast. FGS's Klamath River Management Unit lies near the middle of this range; precipitation increases with elevation within the unit. Precipitation in the Klamath River Management Unit ranges from an average of around 30 inches per year in the lower elevations near the Klamath River to about 75 inches per year at the highest elevations, with approximately 90 percent falling between October and May (USDA FS 1996a, 2002). Summer precipitation occurs primarily during thunderstorm activity; high-intensity, short-duration thunderstorms are common (USFS 1996a, 2002). Below 3,500 feet in elevation, most precipitation is rainfall; above 4,000 feet, winter precipitation is predominately snowfall. Higher-elevation terrain in the Klamath River watershed receives large winter and spring snowpacks, and can be associated with high amounts of runoff during warm winter storms (CETFKRB 2004).

The Scott River watershed also has hot, dry summers and cool, wet winters characteristic of Mediterranean climates. Rainfall is somewhat less than along the Klamath River. Approximately 90 percent of precipitation falls between October and May; peak precipitation occurs in December and January. Although most precipitation occurs winter through spring, there may be short periods of locally intense rainfall from summer thunderstorms (USDA FS 1997, 2000b). In the valleys, precipitation is significantly lower than in the surrounding mountains. Average annual precipitation ranges from below 20 inches at the lowest elevations along the Scott River, to more than 60 inches at the highest elevations at the western and southern extents of the watershed (North Coast RWQCB 2005). Winter precipitation is mostly rain at the lower elevations, below about 4,000 feet, with a rain-snow transition zone between about 4,000 feet and 5,000 feet. Snow typically accumulates in the rain-snow transition zone, but is frequently melted by midwinter rains. The higher elevations, especially above 6,000 feet, have short summers and relatively long winters with deep snowpacks.

The topographic characteristics of the basin make the Scott River watershed particularly susceptible to severe flooding caused by rain-on-snow events. A significant portion of the basin is between 4,500 and 5,500 feet in elevation, which is the range of elevation most susceptible to rain-on-snow events (North Coast RWQCB 2005). The largest floods on record (1861, 1955, 1964, 1974, and 1997) were associated with this type of event (USDA FS 2000b).

The Grass Lake Management Unit receives considerably less precipitation than the Klamath River and Scott Valley Management Units. In the western portions of the Action Area, annual precipitation averages about 30 to 35 inches, whereas precipitation in the eastern portions averages 20 inches or less per year (Ruffner 1978).

3.1.4 Land Ownership

FGS's Hilt/Siskiyou ownership is intermixed with Federal and other private lands. The KNF accounts for the largest proportion of adjacent Federal land; although a small portion of FGS lands are bordered by lands managed by the Bureau of Land Management (BLM). Much of FGS's Klamath River Management Unit is in "checkerboard" ownership; land in alternating sections typical of lands granted to the railroad in the nineteenth century, with USFS lands and other private landowners. FGS's Scott Valley and Grass Lake Management Units generally consist of larger, more contiguous blocks surrounded by USFS lands or private landowners. Adjoining privately owned lands are managed for commercial timber harvest in a manner similar to the FGS ownership, or are agricultural lands with rural residential use.

Federal lands of the KNF are managed for multiple uses including recreation, fish and wildlife habitat, timber harvest, and visual resources under the KNF Land and Resource Management Plan (LRMP) (USDA FS 1994). The LRMP was largely based on the NWFP (USDA FS and USDI BLM 1994a). Under the LRMP, the USFS will manage about 22 percent of the KNF as LSRs, with the objective of providing for the viability needs of late-successional species using an ecosystem-based approach. About 35 percent of the KNF is considered matrix lands that are managed for multiple-use purposes, including timber harvest, fish and wildlife resources, recreation, and visual resources. The remaining 43 percent of the KNF consists of other CRAs

and AWAs. Many of these areas (such as wilderness areas, backcountry areas, RRs, cultural areas, and research natural areas) will be managed in a manner consistent with achieving late seral conditions (USDA FS 1994).

Riparian Reserves on the KNF are designated primarily along perennial and intermittent streams, lakes, ponds, seeps, springs, and wetlands. They are also designated in unstable and potentially unstable non-riparian areas that are primary contributors of sediment and wood to aquatic systems. In riparian reserves, riparian-dependent resources are of primary concern, with management standards and guidelines applied to maintain or restore riparian functions. In keeping with the ROD, riparian reserves are at least 300 feet wide along fishbearing (Class I)[5] streams, and at least 150 feet wide along perennial, non-fishbearing (Class II) streams. Along intermittent streams and around unstable or potentially unstable areas, riparian reserves are at least 100 feet wide. Timber harvest is generally prohibited in riparian reserves unless it is consistent with or necessary to achieve the Aquatic Conservation Strategy (ACS) objectives set forth in the NWFP. Other land uses, such as grazing and mineral operations, are similarly restricted in that they must be conducted in a manner compatible with the ACS objectives. Riparian reserves encompass an estimated 458,000 acres (27 percent) of KNF (USDA FS 1994).

3.2 Status of Northern Spotted Owl in the Action Area

The Action Area is defined to mean "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR §402.02)." For the purposes of this consultation, the Action Area consists of a 1.3-mile radius around the FGS ownership, reflective of the local owl population that could be directly or indirectly affected by the HCP. The 1.3-mile distance criterion is based on the average home range size of the northern spotted owl within the California Klamath and California Cascades Provinces (USDI FWS 2005). The activity center typically consists of a roost or nest site, and is considered the center of an owl's home range. The total area within the Action Area is approximately 545,030 acres. This 1.3-mile radius around the FGS ownership is termed "Area of Impact" in the FGS HCP for the purposes of characterizing environmental baseline conditions and describing effects of the covered activities on the northern spotted owl.

The northern spotted owl population in the Action Area is divided by two ecological provinces: the California Klamath Province and the California Cascades Province. The environmental baseline is described separately for these two provinces within the Action Area because they are distinct in terms of population demographics and trends, threats, and quantity and quality of northern spotted owl habitat.

The following description of owl population status and habitat both range-wide and within the Action Area is based on published and unpublished information, and stand inventories and protocol-level owl surveys within the Plan Area and adjacent Federal lands.

[5] Stream classes used in the HCP are those defined in the California Forest Practice Rules (CAL FIRE 2008)

3.2.1 Environmental Baseline in the California Klamath Province Action Area

The following section describes local environmental baseline conditions for the portion of the Action Area within the California Klamath Province, including a discussion of the northern spotted owl population, amount and quality of habitat on the FGS ownership and adjacent Federal lands, and current threats. Fruit Growers Supply's Scott Valley and Klamath River Management Units occur within the California Klamath Province.

Northern Spotted Owl Population in the Klamath Action Area

Comprehensive surveys for spotted owls were not conducted for the purposes of developing the FGS HCP. The Service relied on the CDFG Northern Spotted Owl Database to estimate the number of spotted owls occupying the Action Area using records dating from 1987 through 2007. The owl population baseline is based on a compilation of northern spotted owl sightings from the database within the Action Area, including results of incidental sightings as well as protocol-level owl surveys on FGS lands and adjacent private and public lands. Information on fecundity and survivorship in the Action Area is not available, as no mark-recapture programs for owls have been conducted on FGS's ownership in the California Klamath Province.

For the period from 1987 through 2007, the CDFG database contains records of 87 activity centers on or within 1.3-miles of FGS's ownership in the California Klamath Province. Of these, 13 sites were determined by the Service to be invalid because they did not meet the Service's criteria for designation as an activity center (i.e, inadequate number of detections for residency status) and/or were extremely lacking in amounts of suitable habitat (i.e., habitat was removed by a stand-replacing fire in a significant portion of the core) during development of the HCP. Since FGS did not conduct comprehensive surveys of all the historic activity centers to determine current occupancy status, the remaining 74 activity centers were considered occupied at their highest historic status (Table 5) for the purposes of HCP development. Using this conservative approach, a total of 143 northern spotted owls were estimated to occur within the California Klamath Province portion of the Action Area (containing FGS's Scott Valley and Klamath River Management Units); 18 of these historic activity centers are located on FGS land.

There is some uncertainty as to the exact number of currently occupied activity centers within this area because some activity centers may no longer be active. A substantial number of the remaining 74 historic activity centers are unlikely to support occupancy by spotted owls, particularly reproducing pairs. Many of the historic activity centers have not been surveyed during the past five to 10 years, others have been surveyed to varying degrees with no detections, and most of the historic activity centers have received substantial timber harvest within their core areas and home ranges. It is unlikely that there are additional undetected activity centers on FGS ownership given the low amounts of suitable habitat and extensive survey effort over time on the property.

Because the size and distribution of the spotted owl population within the Action Area was uncertain, the Service augmented the above-described survey information with results from a predictive model developed by Zabel et al. (2003). The model was used to evaluate the likelihood of additional activity centers occurring within the California Klamath Province

portion of the Action Area over the permit term. The model predicts probability of occupancy based on habitat conditions within a 500-acre (0.5-mile radius) circular window; this spatial scale corresponds to 'core areas' that receive disproportionate use by nesting and foraging spotted owls in the Klamath region (Bingham and Noon 1997) and where differences between use and availability of habitat tend to be most pronounced (USDI FWS 2011b, Appendix C). The Service evaluated the broad-scale patterns of habitat suitability on and within 1.3 miles of the FGS ownership by decade and determined that establishment of additional activity centers (i.e larger population size) beyond the owl population baseline within the Klamath Action Area is unlikely over the permit term.

Table 5. Quantification of Northern Spotted Owls by Reproductive Status in the California Klamath Province Portion of the Action Area

Status (1987-2007)[a]	**Sites[b]**	**Owls**
Reproductive pair with young	50	100
Nesting pair	19	38
Territorial single	5	5
Not valid activity center	13	0
Total activity centers	87	143
Total valid activity centers	74	143

[a] Source: CDFG Northern Spotted Owl Database
[b] For the purpose of the effects analysis, each site is considered an activity center

Northern Spotted Owl Habitat in the Klamath Action Area

In addition to landscape and topographic features, vegetation and structural elements are important factors determining northern spotted owl habitat suitability (57 FR 1796). The structure and composition of coniferous vegetation within the Action Area is naturally diverse and fragmented due to variation in topography and soil type, the relatively dry climate, and stochastic events such as fire. Timber harvest and fuels management have contributed to the habitat mosaic. Because the HCP area is an industrial forest landscape, forest stands within the HCP area have experienced a long history of intensive management. Many attributes important to northern spotted owls (i.e., dense stands of large old trees, snags, logs) are lacking in most stands.

As part of the HCP development process, FGS worked with the Service to produce a GIS layer that represents current northern spotted owl habitat in the Action Area and the region. Using a combination of local data sources and models, a habitat data layer was derived for the area encompassing FGS ownership and surrounding 20-mile buffer, which includes portions of Siskiyou, Shasta, and Trinity counties in California and Jackson, Josephine, and Klamath counties in Oregon. This derived data layer represents the most current depiction of northern spotted owl habitat for this region. The habitat definitions used in the database are based on mean values and minimum standards for stand structural variables; this fact, combined with the long history of intensive timber management of FGS lands, suggests that the habitat layer likely represents an overestimate of actual habitat quality. A description of the 2005 northern spotted

owl baseline habitat layer, including data sources and methods can be found in Appendix A of the FGS HCP (2009).

Based on the owl habitat layer, there are 70,034 acres of foraging habitat, 42,045 acres of nesting habitat, and 227,464 acres of unsuitable habitat within the 339,543-acre Klamath portion of the Action Area (Table 6). Table 7 shows the acreage and ownership of northern spotted owl habitat within the core and home range of each activity center within the Klamath Action Area. Habitat on Federal and private non-FGS land over the term of the ITP is represented by the owl habitat layer to avoid speculating on the types of changes that may occur on these lands over time.

Table 6. Northern Spotted Owl Habitat and Land Ownership in the California Klamath Province portion of the Action Area

Acres of Habitat				
Owner	**Unsuitable**	**Foraging**	**Nesting/Roosting**	**Total**
Federal	78,144	26,315	26,436	130,895
FGS	65,535	30,548	8,410	104,493
Other Private	83,281	13,128	7,199	103,608
State	504	42	0	546
Total Public	78,648	26,358	26,436	131,442
Total Private	148,816	43,676	15,609	208,101

Table 7. Suitable Northern Spotted Owl Nesting/Roosting and Foraging Habitat within Northern Spotted Owl Cores and Home Ranges across Land Ownerships within the Klamath Action Area.

Klamath Action Area			**Acres of Suitable Nesting/ Roosting and Foraging Habitat in NSO Core (502 acres)**					**Acres of Suitable Nesting/ Roosting and Foraging Habitat in NSO Outer Ring Home Range (2,894 acres)**					
Activity Center	**HRS**	**Habitat**	**Total**	**FGS**	**USFS**	**BLM**	**OP**	**Total**	**FGS**	**USFS**	**BLM**	**OP**	**State**
SK002	Pair (KNF)	Foraging	**139**	139	0	0	0	**515**	315	140	0	61	0
		Nesting	**165**	3	162	0	0	**302**	6	296	0	0	0
		Total	**314**	142	162	0	0	**817**	321	436	0	61	0
SK012	Pair (KNF)	Foraging	**188**	0	177	0	11	**1570**	40	370	0	1160	0
		Nesting	**118**	0	110	0	8	**436**	1	310	0	126	0
		Total	**306**	0	287	0	19	**2006**	41	680	0	1286	0
SK020	Pair (KNF)	Foraging	**80**	5	75	0	0	**164**	119	45	0	0	0
		Nesting	**243**	26	217	0	0	**618**	160	458	0	0	0
		Total	**323**	31	292	0	0	**782**	279	503	0	0	0
SK028	Pair (KNF)	Foraging	**388**	39	257	0	92	**1540**	617	920	0	4	0
		Nesting	**48**	0	47	0	0	**300**	0	296	0	3	0
		Total	**436**	39	304	0	92	**1840**	617	1216	0	7	0
SK040	Pair (KNF)	Foraging	**152**	4	147	0	0	**1132**	266	654	0	213	0
		Nesting	**137**	0	137	0	0	**352**	174	167	0	10	0
		Total	**289**	4	284	0	0	**1484**	440	821	0	223	0
SK044	Pair (KNF)	Foraging	**40**	21	18	0	0	**748**	429	267	0	52	0
		Nesting	**393**	12	381	0	0	**1231**	58	1173	0	0	0
		Total	**433**	33	399	0	0	**1979**	487	1440	0	52	0
SK046	Pair (KNF)	Foraging	**173**	173	0	0	0	**821**	749	72	0	0	0
		Nesting	**119**	67	52	0	0	**143**	39	104	0	0	0
		Total	**292**	240	52	0	0	**964**	788	176	0	0	0

Klamath Action Area			Acres of Suitable Nesting/ Roosting and Foraging Habitat in NSO Core (502 acres)					Acres of Suitable Nesting/ Roosting and Foraging Habitat in NSO Outer Ring Home Range (2,894 acres)					
Activity Center	**HRS**	**Habitat**	**Total**	**FGS**	**USFS**	**BLM**	**OP**	**Total**	**FGS**	**USFS**	**BLM**	**OP**	**State**
SK048	Pair (KNF)	Foraging	**213**	0	105	0	108	**1133**	0	428	0	704	0
		Nesting	**152**	0	120	0	32	**730**	7	553	0	171	0
		Total	**365**	0	225	0	140	**1863**	7	981	0	875	0
SK051	Pair (KNF)	Foraging	**74**	0	49	0	25	**582**	51	267	0	263	0
		Nesting	**153**	0	122	0	31	**429**	10	240	0	179	0
		Total	**227**	0	171	0	56	**1011**	61	507	0	442	0
SK061	Pair (OP)	Foraging	**70**	0	41	0	29	**697**	96	346	0	255	0
		Nesting	**344**	0	409	0	235	**966**	52	436	0	477	0
		Total	**414**	0	450	0	264	**1663**	148	782	0	732	0
SK063	Pair (KNF)	Foraging	**156**	11	75	0	70	**551**	131	224	0	196	0
		Nesting	**167**	0	138	0	29	**761**	32	322	0	407	0
		Total	**323**	11	213	0	99	**1312**	163	546	0	603	0
SK065	Pair (KNF)	Foraging	**82**	0	44	0	39	**286**	87	82	0	117	0
		Nesting	**118**	63	54	0	1	**832**	278	460	0	94	0
		Total	**200**	63	98	0	40	**1118**	365	542	0	211	0
SK097	Pair (KNF)	Foraging	**34**	34	0	0	0	**646**	399	247	0	0	0
		Nesting	**395**	0	395	0	0	**1235**	37	1198	0	0	0
		Total	**429**	34	395	0	0	**1881**	436	1445	0	0	0
SK099	Pair (KNF)	Foraging	**136**	1	91	0	44	**573**	79	376	0	118	0
		Nesting	**300**	0	300	0	0	**1197**	207	991	0	0	0
		Total	**436**	1	391	0	44	**1770**	286	1367	0	118	0
SK100	Pair (KNF)	Foraging	**210**	8	188	0	14	**1054**	14	755	0	285	0
		Nesting	**77**	38	26	0	13	**421**	5	360	0	56	0

Klamath Action Area			Acres of Suitable Nesting/ Roosting and Foraging Habitat in NSO Core (502 acres)					Acres of Suitable Nesting/ Roosting and Foraging Habitat in NSO Outer Ring Home Range (2,894 acres)					
Activity Center	**HRS**	**Habitat**	**Total**	**FGS**	**USFS**	**BLM**	**OP**	**Total**	**FGS**	**USFS**	**BLM**	**OP**	**State**
		Total	**287**	46	214	0	27	**1475**	19	1115	0	341	0
SK130	Single (KNF)	Foraging	**175**	60	114	0	0	**1501**	611	540	0	349	0
		Nesting	**155**	59	96	0	0	**567**	131	406	0	30	0
		Total	**330**	119	210	0	0	**2068**	742	946	0	379	0
SK131	Pair (KNF)	Foraging	**95**	0	95	0	0	**940**	192	717	0	30	0
		Nesting	**177**	0	177	0	0	**385**	0	385	0	0	0
		Total	**272**	0	272	0	0	**1325**	192	1102	0	30	0
SK204	Pair (KNF)	Foraging	**117**	0	54	0	62	**763**	25	517	0	221	0
		Nesting	**96**	0	42	0	54	**788**	13	462	0	313	0
		Total	**213**	0	96	0	116	**1551**	38	979	0	534	0
SK205	Pair (OP)	Foraging	**216**	109	56	0	51	**678**	276	180	0	223	0
		Nesting	**87**	63	15	0	9	**277**	52	108	0	116	0
		Total	**303**	172	71	0	60	**955**	328	288	0	339	0
SK237	Pair (KNF)	Foraging	**48**	0	48	0	0	**537**	5	495	0	38	0
		Nesting	**360**	0	324	0	36	**1989**	179	1515	0	296	0
		Total	**408**	0	372	0	36	**2526**	184	2010	0	334	0
SK238	Pair (KNF)	Foraging	**103**	0	103	0	0	**886**	83	803	0	0	0
		Nesting	**339**	0	339	0	0	**1336**	104	1232	0	0	0
		Total	**442**	0	442	0	0	**2222**	187	2035	0	0	0
SK239	Pair (KNF)	Foraging	**9**	0	9	0	0	**765**	474	275	0	16	0
		Nesting	**451**	151	301	0	0	**1365**	619	721	0	25	0
		Total	**460**	151	310	0	0	**2130**	1093	996	0	41	0
SK262	Pair	Foraging	**194**	193	1	0	0	**982**	455	484	20	23	0

Klamath Action Area			Acres of Suitable Nesting/ Roosting and Foraging Habitat in NSO Core (502 acres)					Acres of Suitable Nesting/ Roosting and Foraging Habitat in NSO Outer Ring Home Range (2,894 acres)					
Activity Center	**HRS**	**Habitat**	**Total**	**FGS**	**USFS**	**BLM**	**OP**	**Total**	**FGS**	**USFS**	**BLM**	**OP**	**State**
	(KNF)	Nesting	**79**	79	0	0	0	**306**	31	241	2	32	0
		Total	**273**	272	1	0	0	**1288**	486	725	22	55	0
SK262B	Pair (KNF)	Foraging	**225**	101	123	0	0	**1211**	523	650	0	38	0
		Nesting	**82**	0	82	0	0	**374**	196	158	0	20	0
		Total	**307**	101	205	0	0	**1585**	719	808	0	58	0
SK291	Pair (KNF)	Foraging	**281**	16	265	0	0	**1900**	641	1122	0	138	0
		Nesting	**106**	4	102	0	1	**249**	3	242	0	4	0
		Total	**387**	20	367	0	1	**2149**	644	1364	0	142	0
SK309	Pair (FGS)	Foraging	**84**	71	13	0	0	**544**	325	219	0	0	0
		Nesting	**75**	75	0	0	0	**67**	44	23	0	0	0
		Total	**159**	146	13	0	0	**611**	369	242	0	0	0
SK310	Pair (KNF)	Foraging	**59**	0	41	0	17	**286**	0	81	0	205	0
		Nesting	**232**	0	159	0	74	**564**	45	264	0	256	0
		Total	**291**	0	200	0	91	**850**	45	345	0	461	0
SK318	Pair (KNF)	Foraging	**43**	0	30	0	14	**290**	0	211	0	79	0
		Nesting	**150**	0	138	0	12	**283**	0	225	0	59	0
		Total	**193**	0	168	0	26	**573**	0	436	0	138	0
SK321	Pair (FGS)	Foraging	**313**	139	175	0	0	**1769**	970	767	2	30	0
		Nesting	**51**	12	39	0	0	**215**	148	68	0	0	0
		Total	**364**	151	214	0	0	**1984**	1118	835	2	30	0
SK322	Pair (KNF)	Foraging	**12**	4	8	0	0	**1100**	1088	5	0	5	0
		Nesting	**286**	12	274	0	0	**177**	129	48	0	0	0
		Total	**298**	16	282	0	0	**1277**	1217	53	0	5	0

Klamath Action Area			Acres of Suitable Nesting/ Roosting and Foraging Habitat in NSO Core (502 acres)					Acres of Suitable Nesting/ Roosting and Foraging Habitat in NSO Outer Ring Home Range (2,894 acres)					
Activity Center	**HRS**	**Habitat**	**Total**	**FGS**	**USFS**	**BLM**	**OP**	**Total**	**FGS**	**USFS**	**BLM**	**OP**	**State**
SK333	Pair (FGS)	Foraging	**391**	290	101	0	0	**902**	617	270	0	15	0
		Nesting	**22**	12	10	0	0	**194**	59	135	0	0	0
		Total	**413**	302	111	0	0	**1096**	676	405	0	15	0
SK334	Pair (KNF)	Foraging	**119**	34	85	0	0	**1151**	872	279	0	0	0
		Nesting	**40**	0	40	0	0	**303**	82	220	0	0	0
		Total	**159**	34	125	0	0	**1454**	954	499	0	0	0
SK335	Pair (FGS)	Foraging	**75**	39	36	0	0	**862**	582	277	3	0	0
		Nesting	**151**	46	106	0	0	**288**	18	245	20	5	0
		Total	**226**	85	142	0	0	**1150**	600	522	23	5	0
SK336	Pair (KNF)	Foraging	**151**	151	1	0	0	**890**	725	165	0	0	0
		Nesting	**104**	70	34	0	0	**200**	68	133	0	0	0
		Total	**255**	221	35	0	0	**1090**	793	298	0	0	0
SK352	Pair (KNF)	Foraging	**9**	0	9	0	0	**482**	317	165	0	0	0
		Nesting	**320**	4	316	0	0	**816**	67	749	0	0	0
		Total	**329**	4	325	0	0	**1298**	384	914	0	0	0
SK358	Pair (FGS)	Foraging	**272**	272	0	0	0	**1546**	1546	0	0	0	0
		Nesting	**69**	69	0	0	0	**162**	162	0	0	0	0
		Total	**341**	341	0	0	0	**1708**	1708	0	0	0	0
SK359	Pair (KNF)	Foraging	**199**	0	182	0	17	**818**	96	267	0	456	0
		Nesting	**61**	0	61	0	0	**175**	15	61	0	99	0
		Total	**160**	0	243	0	17	**993**	111	328	0	555	0
SK360	Pair (FGS)	Foraging	**235**	235	0	0	0	**920**	919	0	0	1	0
		Nesting	**171**	171	0	0	0	**452**	452	0	0	1	0

Klamath Action Area			Acres of Suitable Nesting/ Roosting and Foraging Habitat in NSO Core (502 acres)					Acres of Suitable Nesting/ Roosting and Foraging Habitat in NSO Outer Ring Home Range (2,894 acres)					
Activity Center	**HRS**	**Habitat**	**Total**	**FGS**	**USFS**	**BLM**	**OP**	**Total**	**FGS**	**USFS**	**BLM**	**OP**	**State**
		Total	**406**	406	0	0	0	**1372**	1371	0	0	2	0
SK361	Pair (FGS)	Foraging	**138**	138	0	0	0	**789**	686	98	0	5	0
		Nesting	**185**	184	0	0	0	**542**	536	2	0	3	0
		Total	**232**	322	0	0	0	**1331**	1222	100	0	8	0
SK363	Pair (FGS)	Foraging	**156**	152	0	0	3	**592**	223	44	0	325	0
		Nesting	**67**	55	12	0	0	**303**	40	67	0	197	0
		Total	**223**	207	12	0	3	**895**	263	111	0	522	0
SK364	Pair (FGS)	Foraging	**123**	116	0	0	6	**987**	924	5	0	58	0
		Nesting	**134**	130	0	0	4	**487**	214	65	0	209	0
		Total	**257**	246	0	0	10	**1474**	1138	70	0	267	0
SK365	Single (FGS)	Foraging	**164**	0	122	0	41	**950**	75	596	4	276	0
		Nesting	**63**	0	11	0	52	**0**	0	0	0	0	0
		Total	**227**	0	133	0	93	**950**	75	596	0	276	0
SK368	Pair (FGS)	Foraging	**70**	70	0	0	0	**724**	716	0	0	9	0
		Nesting	**111**	111	0	0	0	**241**	241	0	0	0	0
		Total	**181**	181	0	0	0	**965**	957	0	0	9	0
SK369	Pair (FGS)	Foraging	**370**	365	0	2	4	**590**	373	9	197	11	0
		Nesting	**76**	76	0	0	0	**282**	236	6	40	0	0
		Total	**446**	441	0	2	4	**872**	609	15	237	11	0
SK370	Pair (OP)	Foraging	**174**	130	0	45	0	**1155**	1017	30	96	13	0
		Nesting	**76**	18	0	59	0	**374**	305	6	2	61	0
		Total	**250**	148	0	104	0	**1529**	1322	36	98	74	0
SK378	Pair	Foraging	**150**	0	150	0	0	**722**	5	717	0	0	0

Klamath Action Area			Acres of Suitable Nesting/ Roosting and Foraging Habitat in NSO Core (502 acres)					Acres of Suitable Nesting/ Roosting and Foraging Habitat in NSO Outer Ring Home Range (2,894 acres)					
Activity Center	**HRS**	**Habitat**	**Total**	**FGS**	**USFS**	**BLM**	**OP**	**Total**	**FGS**	**USFS**	**BLM**	**OP**	**State**
	(KNF)	Nesting	**308**	32	276	0	0	**1625**	167	1399	0	59	0
		Total	**458**	32	426	0	0	**2347**	172	2116	0	59	0
SK379	Pair (KNF)	Foraging	**205**	0	205	0	0	**910**	4	885	0	20	0
		Nesting	**286**	0	286	0	0	**1458**	196	1262	0	0	0
		Total	**491**	0	491	0	0	**2368**	200	2147	0	20	0
SK380	Pair (OP)	Foraging	**152**	69	77	0	6	**937**	357	464	0	117	0
		Nesting	**294**	164	116	0	14	**1326**	201	936	0	189	0
		Total	**446**	233	193	0	20	**2263**	558	1400	0	305	0
SK382	Pair (KNF)	Foraging	**152**	0	93	0	59	**398**	0	214	0	183	0
		Nesting	**55**	0	39	0	16	**734**	0	348	0	386	0
		Total	**207**	0	132	0	75	**1132**	0	562	0	569	0
SK386	Single (OP)	Foraging	**61**	0	4	0	58	**352**	0	111	0	241	0
		Nesting	**157**	0	13	0	144	**572**	0	225	0	346	0
		Total	**218**	0	17	0	202	**924**	0	336	0	587	0
SK387	Pair (KNF)	Foraging	**267**	3	264	0	0	**575**	22	462	0	92	0
		Nesting	**89**	49	40	0	0	**220**	211	10	0	0	0
		Total	**355**	52	304	0	0	**795**	233	472	0	92	0
SK388	Pair (KNF)	Foraging	**69**	7	61	0	0	**834**	353	406	0	75	0
		Nesting	**40**	40	0	0	0	**223**	115	33	0	75	0
		Total	**109**	47	61	0	0	**1057**	468	439	0	150	0
SK389	Pair (FGS)	Foraging	**113**	64	48	0	0	**291**	14	140	0	137	0
		Nesting	**81**	0	35	0	46	**590**	31	453	0	105	0
		Total	**194**	64	83	0	46	**881**	45	593	0	242	0

Klamath Action Area			Acres of Suitable Nesting/ Roosting and Foraging Habitat in NSO Core (502 acres)					Acres of Suitable Nesting/ Roosting and Foraging Habitat in NSO Outer Ring Home Range (2,894 acres)					
Activity Center	**HRS**	**Habitat**	**Total**	**FGS**	**USFS**	**BLM**	**OP**	**Total**	**FGS**	**USFS**	**BLM**	**OP**	**State**
SK391	Pair (OP)	Foraging	**107**	20	3	0	84	**571**	92	201	4	258	17
		Nesting	**112**	49	0	0	62	**687**	298	330	0	59	0
		Total	**219**	69	3	0	146	**1258**	390	531	4	317	17
SK446	Pair (KNF)	Foraging	**212**	18	184	0	10	**890**	178	583	0	129	0
		Nesting	**209**	5	204	0	0	**308**	41	264	0	4	0
		Total	**421**	23	388	0	0	**1198**	219	847	0	133	0
SK450	Pair (KNF)	Foraging	**120**	50	53	0	17	**639**	209	36	7	378	9
		Nesting	**196**	159	34	0	4	**819**	652	51	6	111	0
		Total	**316**	209	87	0	21	**1458**	861	87	13	489	9
SK454	Pair (KNF)	Foraging	**170**	65	106	0	0	**609**	356	246	0	8	0
		Nesting	**14**	14	0	0	0	**166**	117	49	0	0	0
		Total	**184**	79	106	0	0	**775**	473	295	0	8	0
SK467	Pair (FGS)	Foraging	**204**	204	0	0	0	**550**	549	0	0	1	0
		Nesting	**15**	15	0	0	0	**234**	193	0	0	41	0
		Total	**219**	219	0	0	0	**784**	742	0	0	42	0
SK469	Pair (FGS)	Foraging	**26**	0	26	0	0	**725**	506	219	0	0	0
		Nesting	**379**	297	82	0	0	**1377**	443	934	0	0	0
		Total	**405**	297	108	0	0	**2102**	949	1153	0	0	0
SK472	Pair (KNF)	Foraging	**153**	13	141	0	0	**626**	385	241	0	0	0
		Nesting	**126**	21	105	0	0	**454**	283	171	0	0	0
		Total	**279**	34	246	0	0	**1080**	668	412	0	0	0
SK473	Single (FGS)	Foraging	**229**	226	3	0	0	**296**	191	104	0	0	0
		Nesting	**62**	0	62	0	0	**50**	3	47	0	0	0

Klamath Action Area			Acres of Suitable Nesting/ Roosting and Foraging Habitat in NSO Core (502 acres)					Acres of Suitable Nesting/ Roosting and Foraging Habitat in NSO Outer Ring Home Range (2,894 acres)					
Activity Center	**HRS**	**Habitat**	**Total**	**FGS**	**USFS**	**BLM**	**OP**	**Total**	**FGS**	**USFS**	**BLM**	**OP**	**State**
		Total	**291**	226	65	0	0	**346**	194	151	0	0	0
SK474	Pair (KNF)	Foraging	**205**	120	85	0	0	**687**	404	284	0	0	0
		Nesting	**40**	11	29	0	0	**81**	57	24	0	0	0
		Total	**245**	131	114	0	0	**768**	461	308	0	0	0
SK475	Pair (FGS)	Foraging	**53**	51	2	0	0	**495**	403	89	0	4	0
		Nesting	**176**	159	17	0	0	**104**	42	42	0	51	0
		Total	**229**	210	19	0	0	**599**	445	131	0	55	0
SK477	Pair (KNF)	Foraging	**67**	37	30	0	0	**463**	370	93	0	0	0
		Nesting	**183**	1	182	0	0	**547**	228	319	0	0	0
		Total	**150**	38	212	0	0	**1010**	598	412	0	0	0
SK500	Pair (KNF)	Foraging	**66**	33	33	0	0	**896**	348	478	0	70	0
		Nesting	**92**	0	92	0	0	**215**	0	170	0	45	0
		Total	**158**	33	125	0	0	**1111**	348	648	0	115	0
SK503	Pair (KNF)	Foraging	**25**	0	21	0	4	**332**	0	89	0	242	0
		Nesting	**303**	0	300	0	2	**864**	120	335	0	409	0
		Total	**328**	0	321	0	6	**1196**	120	424	0	651	0
SK512	Pair (KNF)	Foraging	**24**	0	24	0	0	**743**	16	604	0	123	0
		Nesting	**205**	16	189	0	0	**940**	168	772	0	0	0
		Total	**229**	16	213	0	0	**1683**	184	1376	0	123	0
SK526	Pair (KNF)	Foraging	**37**	0	0	0	37	**525**	7	242	0	276	0
		Nesting	**285**	0	178	0	107	**635**	0	345	0	290	0
		Total	**322**	0	178	0	144	**1160**	7	587	0	566	0
SK530	Pair	Foraging	**28**	28	0	0	0	**814**	439	374	0	0	0

Klamath Action Area			Acres of Suitable Nesting/ Roosting and Foraging Habitat in NSO Core (502 acres)					Acres of Suitable Nesting/ Roosting and Foraging Habitat in NSO Outer Ring Home Range (2,894 acres)					
Activity Center	**HRS**	**Habitat**	**Total**	**FGS**	**USFS**	**BLM**	**OP**	**Total**	**FGS**	**USFS**	**BLM**	**OP**	**State**
	(KNF)	Nesting	**316**	0	316	0	0	**974**	24	949	0	0	0
		Total	**344**	28	316	0	0	**1788**	463	1323	0	0	0
SK531	Pair (KNF)	Foraging	**61**	58	3	0	0	**924**	765	159	0	0	0
		Nesting	**272**	3	269	0	0	**728**	73	654	0	0	0
		Total	**333**	61	272	0	0	**1652**	838	813	0	0	0
SK533	Pair (KNF)	Foraging	**125**	81	44	0	0	**671**	206	425	0	40	0
		Nesting	**11**	11	0	0	0	**136**	103	33	0	0	0
		Total	**136**	92	44	0	0	**807**	309	458	0	40	0
SK534	Pair (FGS)	Foraging	**121**	121	0	0	0	**381**	368	0	7	5	0
		Nesting	**107**	107	0	0	0	**24**	19	0	5	0	0
		Total	**228**	228	0	0	0	**405**	387	0	12	5	0
SK537	Pair (BLM)	Foraging	**104**	0	0	44	60	**136**	84	0	0	52	0
		Nesting	**0**	0	0	0	0	**0**	0	0	0	0	0
		Total	**104**	0	0	44	60	**136**	84	0	0	52	0
SK548	Pair (OP)	Foraging	**91**	3	61	0	28	**738**	130	475	0	133	0
		Nesting	**227**	1	58	0	168	**682**	69	555	0	58	0
		Total	**318**	4	119	0	196	**1420**	199	1030	0	191	0

HRS = Highest Reproductive Status and land owner on which activity center occurs
Nesting = Nesting/Roosting
OP = Other Private

Northern Spotted Owl Critical Habitat in the Klamath Action Area

On August 13, 2008, the Service released the Final Revised Designation of Critical Habitat for the Northern Spotted Owl (USDI FWS 2008b). This rule became effective on September 12, 2008, and designated 5,312,300 acres of Federal lands in California, Oregon, and Washington as northern spotted owl critical habitat. Under regulations, the Service is required to identify the known physical and biological features [Primary Constituent Elements (PCEs)] essential to the conservation of the northern spotted owl. All areas designated as revised critical habitat for the northern spotted owl are within the geographic area occupied by the species at the time of listing and contain the appropriate forest type (PCE 1) and at least one other PCE. The Service determined that the PCEs for northern spotted owl are 1) forest types that support the northern spotted owl across its geographic range, 2) nesting, roosting, and foraging habitat, and 3) dispersal habitat. Nesting, roosting, foraging, and dispersal habitat, as well as the forest types associated with northern spotted owls, are described in section 2.1.2.5 (Habitat Relationships).

Northern spotted owl critical habitat has not been designated for private lands, and therefore, critical habitat does not occur on FGS lands. However, designated northern spotted owl critical habitat is located on Federal lands within the Action Area of the FGS HCP. The selection of FGS HCP mitigation sites was based on proximity to northern spotted owl critical habitat. The FGS HCP Conservation Strategy is designed to provide demographic support to northern spotted owls inhabiting lands in the Federal Reserve System by providing CSAs on FGS's ownership to provide habitat for activity centers that are centered on or are in close proximity to federal lands designated as northern spotted owl critical habitat. The following information characterizes the status of northern spotted owls and habitat within CHUs and LSRs within the California Klamath Province portion of the Action Area to describe the baseline condition of the Federal Reserve System upon which the FGS HCP Conservation Strategy is based.

Five CHU subunits overlap with the California Klamath Province portion of the Action Area: subunits CA-29 and OR-19 in the Klamath Intra-Province CHU; subunit OR-18 in the Southern Cascades CHU; and subunits CA-28 and CA-31 in the Scott and Salmon Mountains CHU. Four of these subunits overlap with four designated LSRs. A summary of the habitat conditions in the LSRs that overlap the CHUs is described below and is based on the KNF LSR Assessment conducted by Dix et al. (1999). Information on the status of the LSRs was used because considerably more information is available on conditions in the LSRs than for individual CHUs and subunits, and because there is an 83 percent overlap in acreage between current subunit designations and the 1994 LSRs. Northern spotted owl pair goals for the newly designated CHUs and their subunits are under development by the Service but have not been finalized. However, because the distribution and total acres of the 2008 designated subunits do not differ significantly from the 1992 critical habitat designation within the Action Area, it is reasonable to assume that pair goals will be comparable. Therefore, for the purpose of this document, the 1992 pair goals will be used as a surrogate for the 2008 designated subunits.

Seiad LSR (353)/Scott and Salmon Mountains CHU Subunits CA 28 and CA-30.
The Seiad LSR is approximately 101,200 acres in size, making it the largest LSR within the KNF. It contains approximately 26,240 acres of nesting/roosting habitat and 23,490 acres of foraging habitat, for a total of 49,730 acres of suitable northern spotted owl habitat. An

additional 24,910 acres have the potential to provide northern spotted owl habitat. The combined habitat within the Seiad LSR and the adjacent Marble Mountain Wilderness enables this area to function as a large refugium for northern spotted owls. The amount of nesting/roosting and foraging habitat is within 10 percent of the expected range of suitable northern spotted owl habitat for the Seiad LSR (Dix et al. 1999).

Twenty-five activity centers have been located within the Seiad LSR boundary (21 pairs and 4 territorial singles); however, at least 40 percent of the LSR has not been adequately surveyed. The southern portion of the Seiad LSR overlaps considerably with subunit CA-30 (which is outside of the FGS Action Area) and the northern portion of this LSR overlaps considerably with the western portion of subunit CA-28. The eastern portion of CA-28 overlaps with the Klamath portion of the Johnny O'Neil LSR. In the northern portion of the Seiad LSR that overlaps with CA-28, three pairs and 4 territorial singles have been reported. In the Klamath portion of the Johnny O'Neil LSR that overlaps with CA-28, 16 pairs and one territorial single have been reported. The total of 19 owl pairs within the portions of the Seiad and Johnny O'Neil LSRs that overlap with subunit CA-28 nearly meets the pair goal of 22 for this subunit. Overall, the Seiad LSR, in combination with the Johnny O'Neil LSR, performs all the intended functions for subunit CA-28. There are some portions of critical habitat that fall outside of the LSR boundary, but overall, the population goals of the critical habitat designation is exceeded by the LSR.

Johnny O'Neil LSR (354)/ Scott and Salmon Mountains CHU Subunit CA-28.
The Johnny O'Neil LSR is approximately 46,840 acres in size, with 27,900 acres located on the KNF and the remainder on the Rogue National Forest. This LSR contains approximately 20,420 acres of nesting/roosting habitat and 7,370 acres of foraging habitat, for a total of 27,790 acres of suitable northern spotted owl habitat. An additional 8,850 acres have the potential to provide owl habitat. There are large, continuous parcels of late-successional and old growth (LSOG) habitat throughout most portions of the Johnny O'Neil LSR, including the Horse Creek drainage in the southeast, much of the northeast portion, and a 2-mile-wide band in the northwest that runs along the Siskiyou Crest and north. The amount of nesting/roosting and foraging habitat is within the expected range of suitable northern spotted owl habitat, and the acres of LSOG forest are above the expected functioning range for the Klamath portion, but below for the Rogue portion. Overall, Johnny O'Neil was ranked at the high end of moderate for habitat connectivity, due in part to moderate amounts of mid-successional forest.

As described previously, the Klamath portion of the Johnny O'Neil LSR overlaps with the eastern portion of subunit CA-28. A total of 21 northern spotted owl activity centers have been located within the Johnny O'Neil LSR boundary, 17 of which overlap with subunit CA-28. However, approximately 20 percent of the Klamath portion has not been surveyed. Sixteen northern spotted owl pairs and one territorial single were recorded in the Klamath portion of the Johnny O'Neil LSR. The total of 19 owl pairs within the portions of the Seiad and Johnny O'Neil LSRs that overlap with subunit CA-28 nearly meets the pair goal of 22 for this subunit. There are some portions of critical habitat that fall outside of the LSR boundary, but overall, the population goals of the critical habitat designation is met by the LSR.

Collins Baldy LSR (355)/ Scott and Salmon Mountains Subunit CA-31.
The Collins Baldy LSR is approximately 14,670 acres in size, and supports approximately 4,600 acres of nesting/roosting habitat and 4,500 acres of foraging habitat, for a total of 9,100 acres of suitable northern spotted owl habitat. An additional 2,930 acres have the potential to provide northern spotted owl habitat. The habitat is fairly discontinuous because of the checkerboard ownership of private and Federal lands. Late-successional habitat is currently lacking within the Collins Baldy LSR and accounts for only 1,630 acres (13 percent) of the capable ground. Relative to other LSRs, it ranks low and moderate for the proportion of LSOG habitat and combined mid-successional/LSOG habitat, respectively.

A total of 12 northern spotted owl activity centers supporting 12 owl pairs have been located within the Collins Baldy LSR. The entire LSR has been surveyed for northern spotted owls. The Collins Baldy LSR overlaps almost entirely with subunit CA-31. The 12 known owl pairs within the Collins Baldy LSR exceed the pair goal of 5 for subunit CA-31.

Overall, the Collins Baldy LSR performs the intended function of subunit CA-31 in that it extends protected habitat east toward subunit CA-61 in the Southern Cascades Unit and exceeds the CHU pair goal.

Mt. Ashland LSR (248)/Klamath Intra-Province Subunits OR-19 and CA-29.
The Mt. Ashland LSR is approximately 51,512 acres in size and provides approximately 30,169 acres of suitable northern spotted owl habitat, or 58 percent of the total LSR land base. Late-successional habitat (greater than 24 inch dbh) accounts for 14,981 acres (29 percent) of the LSR and mostly occurs below 5,000 feet elevation. Another 29 percent is less optimal habitat (mid-successional stands from 17 to 24 inch dbh). This LSR is extensively fragmented by a checkerboard ownership pattern and past land use.

A total of 26 activity centers have been located within the Mt. Ashland LSR. Thirteen northern spotted owl pairs and two territorial singles were recorded in the northern portion of the LSR, while nine pairs and two territorial singles were located in the southern zone, for a total of 22 pairs and four resident singles. Complete protocol surveys have covered almost all suitable habitat within the LSR boundary. The home ranges of two activity centers in the northern portion of the LSR have less than 40 percent suitable habitat, and four activity centers south of the crest are below this minimum habitat threshold. The Mt. Ashland LSR overlaps with the subunits OR-19 and CA-29 of the Klamath Intra-Province CHU. The CHU objectives include maintaining a link between California and Oregon, and providing habitat for 20 northern spotted owl pairs. The 22 owl pairs in the Mt. Ashland LSR exceed the pair goals for subunits OR-19 and CA-29.

Threats to the Northern Spotted Owl in the California Klamath Province

Threats to the northern spotted owl in this region include habitat loss due to fires, Federal and private management activities, displacement by barred owls, forest health (insect outbreaks and disease), and potential for avian disease. Northern spotted owl nesting/roosting and dispersal habitat both decreased by one percent on Federal lands as a result of management activities from 1994 to 2007 in the California Klamath Province; nesting/roosting and dispersal habitat on

Federal lands was reduced by 1.05 percent and 1.03 percent, respectively, as a result of natural disturbances from 1994 to 2007 in this province (Davis, in press). The total reduction in nesting/roosting habitat was 5.2 percent and the net gain of dispersal habitat was 5.4 percent on Federal lands from land management activities and natural disturbances during this timeframe.

Fire

Fire continues to modify the quality and quantity of northern spotted owl habitat within this region. The Revised Recovery Plan for the Northern Spotted Owl (USDI FWS 2011b) reported a reduction of 71,600 acres from 1994 to 2007 on Federal lands in the California Klamath Province attributable to fire, and 1,600 acres lost from insects and disease during the same time period. However, Agee (2007) disputed these estimates, reporting that from 1994 through 2003, this region experienced the Dillon fire (27,000 acres), Megram/Onion (125,000 acres), Jones and Happy Camp Complex (1,670 acres and 6,800 acres, respectively), and many smaller fires. He concluded that while not all acres burned with high severity, probably 30 percent of this habitat was seriously altered or destroyed as owl habitat, resulting in a loss of 48,141 acres from 1994 through 2003. An additional 170,000 acres burned in 2006. While not all of the 2006 fires burned with high severity, using an estimate of 30 percent loss, it was estimated that an additional 51,042 acres of habitat was lost to fire in this province (Agee 2007). Although there is some uncertainty as to the extent of northern spotted owl habitat loss due to fire, both estimates clearly demonstrate that fire is a threat to owls.

Historically, lands within the California Klamath Province experienced frequent (1 to 25 years) low- to moderate-intensity surface fires, while the current regime is characterized as infrequent (25 to 100 years) high-intensity fires. The extent of the recent high-severity burns appears to be different than historic burn patterns, with more area burning at high intensity (Skinner et al. 2006). Before fire suppression, fires of higher spatial complexity created openings of variable size within a matrix of forest that was generally more open than today (Taylor and Skinner 1998, as referenced in Skinner et al. 2006). This heterogeneous pattern has been replaced by a more homogeneous pattern of smaller openings in a matrix of denser forest, thus reducing spatial complexity (Skinner 1995, as referenced in Skinner et al. 2006). Studies suggest that vegetation patterns and conditions generated by pre-fire suppression fire regimes may be advantageous for the northern spotted owl (Franklin et al. 2000). The incidence of catastrophic wildfire on Federal Reserve lands (e.g., CHUs, LSRs) may have increased from historical occurrences as a result of recent fire suppression policies, but this effect has been strongly debated by various researchers (Hanson et al. 2009).

Forest Health

Information on forest health is primarily based on the KNF LSR Assessment conducted by Dix et al. (1999). Mortality caused by insects and disease in the Seiad and Johnny O'Neil LSRs was localized to the southern portion of the LSRs. At upper elevations, the fir engraver beetle has been responsible for ponderosa pine and Douglas fir mortality. At lower elevations, the western pine beetle and pine engraver beetle have been primarily responsible for ponderosa pine and Douglas-fir mortality. The Johnny O'Neil LSR is at risk for future insect outbreaks due to early and midseral stand stocking levels.

Barred Owls

Barred owls are present within the California Klamath Province, and have recently been detected in the Action Area. Barred owls were reported in southern Jackson County, Oregon as early as 1990 (Kelly 2001), and records from the Rogue-Siskiyou National Forest and Medford BLM indicate that numerous barred owl locations have been reported in that area through 2007. Five pairs of barred owls were detected in the Oregon portion of the Mt. Ashland LSR (subunit OR-19 of the Klamath Intra-Province CHU) during 2005-2006 (USDI FWS unpublished data); however, annual surveys of subunit CA-29 of the Klamath Intra-Province CHU, and subunits CA-28, CA-31, and CA-30 of the Scott and Salmon Mountains CHU did not detect barred owls until 2006. In 2006 and 2007, barred owls were detected at six locations in and adjacent to these CHUs (USDI FWS unpublished data). Based on these reports, combined with the rate and pattern of colonization observed in the California Cascades Province, barred owls are predicted to become established in the Action Area within 5 years (USDI FWS unpublished data).

West Nile Virus

West Nile virus is the primary disease of concern for the northern spotted owl (USDI FWS 2008a). The virus has not been detected in the California Klamath Province; however, it is now within the range of the northern spotted owl in northwestern California (Courtney et al. 2004).

3.2.2 Environmental Baseline in the California Cascade Province Action Area

The following section describes environmental baseline conditions for the portion of the Action Area within the California Cascades Province, including a discussion of the northern spotted owl population, amount and quality of habitat on the FGS ownership and adjacent Federal lands, and current threats. Fruit Growers Supply's Grass Lake Management Unit occurs within the California Cascades Province.

Northern Spotted Owl Population in the Cascades Action Area

The northern spotted owl population in the California Cascades Province has been identified as providing an important link between the California spotted owl and northern spotted owl and resides in the Shasta-McCloud Area of Special Concern (Thomas et al. 1990). Unlike the California Klamath Province, the amount of northern spotted owl habitat in the California Cascades Province is limited and protocol-level owl surveys have been conducted in the last 10 years on the majority of lands within the province that could potentially support owls. Anthony et al. (2006) did not include the California Cascades Province in their demographic studies because northern spotted owl populations in this province are too low to make demographic studies of this type possible. Information on fecundity and survivorship in this portion of the Action Area is not currently available, as no mark-recapture programs for owls have been conducted on FGS's ownership in the California Cascades Province.

The Service considers the CDFG Northern Spotted Owl Database the best source for documenting the number of owls in this province. For the period from 1987 through 2007, the

CDFG database contains records of 10 activity centers within 1.3 miles of FGS's ownership in the California Cascades Province. Of these, two sites were determined by the Service to be invalid because they typically did not meet the Service's criteria for designation as an activity center (i.e, inadequate number of detections for residency status) and/or were extremely lacking in amounts of suitable habitat (i.e., habitat was removed by a stand-replacing fire in a significant portion of the core). Therefore, eight historic activity centers supporting a total of up to 15 northern spotted owls are estimated to occur within the California Cascades Province portion of the Action Area. A quantification of northern spotted owls by reproductive status in the Cascades Action Area is presented in Table 8. There is some uncertainty as to the exact number of currently occupied activity centers within this area because some activity centers may no longer be active. It is unlikely that there are additional undetected activity centers on FGS ownership given the low amounts of suitable habitat and extensive survey effort over time on the property.

Table 8. Quantification of Northern Spotted Owls by Reproductive Status in the California Cascades Province Portion of the Action Area.

Status (1987-2007)[a]	**Sites[b]**	**Owls**
Reproductive pair with young	5	10
Nesting pair	2	4
Territorial single	1	1
Total valid activity centers	8	15

[a] Source: CDFG Northern Spotted Owl Database
[b] For the purpose of the effects analysis, each site is considered an activity center

Northern Spotted Owl Habitat in the Cascades Action Area

Based on the 2005 owl habitat layer, there are 22,728 acres of suitable foraging habitat, 7,349 acres of suitable nesting habitat, and 154,865 acres of unsuitable habitat within the entire 184,942-acre Cascades Province portion of the Action Area (Table 9). Table 10 shows the acreage and ownership of northern spotted owl habitat within the core and home range of each activity center within the Cascades Action Area.

Table 9. Northern Spotted Owl Habitat and Land Ownership within the California Cascades Province Portion of the Action Area.

	Acres of Habitat			
Owner	**Unsuitable**	**Foraging**	**Nesting/Roosting**	**Total**
Federal	83,092	14,220	5,737	103,050
FGS	38,168	4,180	619	42,967
Other Private	33,464	4,328	933	38,785
State	140	0	0	140
Total Public	83,233	14,220	5,737	103,190
Total Private	71,632	8,508	1,612	81,752

Data from 2005 northern spotted owl baseline habitat layer developed by FGS and the Service

Table 10. Suitable Northern Spotted Owl Nesting/Roosting and Foraging Habitat within Northern Spotted Owl Cores and Home Ranges across Land Ownerships within the Cascades Action Area.

Cascades Action Area			**Acres of Suitable Nesting/ Roosting and Foraging Habitat in NSO Core (502 acres)**					**Acres of Suitable Nesting/ Roosting and Foraging Habitat in NSO Outer Ring Home Range (2,894 acres)**				
Activity Center	**HRS**	**Habitat**	**Total**	**FGS**	**USFS**	**BLM**	**OP**	**Total**	**FGS**	**USFS**	**BLM**	**OP**
SK153	Pair (KNF)	Foraging	**141**	61	79	0	1	**1036**	454	482	0	100
		Nesting	**133**	0	132	0	1	**155**	0	130	0	24
		Total	**274**	61	211	0	2	**1191**	454	612	0	124
SK153B	Pair (KNF)	Foraging	**294**	0	274	0	20	**772**	15	501	10	247
		Nesting	**3**	0	3	0	0	**419**	0	308	19	92
		Total	**297**	0	277	0	20	**1191**	15	809	29	339
SK194	Pair (KNF)	Foraging	**56**	0	56	0	0	**811**	0	782	0	29
		Nesting	**101**	0	101	0	0	**630**	0	628	0	2
		Total	**157**	0	157	0	0	**1441**	0	1410	0	31
SK284	Pair (KNF)	Foraging	**292**	12	115	0	166	**501**	96	55	0	351
		Nesting	**6**	6	0	0	0	**73**	0	17	0	56
		Total	**298**	18	115	0	166	**574**	96	72	0	407
SK428	Pair (KNF)	Foraging	**2**	0	2	0	0	**166**	0	80	0	86
		Nesting	**271**	0	270	0	1	**177**	12	131	0	35
		Total	**273**	0	272	0	1	**343**	12	211	0	121
SK442	Single (KNF)	Foraging	**123**	0	123	0	0	**847**	0	847	0	0
		Nesting	**0**	0	0	0	0	**93**	0	93	0	0
		Total	**123**	0	123	0	0	**940**	0	940	0	0
SK462	Pair (KNF)	Foraging	**395**	120	276	0	0	**1602**	639	718	0	245
		Nesting	**17**	0	17	0	0	**95**	0	86	0	8
		Total	**412**	120	293	0	0	**1697**	639	804	0	253
SK542	Pair	Foraging	**8**	0	0	0	8	**431**	44	285	0	102

Cascades Action Area			Acres of Suitable Nesting/ Roosting and Foraging Habitat in NSO Core (502 acres)					Acres of Suitable Nesting/ Roosting and Foraging Habitat in NSO Outer Ring Home Range (2,894 acres)				
Activity Center	**HRS**	**Habitat**	**Total**	**FGS**	**USFS**	**BLM**	**OP**	**Total**	**FGS**	**USFS**	**BLM**	**OP**
	(OP)	Nesting	**25**	0	6	0	19	**30**	0	0	0	30
		Total	**33**	0	6	0	27	**461**	44	285	0	132

HRS = Highest Reproductive Status and land owner on which activity center occurs
Nesting = Nesting/Roosting
OP = Other Private

Northern Spotted Owl Critical Habitat in the Cascades Action Area

As described above, the Revised Designation of Critical Habitat for the Northern Spotted Owl; Final Rule (FR 73 47326, USDI FWS 2008b) revised the designation of critical habitat into larger critical habitat units (e.g., Western Klamath-Siskiyou Mountains) with designated subunits that roughly correspond with the original CHU designations. Northern spotted owl critical habitat does not occur on FGS lands; however, the following section characterizes the status of northern spotted owls and habitat within CHUs and LSRs to describe the baseline condition of the Federal Reserve System upon which the FGS HCP Conservation Strategy is based. The analysis below is based on LSR Assessment for the Goosenest LSR #RC-363 (USDA FS 1996b) but uses the revised subunit numbers for critical habitat from the revised designation. Information on the status of the LSRs was used because considerably more information is available on conditions in the LSRs than for individual CHUs and subunits, and because there is an 83 percent overlap in acreage between current subunit designations and the 1994 LSRs. Owl pair objectives for the new subunits have not been established by the Service; however, since the distribution and total acres of the newly designated subunits do not significantly differ from the 1992 critical habitat designation within the Action Area, pair objectives from the 1992 critical habitat designation were used for the evaluation below.

Two subunits (CA-61 and CA-66) in the Southern Cascades CHU are within the California Cascades portion of the Action Area. Subunit CA-61 overlaps with the Goosenest LSR. A very small portion (200 of approximately 3,000 acres) of subunit CA-66 is within the California Cascades Province portion of the Action Area.

Goosenest LSR (363)/ Southern Cascades CHU Subunits CA-61 and CA-66. The Goosenest LSR is approximately 39,770 acres in size. Habitats considered suitable for breeding and/or foraging by northern spotted owls (dense late-successional, open late-successional, and dense mid-successional) occupy 14,097 acres, or about 35 percent, of the LSR area (USDA FS 1996b). Low precipitation and temperatures, and high elevation reduce the overall potential of lands within the California Cascades Province to support dense late-successional habitat suitable for northern spotted owls (USDA FS 1996b). The majority of northern spotted owl home ranges in the Goosenest LSR are functioning poorly in terms of long-term sustainability (USDA FS 2005). Home ranges contain overly dense forest with suppressed understory dominated by white fir and lack large trees, particularly Douglas fir. The habitat in these home ranges is at moderate to high risk of insect attack, with subsequent increased wildfire hazard. At such high densities, stand development is unlikely to attain old-growth characteristics in the absence of fire or active management.

A total of 14 northern spotted owl activity centers have been located within the Goosenest LSR. The Goosenest LSR overlaps considerably with subunit CA-61. The 14 known activity centers (12 pairs and 2 territorial singles) within the Goosenest LSR exceed the recovery pair goal of 6 for subunit CA-61 (USDA FS 1996b).

Threats to the Northern Spotted Owl in the California Cascades Province

Threats to the northern spotted owl in this region include habitat loss due to Federal and private management activities, forest health issues (including overstocking, insect infestations, and forest disease), fire, and displacement by barred owls. Northern spotted owl nesting/roosting and dispersal habitat decreased by 1.03 percent and 1.02 percent, respectively, on Federal lands as a result of management activities from 1994 to 2007 in the California Cascades Province; nesting/roosting and dispersal habitat both decreased by 1.01 percent on Federal lands as a result of natural disturbances from 1994 to 2007 in this province (Davis, in press). Bigley and Franklin (2004) reported a 5.77 percent reduction in northern spotted owl habitat on Federal lands as a result of management activities from 1994 to 2003 in the California Cascades Province. Habitat was unchanged by natural disturbances from 1994 to 2002 in the California Cascade Province (USDI FWS 2008a). The total reduction in nesting/roosting habitat was 4.0 percent and the net gain of dispersal habitat was 8.1 percent on Federal lands from land management activities and natural disturbances during this timeframe.

Barred owls currently pose a significant threat to northern spotted owls in the California Cascades Province. While numerous detections of barred owls were reported in the southern Oregon Cascades during the early 1990s, this species was not detected in the California Cascades Province until 1996. From 1996 to 2003, single barred owls were detected at two locations within subunit CA-61 of the Southern Cascades CHU. Surveys in 2004 detected barred owl pairs at three locations, all within northern spotted owl territories. Single barred owls were detected at three additional locations in and adjacent to CHU CA-61, and two locations were reported on the McCloud Ranger District of the STNF, immediately to the south of subunit CA-61. Between 2004 and 2007, the numbers of barred owls detected in the California Cascades Province has increased steadily (USDI FWS unpublished data). As of 2007, barred owls have been detected at 11 locations, and three of 12 northern spotted owl territories (within subunit CA-61) have been displaced by barred owls.

West Nile virus is the primary disease of concern for the northern spotted owl (USDI FWS 2008a). The virus has not been detected in the California Cascades Province; however, it is within the range of the northern spotted owl in northwestern California (Alan Franklin, John Marzluff, pers. comm., as reported in Courtney et al. 2004).

3.3 Status of Fishers in the Action Area

For the purposes of this consultation, the Service is analyzing the environmental baseline for fisher populations and habitat within the California Klamath Province and California Cascades Province portions of the Action Area. The environmental baseline is described separately for these two provinces because they are distinct in terms of their ecology, the availability and quality of information for fishers, and the apparent abundances of fishers and their habitat. The Action Area for fishers consists of FGS ownership with a surrounding 1.6-mile buffer (Figure 3). The 1.6-mile buffer was based on the radius of an estimated circular home range for female fishers in the Klamath Province (7.7 mile^2: Appendix E of the HCP). Female fisher home range size was used because females are considered the reproductive unit and presumably establish their home ranges based on the availability of resources. Male fisher home ranges are larger and

may in part establish their home ranges based on the location of female home ranges. The Action Area includes the portion of the fisher population that could be directly or indirectly affected by the proposed HCP and ITP.

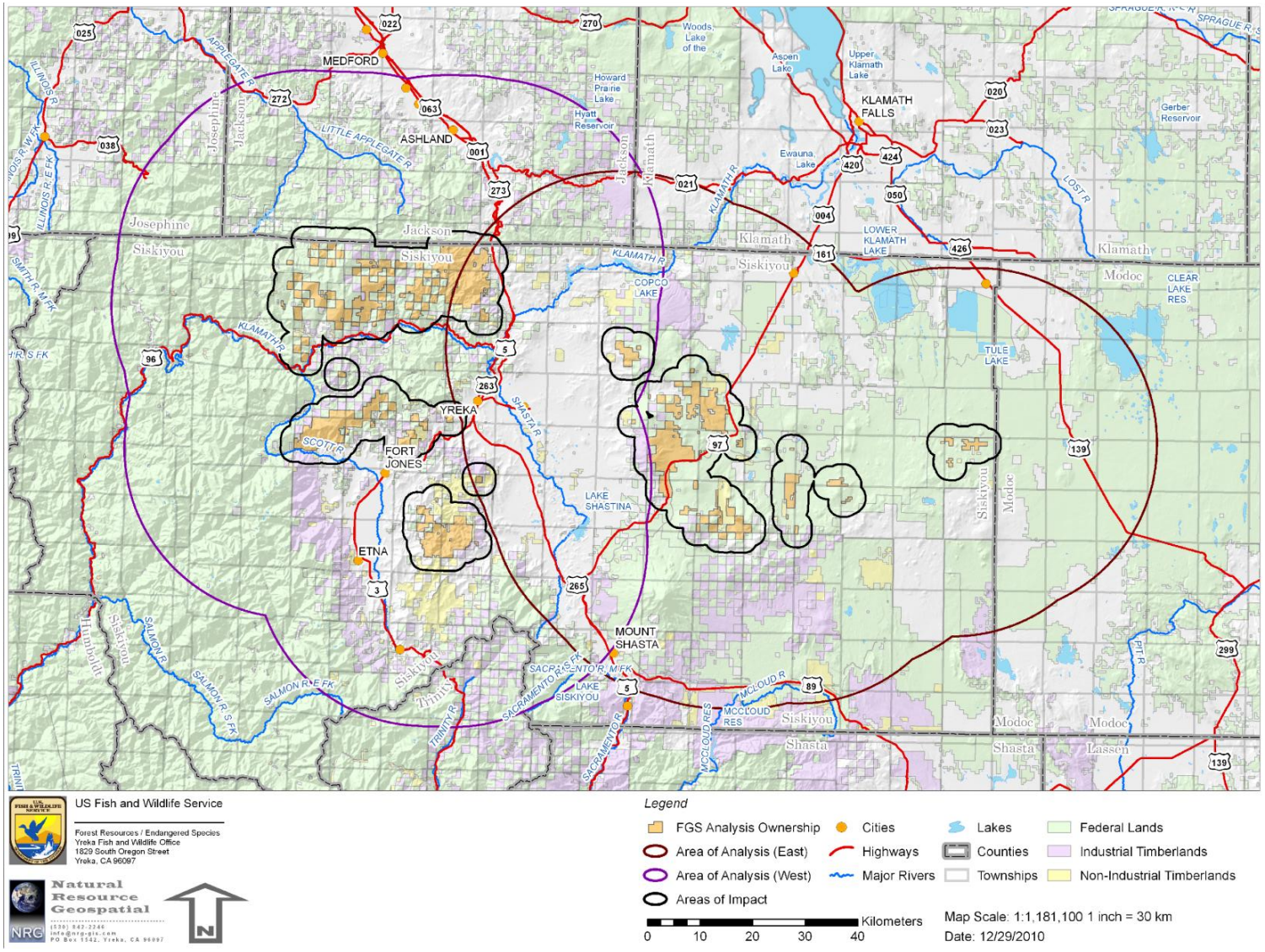


Figure 3. California Klamath and California Cascades regional "Area of Analysis" and local "Area of Impact" within a 20-mile and 1.6-mile radius, respectively, of Fruit Growers Supply Company's ownership.

3.3.1 Environmental Baseline in the California Klamath Province Action Area

The California Klamath Province portion of the Action Area for fishers contains approximately 350,800 acres. About 29% of this area is owned by FGS, 38% is federally owned, 33% is held by other private land owners, and less than 1% is owned by the State of California.

Fisher Habitat in the Klamath Action Area

Zielinski et al. (2010) used survey data to develop a model that predicts the probability of detecting fishers throughout the California Klamath Region. The final model included the following variables (see Zielinski et al. 2010 for definitions): amount of dense forest, percent hardwood, medium and large trees, structurally complex forest, elevation, solar insolation, and predicted abundance of mammalian prey. Other biotic and abiotic habitat variables may also be important to fishers and were included in candidate models. However, the final model (a composite of the 4 best candidate models) better classified fisher detection locations in the region than did any of the candidate models. The model correctly classified fisher detection and non-detection locations 84% and 70% of the time, respectively.

The Service modified the Zielinski et al. (2010) model by using FGS forest inventory data in place of the original model's vegetation data for FGS lands to provide an estimate of the current amount of modeled habitat for fishers in the California Klamath Province portion of the Action Area. The model predicts the probability of detection of fishers across the landscape, and assumes that areas with a higher probability of detection fulfill a greater number of, or higher quality of, life-requisite needs for fishers (e.g., food, shelter). The probability of detecting fishers may be used as an index of relative habitat suitability for fishers. The Service selected modeled values greater than or equal to 0.41 as a threshold to represent preferred habitat (hereafter 'suitable habitat') using the FGS fisher model (see "Fisher Spatial Analysis" in Appendix E of the HCP for more details on the modeling process used for the Klamath Action Area). To represent the minimum area for supporting a hypothetical female home range, the Service excluded from some calculations isolated patches of modeled habitat smaller than 7.7 mi^2 (20 km^2). This provided a conservative approach to quantifying areas that have a greater likelihood of providing sufficient habitat for the species to meet its life history needs and a spatially explicit method for analyzing how changes in the amount and spatial configuration of habitat may impact fishers under the Proposed Action.

The California Klamath Province portion of the Action Area for fishers consists of approximately 350,800 acres. As predicted by the FGS model, 39% of this area (137,163 acres) currently consists of suitable fisher habitat, with 36% (125,937 acres) existing in large (greater than 7.7 mi^2) patches that contain the minimum area to support a hypothetical female fisher home range (Figure 4). Federal and private (e.g., FGS, other private industrial timberland owners, some non-capable agriculture and urban land) lands account for similar proportions of suitable habitat that occurs in large patches (Figure 4). However, relative to their total acreage within this portion of the Action Area, Federal lands disproportionately contribute to the total amount of suitable fisher habitat that occurs in large patches compared to private lands (Figure 4). State lands account for a negligible (0.4%) proportion of the Klamath Action Area, and do not contain suitable habitat for fisher. Of the FGS ownership within the Klamath Action Area,

approximately 34% currently consists of suitable habitat for fishers, mostly (31%) in large blocks. Fruit Growers Supply Company contributes about 10% of the suitable habitat and about 9% of the suitable habitat that occurs in large blocks; therefore, FGS's potential impact on fisher habitat within the Klamath Action Area is limited (Figure 4).

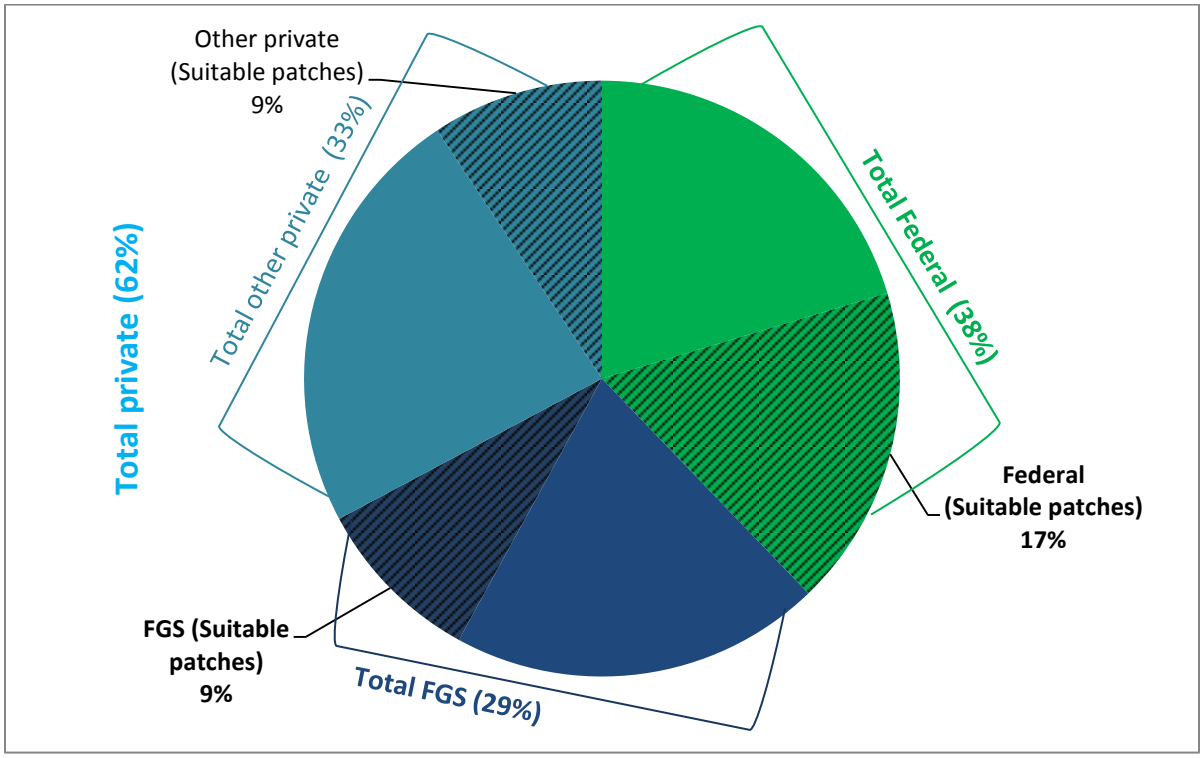


Figure 4. Percentage of total ownership and large patches (>7.7 mi^2) of fisher habitat within the California Klamath Province portion of the Action Area showing suitable habitat by ownership at baseline conditions.

Fisher Population in the Klamath Action Area

Fishers within the California Klamath Province portion of the Action Area are part of the native southwestern Oregon/northern California population, which consists of a series of interconnected local populations that extend west to the Pacific Ocean, south to Lake County, and north into southern Oregon (USDI FWS 2010b). A USFS database query conducted on January 24, 2011 reported verified fisher detections throughout much of the northern and central portions of the Klamath Action Area (Figure 5). Relatively few surveys have been conducted in the vicinity of Moffet Creek in the southernmost portion of the Klamath Action Area; however, one fisher was detected in this area in October, 2011 (Callas 2011).

Additional information on fisher numbers was available for a portion of the Klamath Action Area. In 2006, a fisher monitoring study began in the eastern Klamath Mountains of California. The northern half of this 200-mile^2 study area occurs within the Action Area, overlapping the Beaver Creek drainage of FGS's Klamath River Management Unit. This study uses DNA

extracted from fisher hair samples to "mark" and "recapture" individuals. This methodology can be used to estimate population size, demographic structure, and immigration/emigration for each year. DNA samples were collected from 52 different fishers (22 females and 30 males) during 2006 through 2009. Preliminary population estimates for the study area were 25, 53, and 47 individuals during years 2007, 2008, and 2009, respectively (Swiers and Powell 2010).

Comprehensive surveys have not been conducted within the California Klamath Province portion of the Action Area to determine actual fisher population size within this area; however, the modified Zielinski et al. (2010) model indicated that current conditions could support approximately 25 hypothetical female home ranges within the Klamath Action Area (Appendix E of the HCP).

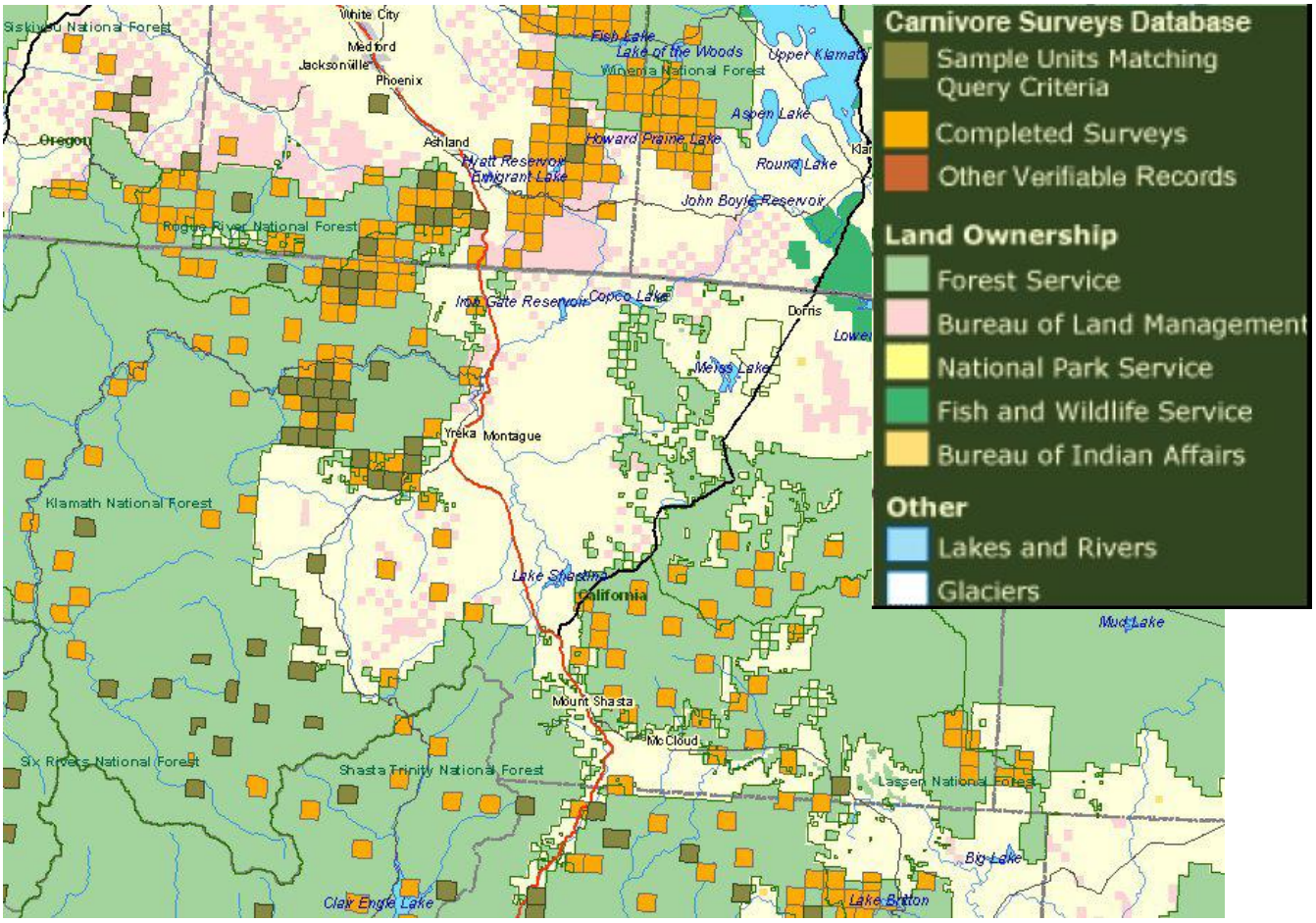


Figure 5. Graphical results of January 24, 2011 query of the USFS Forest Carnivore Surveys in the Pacific States website [http://maps.fs.fed.us/carnivore//Modules/application/home.html]. Orange squares [ ] represent completed surveys within 4-mi^2 sample units based on the Public Land Survey System. Dark green squares [ ] match query parameters that included: Carnivores: "Fisher", Range of Years from: "1995" to "2010", and detection Sources: "All Sources".

Threats to the Fisher in the California Klamath Province

Threats to fishers in the Klamath Province are similar those that threaten the West Coast DPS as a whole (see section 2.2.3). Threats in the Klamath Province include loss, deterioration, and fragmentation of habitat from past and current forest management practices and the potential for catastrophic wildfire. Disturbances that reduce canopy cover or the availability of large trees, snags, and down wood can negatively affect fishers by degrading habitat for them and their prey. Other potential threats, such as vehicle traffic, disease, or predation could work synergistically with habitat modification to further threaten fishers. See section 3.2.2 for more information on management-induced changes to natural disturbance regimes and habitat in the California Klamath Province.

3.3.2 Environmental Baseline in the California Cascades Province Action Area

The total area within the California Cascades Province portion of the Action Area for fishers is 255,100 acres. About 19% of this area is owned by FGS, 60% is federally owned, 20% is held by other private land owners, and less than 1% is owned by the State of California.

Fisher Habitat in the Cascades Action Area

The Zielinski et al. (2010) habitat model could not be applied to the California Cascades Province because it was developed specifically for the Klamath region. Furthermore, the number of fisher detections in the California Cascades Province is currently insufficient for an adequate evaluation of model performance.

Davis et al. (2007) developed and compared multiple habitat models for fishers in California. The model that was developed with detection locations from northern California (as opposed to the southern Sierra Nevada or Statewide) predicted only small, isolated areas of modeled habitat in the California Cascades portion of the Action Area.

Although some of their life history requirements differ, fishers and northern spotted owls have overlapping habitat associations. For example, both species generally gravitate toward relatively old, densely-canopied, multi-layered forests with large trees and dead woody materials. Sixteen percent of the Cascades Action Area currently consists of suitable foraging, nesting, or roosting northern spotted owl habitat on FGS ownership (Table 9). Section 3.2.3 describes the distribution of foraging, nesting, and roosting habitat for northern spotted owls by ownership within the Cascades Action Area.

Fisher Population in the Cascades Action Area

A January 24, 2011 query of the USFS Forest Carnivore Surveys in the Pacific States showed no records of fisher detections within the California Cascades Province portion of the Action Area. However, survey effort in this area is relatively low compared to the Klamath Province. One verified detection of a fisher south of Mount Shasta approximately 9 miles south-southwest of the Cascades Action Area is known to have occurred in 2003 (Lindstrand 2008). Except for the one verified location, fishers appear to be either not present or sufficiently low in numbers to

avoid detection. The close proximity of this detection relative to fisher movements, combined with the relatively low survey effort in the region, suggest that fishers may occur in the Cascades Action Area.

As described above in the "Fisher Habitat in the Cascades Action Area" section, the Zielinski et al. (2010) model could not be used to model habitat within the California Cascades Province; therefore, the number of hypothetical female home ranges under current conditions within the California Cascades Province portion of the Action Area could not be estimated.

Threats to Fishers in the California Cascades Province

Threats to fishers in the California Cascades Province include habitat loss and modification due to management activities (e.g., timber harvesting, fire suppression) and the potential for catastrophic wildfire. The Forest Ecosystem Management Assessment Team (1993) described forests in the California Cascades as highly fragmented due to harvest activities and natural factors.

4.0 EFFECTS OF THE ACTION

In general, implementation of the FGS HCP Covered Activities consists of the following: timber harvest (e.g., felling and bucking of timber, yarding timber, salvage and transport of timber), silviculture (e.g., clearcutting, commercial thinning, biomass thinning, seedtree/shelterwood removal, selection/group selection, or combination of these), stand regeneration and improvement (e.g., site preparation, prescribed burning, slash treatment, tree planting, vegetation management), minor forest products (e.g., Christmas tree cutting, firewood cutting, fence post cutting), and fire prevention (e.g., vegetation management, fuel break construction) and suppression (e.g., fuel break construction, application of aerial fire suppressants, falling trees or snags, water drafting). Each of these Covered Activities has the potential to result in adverse effects to the northern spotted owl, fisher, and their habitat through a number of mechanisms (e.g., habitat modification, noise disturbance, direct injury, and mortality), which are described in detail in the following sections. This section presents an analysis of the direct and indirect effects of the FGS HCP, including interrelated and interdependent actions, on the northern spotted owl and fisher.

4.1 Northern Spotted Owl

The degree to which the Covered Activities listed above are likely to directly and indirectly affect the northern spotted owl within the Action Area are discussed below. These effects are then evaluated with consideration of the conservation needs of the owl within the larger conservation strategy established for the northern spotted owl by the NWFP and Revised Recovery Plan, including: 1) protection of large blocks of habitat to provide for clusters of breeding pairs of northern spotted owls; 2) suitable habitat distributed across a variety of ecological conditions; and, 3) reserves connected by habitat within the intervening matrix to support survival and movement across the landscape.

Forest management is the primary activity in the Plan Area, occurring on 152,178 acres. Not all

forest management activities and their effects have the potential to cause 'take' of northern spotted owls. The modification of forest stand conditions through timber harvest has the greatest potential to affect (adversely or beneficially) northern spotted owls because of the immediate and long-term effects it has on habitat conditions and prey availability. Silvicultural treatments such as thinning may benefit northern spotted owls by accelerating the development of northern spotted owl habitat and dense prey populations, and reducing the risk of catastrophic wildfire. Silvicultural activities associated with stand regeneration (e.g., site prep and tree planting) are unlikely to affect habitat conditions for northern spotted owls, but have the potential to adversely affect northern spotted owls by increasing noise and activity levels. Other Covered Activities related to timber harvesting (e.g., harvesting minor forest products, fire prevention, and watershed management) could result in varying levels of habitat modification and disturbance.

4.1.1 Direct Effects

4.1.1.1 Disturbance-Related Effects

Timber harvesting, timber hauling, plantation establishment and maintenance, road management (road building, road decommissioning), and fuels work will require use of heavy equipment, power tools, chainsaws, and large vehicles, all of which introduce an increased level of sound and human activity into the environment. The effect of sight- and sound-related disturbance on northern spotted owls is not well studied. Further, the effects of noise on birds can be difficult to establish due to difficulties associated with quantifying and qualifying characteristics of disturbance (i.e., type, frequency, proximity) and appropriate response variables (i.e., behavior, reproductive success, survival). Additional factors increase the complexity of evaluating effects of disturbance such as 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.

In spite of these challenges, research conducted on a variety of bird species does suggest that disturbance can have a negative effect on reproductive success (Tremblay and Ellison 1979, Anderson et al. 1989, Belanger and Bedard 1989, Piatt et al. 1990, Henson and Grant 1991). Such studies have shown that disturbance can affect productivity in a number of ways including: interference of courtship (Bednarz and Hayden 1988), nest abandonment (White and Thurow 1985), egg and hatchling mortality due to exposure and predation (Drent 1972, Swensen 1979), and altered parental care (Fyfe and Olendorrf 1976, Bortolotti et al. 1984). Disturbance can also have an effect prior to incubation by influencing the choice of a nesting site (Long and Ralph 1998). The few studies that have examined spotted owl responses to several types of disturbance (e.g., helicopters, small chainsaw, hikers) determined that owl behavior was disrupted by such stimuli, as demonstrated by flushing, altered prey delivery rates, and decreased prey handling behavior (Delaney et al. 1999; Delaney and Grubb 2001; Swarthout and Steidl 2001, 2003). However, whether or not the owls responded to the disturbance, and to what extent, depended on several factors, including time of year, noise level, and proximity to stimulus.

Disturbances that cause exposure of adult or juvenile northern spotted owls may increase predation risks. Causing a northern spotted owl to fly off the nest may increase the likelihood of predation or injury through the advertisement of the nest's location, advertisement of the adult

and juvenile, or premature departure of a nestling from a nest. Predation is presumed the largest cause of northern spotted owl mortality, particularly of juveniles, due to raptors, other owls, and corvids (Forsman et al. 1984, Laymon 1985, Verner et al. 1992). Human presence alone appears to attract predators, such as corvids. For example, Forsman et al. (1984) recorded an incident in which ravens attempted to predate a nest after survey efforts called the female out of the nest cavity during the day.

As described under "Disturbance-Related Effects" in section 2.1.3.2 (Threats), spotted owls may have elevated stress hormone levels in response to a disturbance without exhibiting a change in behavior which, over extended periods, may have negative effects on reproductive function, disease resistance, or physical condition (Carsia and Harvey 2000, Saplosky et al. 2000). Prolonged activities, such as those associated with timber harvest, may increase stress hormone levels depending on their proximity to northern spotted owl core areas (Wasser et al. 1997, Tempel and Gutiérrez 2004). Gender differences found in fecal glucocortoid concentrations over time from owls in Washington and Oregon suggest that timber practices and other prolonged disturbances may have disproportional negative effects to female owls (Wasser et al. 1997). However, not surprisingly, these studies also indicate that owl sensitivity varies with stimulus distance, location (aerial or ground), type, and timing, as well as individual tolerance (Delaney et al. 1999; Delaney and Grubb 2001; Swarthout and Steidl 2001, 2003; Tempel and Gutiérrez 2003).

Post-harvest fuels treatments may also create above-ambient smoke or heat. Although it has not been conclusively demonstrated, it is anticipated that nesting northern spotted owls may be negatively affected by heat and smoke intrusion into the nest grove. Smoke and heat may serve as a disturbance to nesting owls or their young by causing them to avoid important foraging areas or fleeing the nest area prematurely, thereby reducing fitness.

Fruit Growers Supply's Covered Activities have the potential to cause direct disturbance to northern spotted owls when they are present within a treatment area. Noise or visual disturbance created by the use of heavy machinery, logging trucks, or other noise producing equipment used within treatment areas or along access roads to carry out FGS' Covered Activities has the potential to disrupt nesting, roosting, and foraging behaviors of northern spotted owls. Prescribed burning or burning of brush/scrap piles may also disrupt northern spotted owls nesting, roosting, and foraging behaviors. Noise, smoke, or visual disturbance can cause nesting northern spotted owls to temporarily flush from nest sites leaving eggs or hatchlings exposed to temperature changes or predation. More severe disturbances can cause the abandonment of the nest by adults or early abandonment of the nest by young. Roosting northern spotted owls exposed to noise, smoke, or visual disturbance can be subject to predation if forced off their roost site. If forced to move into an area with a less favorable microclimate and habitat, it could ultimately reduce their fitness (i.e., survival and reproduction). Additionally, owls that are forced out of their normal foraging areas may be subject to move into areas that have less prey availability or where they are less efficient in capturing prey.

While roosting and foraging northern spotted owls can be disturbed during any time of the year, noise, smoke, or visual disturbances generally have the greatest effect on them during the breeding, nesting, or rearing periods. To minimize direct disturbance to northern spotted owls

during breeding, nesting, or rearing periods, FGS will implement a Limited Operating Period (LOP) from February 1 to August 31 for activities within 0.25 mile of known active nest sites. Fruit Growers Supply Company will implement protocol surveys according to the "Protocol for Surveying Proposed Management Activities that May Impact Northern Spotted Owls" (USDI FWS 2011a) or current northern spotted owl survey protocols approved by the Service prior to project implementation to determine the status of historic activity centers and determine if new activity centers have been established within 0.25 mile of any proposed treatment units.

4.1.1.2 Injury or Mortality

Forest management activities can result in direct mortality of adults, eggs, or young. Such cases are rare, but direct mortality due to tree-felling has been documented (Forsman et al. 2002). The potential for northern spotted owls to be struck and killed or injured by falling trees during harvesting or exposed to high levels of smoke during prescribed burning is confined to the area relatively close to the nest tree. During timber harvest or prescribed burning, individual adult northern spotted owls can reasonably be expected to move from the area and avoid injury. However, nesting adult northern spotted owls tending to reproductive activities such as incubation or brooding young may be reluctant to leave the area (Delaney et al. 1999), and therefore may be vulnerable to such injury. Foraging owls are not expected to be affected directly, as they will likely avoid areas with disturbance.

Young-of-the-year, whether in or out of the nest, may also be vulnerable to the effects of tree falling or smoke inhalation, or might disperse prematurely in response to the disturbance and thus be subject to predation, starvation, or injury outside of the nest or nest grove. Because young must be constantly brooded by an adult post hatching for up to two weeks, parental abandonment of the nest could lead to mortality of the young. Potential effects to eggs range from the implications of parental abandonment (Drent 1972, Swensen 1979, White and Thurow 1985) to destruction during tree falling. These types of direct effects are most likely to occur in nesting/roosting habitat during the breeding season when active breeding activities are underway.

As stated in the Take Minimization Objective in section 5.3.1.4 of the FGS HCP, FGS will not conduct timber operations or create a noise or smoke disturbance in conducting Covered Activities (minus fire suppression) within 0.25 mile of active northern spotted owl nest sites during the breeding, nesting, or rearing season beginning February 1 and ending August 31 (i.e., the LOP). "Active northern spotted owl nest site" is defined as the nest tree of a pair of nesting northern spotted owls. Road use and maintenance within 0.25 mile of an active northern spotted owl nest site may occur during the breeding season, but will require evaluation and approval by the Service. With implementation of the LOP, the likelihood of direct injury or mortality of owls is very unlikely and thus discountable.

Emergency fire suppression by FGS could potentially lead to incidental take of northern spotted owls. Since wildfire can occur during the northern spotted owl breeding season, there is a small probability that an adult owl or dependent young could be injured or killed as a result of dozer line construction, lighting backfires, applying aerial fire suppressants, and falling trees or snags. While individual adult northern spotted owls can reasonably be expected to move from an area of disturbance, nesting northern spotted owls tenaciously tending to reproductive activities such

as incubation or brooding young may be reluctant to leave the area (Delaney et al. 1999), and therefore may be vulnerable to injury or death. Northern spotted owl eggs or nest dependent young have a higher probability of mortality from fire suppression activities that affect nest groves since they would be unable to move away from the disturbance.

4.1.2 Indirect Effects

4.1.2.1 Habitat Modification

The FGS HCP proposes timber harvest through different types of silviculture, road construction and maintenance, stand regeneration and improvement, minor forest product harvest, fire prevention and suppression, and other activities collectively referred to as Covered Activities. Forest management activities can alter suitable northern spotted owl habitat to varying degrees, leading to direct and indirect effects to northern spotted owls at both site-specific and landscape scales.

Site-Specific Effects

Currently, FGS has approximately 43,757 acres of suitable northern spotted owl habitat across its ownership within the entire Action Area, 9,029 acres of which are nesting/roosting and 34,728 acres of which are foraging habitat. Within the California Klamath Province Action Area there are 8,410 acres of nesting/roosting and 30,548 acres of foraging habitat. Within the California Cascades Province Action Area there are 619 acres of nesting/roosting and 4,180 acres of foraging habitat. Nearly all of the currently suitable habitat available for northern spotted owl in the Action Area could be harvested over the term of the ITP, with the exception of approximately 7,131 acres which have been identified by FGS as habitat commitments in CSAs. Of these 7,131 acres in CSAs, 115 acres are targeted for nesting/roosting, 3,721 acres for high-quality foraging, and 3,294 acres for low-quality foraging habitat. Northern spotted owls will benefit from an additional 5,648 acres that will be protected outside of the CSAs in WLPZs under the Aquatic Conservation Strategy, 5,017 acres of which will be in the California Klamath Province and 631 acres of which will be in the California Cascades Province. It is anticipated that the majority of timber harvest of currently suitable northern spotted owl habitat within the Action Area will occur in the first ten years of the HCP, accounting for modification of approximately 18,640 acres of suitable northern spotted owl habitat. Of the 18,640 acres of suitable northern spotted owl habitat that is likely to be harvested in the first decade, it is estimated that 34 percent (approximately 6,347 acres) will be reduced to non-habitat. The remaining acres will provide some level of dispersal or foraging capability.

Timber harvesting can result in the direct loss of suitable habitat important for northern spotted owl nesting, roosting or foraging. As a result, northern spotted owls may abandon a territory and seek out habitat elsewhere that may be marginal or occupied by other northern spotted owls or barred owls that compete for the same resources. Timber harvest can adversely affect northern spotted owls by reducing the total amount of suitable habitat within a northern spotted owl's home range. The result may be that the northern spotted owls continue to persist at the territory in the short-term, but marginal habitat conditions in the territory compromise the northern spotted owls' long-term survival and ability to successfully reproduce.

Forest management activities, whether intended to address silvicultural needs or to facilitate other actions (e.g., road construction, wildfire prevention, recreation) have the potential to reduce availability of nest and roost sites and foraging and dispersal habitat for the northern spotted owl. Northern spotted owls do not construct their own nests, but depend upon existing structures such as cavities in snags and live trees, broken tree tops, and mistletoe brooms; characteristics associated with stands in later seral stages of development. Silvicultural prescriptions (e.g. regeneration and overstory removal prescriptions) or management activities that specifically target the oldest, most decadent trees in the stand for economic purposes, or require removal of hazard trees and snags to address human safety concerns, are likely to result in loss of nesting opportunities for northern spotted owls by removing the trees that contain those structures (Blakesley et al. 1992). In studying tree dimension data from trees harvested in the 1960s, Hummel (2009) found that crown morphologies of large, young trees were not the same as their similarly sized older counterparts; therefore younger stands with old-growth characteristics may not provide as favorable nesting habitat as actual old growth. Further, prescriptions designed to reduce or remove ladder fuels or release co-dominant individuals can simplify vertical structure in the forest understory, where northern spotted owls perch for hunting or roosting (Forsman et al. 1984).

Intermediate timber harvest and fuels reduction activities can contribute to changes in structure, diversity, and habitat microclimate by reducing overall canopy closure within a stand. Northern spotted owls prefer to nest and roost in older, multi-storied forests (USDI FWS 1990a, Thomas et al. 1990, Blakesley et al. 1992, Verner et al. 1992, Andrews et al. 2005) presumably because they provide protection under most weather conditions (Forsman et al. 1984, North et al. 2000). During periods of rain, snow, or cold, Forsman et al. (1984) found northern spotted owls roosting significantly higher in the forest overstory than during hot weather when northern spotted owls were commonly found roosting low in the forest understory (Barrows and Barrows 1978). Weathers et al. (2001) documents physiological limitations that corroborate results of laboratory work and field studies which determined low heat tolerance of northern spotted owls compared to other birds.

Various forestry activities that remove large trees, snags, shrubs, and downed wood can affect prey composition and/or availability by altering characteristics of the habitat upon which prey species depend. Because the amount of standing dead (i.e., snags) and down material present on the forest floor is positively correlated with densities of some northern spotted owl prey species, removing these materials or temporarily disturbing material on the forest floor may contribute to declines in northern spotted owl prey, at least on a localized, short-term basis (Williams et al. 1992, Bevis et al. 1997). It may also be possible for prey species to be adversely affected by incidental loss of hardwoods, hazard trees, or snags during harvest.

In the southern portion of their range, where woodrats are a major component of their diet, northern spotted owls are more likely to use a variety of stands, including younger stands, brushy openings in older stands, and edges between forest types in response to higher prey density in some of these areas (Solis 1983, Sakai and Noon 1993, 1997, Carey et al. 1999, Franklin et al. 2000). Density of dusky-footed woodrats appears to be highest in sapling/bushy poletimber 15 to 40 years old and in older forests that have openings with abundant bushy understory (Raphael

1988, Sakai and Noon 1993, Hamm 1995, Carey et al. 1999, Hamm and Diller 2009). Hamm and Diller (2009) hypothesize that dusky-footed woodrats (*Neotoma fuscipes*) in northern California are likely directly tied to understory plant species diversity, vegetation density, and sites suitable for constructing houses rather than presence or absence of overstory conifer trees. Many other researchers (e.g. Carey et al. 1999, Innes et al. 2007) recognize the importance of large logs, stumps, shrubs, and materials for houses to woodrat density. Because of the importance of snags, downed logs, and mistletoe to woodrats, Lehmkuhl et al. (2006a) found that management to reduce woody fuels and restore low-intensity high frequency fire into ponderosa pine and Douglas fir forests will likely reduce bushy-tailed woodrat (*Neotoma cinerea occidentalis*) populations.

Dusky-footed woodrats prefer forested habitats with a brushy understory and suitable nest building materials. Houses are built of sticks and leaves at the base of, or in a tree, around a shrub, or at the base of a hill. Silvicultural treatments and prescribed burning could negatively affect dusky-footed woodrat habitat by destroying shrub cover and burning stick nests. However, it has been noted that opening up the canopy and having patchy openings throughout a stand may provide for the growth of shrubs, thereby increasing habitat availability to dusky-footed woodrats. Lehmkuhl et al. (2006b) determined that bushy-tailed woodrats can be abundant in dry interior forests where rock is scarce and snags, logs, and mistletoe provide cover. Large snags, mistletoe, and large logs are important cover elements that are positively correlated with bushy-tailed woodrat habitat value (Maser et al. 1984, Carey 1991, Smith 1997, Verts and Carraway 1998). Management to reduce woody fuels and restore low-intensity high-frequency fire regimes in ponderosa pine and dry Douglas-fir forest will likely reduce bushy-tailed woodrat populations (Lehmkuhl et al. 2006b). Cover provided by downed logs and mistletoe trees, whose dense brooms close to the ground torch easily in ground fires (Hessburg et al. 1994), would be mostly consumed by prescribed fire (Lehmkuhl et al. 2006b). Additionally, existing large snags with defects and old woodpecker cavities that provide woodrat nest sites (Carey 1991) also would be at risk of destruction by prescribed fire (Lehmkuhl et al. 2006b). Stand simplification, such as removal of tree height diversity or understory shrubbery, commonly resulting from timber harvest and prescribed burning, create less favorable foraging conditions for northern spotted owls. Because availability of large prey species, particularly dusky-footed woodrat and northern flying squirrels, has been shown to be important for northern spotted owl reproductive success (Barrows 1985, 1987; Zabel et al. 1995), activities that reduce prey populations could lower northern spotted owl recruitment and individual fitness, especially during breeding season.

Populations of small mammals vary widely in response to habitat availability and food resources. Silvicultural and fuel reduction treatments affect species differently depending on their life history needs. Northern flying squirrels, western red-backed voles, and bushy-tailed woodrats are usually negatively affected by silvicultural (thinning, shelterwood) and fuel reduction treatments in the short-term and may not start to recover until several years after treatments. On the other hand, many species such as ground dwelling squirrels and chipmunks increase almost immediately (1 to 2 years) after treatments. Loss of foraging habitat or silvicultural activities that lead to a short-term (1 to 5 years) reduction in prey availability may cause northern spotted owls to forage in other, less-familiar areas, leading to an increased probability of competitive interactions with barred owls or other northern spotted owls that may be in the area, as well as an

increased probability of predation.

Fruit Growers Supply Company will employ various silvicultural treatments across its ownership. The most pronounced effect to suitable northern spotted owl habitat within the Plan Area will be from the use and implementation of even-aged regeneration methods. Even-aged regeneration occurs on a 50- to 80-year rotation and produces stands that will remain in young seral stages for 20 to 50 years depending on site potential and stocking retained. These units are generally small, from 10 to 30 acres, and scattered on the landscape. Additionally, based on FGS's MSP analysis and as stated on page 2-18 of the Final EIS, the HCP is expected to result in an increase in what the Service considers foraging habitat (i.e., CWHR habitat categories 4M and 4D) over time and a decrease in clearcutting and other even-aged management practices.

In most cases, even-aged regeneration targets marginally stocked and/or deteriorating stands to improve their long-term productivity. Harvest methods include seed tree, shelterwood, and clearcutting methods. Regeneration occurs artificially through planting nursery-grown seedlings, or naturally by seed trees retained within harvest units. Stands that are 50 to 80 years old generally support dispersal and foraging habitat for northern spotted owl. Harvesting by seed tree, shelterwood, and clearcutting methods will generally render the stands unsuitable to the northern spotted owl for nesting, roosting, foraging, and potentially dispersal.

Even-aged thinning units are intermediate treatments of mid-seral even-aged stands designed to accelerate growth of trees. Generally, mid-seral even-aged stands may provide dispersal and foraging opportunities for northern spotted owls, although these stands are generally dense with limited below-canopy roosting or perching opportunities. Thinning of these stands would likely improve an owl's ability to disperse through the stand by providing more space in the subcanopy to maneuver and fly through.

Uneven-aged silviculture is used to harvest trees individually or in small groups with the goal of developing or maintaining a variety of age classes within a stand. Typically, sites are restocked through natural regeneration and, where necessary, supplemented by planting seedlings obtained from a nursery. Uneven-aged silviculture will generally maintain the function of northern spotted owl habitat, although degradation of habitat components will typically occur.

Clearcutting

The clearcutting regeneration method involves the removal of a stand in one harvest. These clearcutting units are generally 20 to 30 acres, but may be up to 40 acres in size. Clearcutting occurs on FGS ownership within stands that are generally 50 to 80 years old. These stands typically provide foraging and dispersal habitat for northern spotted owls. In rare circumstances, a 70 to 80 year old stand may provide isolated patches of nesting/roosting habitat for northern spotted owls under optimum conditions (i.e., high site class mixed conifer or Douglas fir, proper elevation, aspect, slope position) which include older trees or snags that provide nesting opportunities. Clearcut timber harvest will adversely affect northern spotted owl habitat by completely removing the forest stand and rendering the harvested area unsuitable for northern spotted owl nesting, roosting, foraging, or dispersal for the life of the 50-year ITP. However, based on FGS's MSP analysis and as stated on page 2-18 of the Final EIS, the HCP is

expected to result in an increase in what the Service considers foraging habitat (i.e., CWHR habitat categories 4M and 4D) over time and a decrease in clearcutting and other even-aged management practices (see section 4.1.3.2).

Commercial Thin

Commercial thinning is the removal of trees in a forest stand to maintain or increase the average diameter of the remaining trees, promote timber growth, and/or improve forest health. Commercial thinning is used as a tool to extend the "life" of some stands before using a regeneration harvest to better balance age class distributions across the forest. Commercial thinning is used to improve stand health and growth in relatively healthy, well-stocked stands of trees large enough to be harvested for lumber (> 10 inches dbh) that exceed target stocking requirements. Commercial thinning is typically conducted in northern spotted foraging or dispersal habitat. Commercial thinning reduces current canopy closure and has the potential to reduce tree height diversity when used within an uneven-aged stand of trees. Removal of forest cover increases solar radiation at the surface and in the understory, elevating daytime air temperatures (Heithecker and Halpern 2006). Rambo and North (2009) found that understory thinning units had significantly more extreme summer daily ranges of temperature and vapor pressure deficit than untreated control units. After thinning, northern spotted owls may avoid the area and move to adjacent suitable habitat areas (Forsman et al. 1984). Northern spotted owls prefer to roost in older forests due to their thermoregulatory properties, and early to middle stage forests have been shown to be used less than expected based on their availability, even in areas where old forest is scarce (Carey et al. 1990). Owls flew long distances to reach older stands, even bypassing younger and mature forests (Carey et al. 1990). Treated stands will likely be less favorable to northern spotted owls in the short-term (i.e., 30 to 50 years) for roosting due to a reduction in thermoregulatory properties, overstory canopy, and a reduction in understory perch trees that the owls use during hot summer days. Additionally, thinning treatments have the potential to damage residual trees, make residual trees more susceptible to windthrow, and allow increased wind speeds through the stand, which in turn could affect fire behavior. Therefore, while these stands will still maintain the characteristics of foraging and dispersal habitat, they may be less desirable to the northern spotted owl as a result of thinning activities.

Depending on the magnitude and severity, commercial thinning within northern spotted owl home ranges has the potential to cause site abandonment of resident owls or cause a reduction in owl fitness and recruitment. In a radiotelemetry study of northern spotted owls in hemlock/Douglas-fir forest in Oregon, timber harvest was the principal cause of site abandonment (Forsman et al. 1984), although it should be noted that sample size was small and the results were not based on an experimental design. In areas that experienced heavy thinning where canopy closure was reduced to less than 50 percent, northern spotted owls either completely disappeared or moved to adjacent unharvested old growth stands (Forsman et al. 1984).

The effects of commercial thinning on northern spotted owl in the more diverse Klamath forest types where the Action Area is located are less conclusive. The limited available literature from the Coast, West Cascades and Klamath Physiographic Provinces in Oregon appears to support the concept that spotted owl habitat can be thinned, to some degree (i.e., lightly), and retain its biological function post-treatment. Solis (1983), using radio-telemetry, found that northern spotted owl pairs infrequently used recently thinned pole/medium stands that retained 70 percent canopy closure post-thinning. Irwin et al. (1989) reported that many private forest managers in northern California observed owl pairs nesting successfully following partial harvest that retained relatively continuous forest canopies and important structures believed to influence owls and/or their prey. Kerns (1989) monitored three spotted owls during the breeding season and found that one of the owls used a thinned, relatively more open stand. King (1993) found that spotted owls used sites within selectively harvested (uneven-aged management) forests that retained higher canopy cover in the Yakama Indian Reservation. Hicks et al. (1999) documented through telemetry work on 14 northern spotted owls that the owls occasionally roosted in stands that had recently been managed, either through selective harvest or pre-commercial thinning. In both cases the owls were found in the managed stand within six months after ground operations. Irwin et al. (2005) evaluated spotted owl fidelity to home ranges following thinning and partial harvest treatments in young stands that retained at least 60 percent canopy. The authors found that no spotted owls vacated their home ranges after treatments were applied, and spotted owl use of stands pre- and post-treatment remained similar. Meiman et al. (2003) tracked the response of a single male spotted owl following relatively heavy commercial thinning in young (second-growth, 70-80 years old) Douglas-fir stands in the Oregon Coast Range. The authors recorded 13 percent of the male's locations in the thinned area prior to harvest and 3.8 percent of the locations in the thinned area following harvest. Use of the thinned stand was statistically significantly greater before than after harvest.

Thinning reduces the number of snags, downed woody material, shrubs, forbs, grasses, and fungi which provide key components of foraging and denning for northern spotted owl prey species. Shrub, down wood, and snags provide important cover from predators, so loss of these habitat elements may negatively affect some small mammals (Chambers 2002). Although small mammals seem to recolonize disturbed areas soon after disturbance, diversity and species dominance differ as succession progresses. Small mammals that prefer high canopy closure and/or woody debris may be adversely affected by thinning. Additionally, thinning has short-term negative effects on understory plants (mechanical destruction) and below-ground fungi (death of host trees and mechanical destruction) (Courtney et al. 2004). Loss of these habitat components can lead to decreased prey availability and less favorable habitat conditions (i.e., reduced snags, tree height diversity, less thermoregulatory buffering properties) resulting in possible avoidance of use by northern spotted owls and a reduction of overall fitness. Logging methods that minimize ground disturbing activities could minimize detrimental impacts to prey habitat and food resources. Variable-density thinning, as opposed to conventional thinning prescriptions holds promise for acceleration of the development of spotted owl habitat and dense prey populations (Carey 1995, 2001) especially when appropriate attention is paid to decadence (snags, cavity trees, and coarse woody debris) (Bunnell et al. 1999; Carey et al. 2002).

Biomass Thin

This intermediate treatment is used to thin younger, overstocked, submerchantable-sized stands to improve stand health and growth. It is predominantly used in young ponderosa pine stands and in mixed conifer stands with a heavy pine component. Although some saw logs are harvested, the main product is hog fuel (an unprocessed mix of barks and wood fiber) or paper chips from trees ranging from 4 to 10 inches dbh. Biomass thinning has been periodically used in the Grass Lake Management Unit to improve stand condition. It is also a valuable tool to reduce wildfire potential.

Biomass thinning would typically occur in northern spotted owl dispersal habitat or unsuitable habitat due to the age of the stands being thinned. Biomass stands are typically overstocked and are difficult for owls to forage or disperse through. Thinning these stands would generally improve the dispersal capability of northern spotted owls within the stands and potentially provide improved foraging capability. Although some saw logs may be removed, biomass thinning will generally improve current habitat conditions and allow the faster development of foraging and nesting/roosting habitat into the future.

Seedtree

The seed tree regeneration method involves the removal of a stand in one harvest except for well distributed seed trees of desired species which are left singly or in groups to restock the harvested area. The CFPRs require that retention trees are at least 18 inches dbh and that 15 ft^2/ac on site I, II and III (see Table 11; Site Classification) lands and 12 ft^2/ac on site IV and V lands per acre must be retained. The seed step is utilized to promote natural reproduction from seed and to initiate the establishment of an even-aged stand. The removal step may be utilized to remove the seed trees after a fully stocked stand of reproduction has become established.

Table 11. CFPR Site Classification (CALFIRE 2010)

	Ponderosa Pine, Jeffrey Pine, Mixed Conifer and True Fir[1]	
Site Class	**Site Index[2]** feet@100 years	**Site Index[3]** feet@300 years
I	≥114	≥163
II	93-113	138-162
III	75-92	113-137
IV	60-74	88-112
V	<60	<88

[1] Dunning 1942. Site index based on average tree height of dominant trees at age 100 and 300 years.
[2] Average total height in feet of dominant trees at 100 years of age.
[3] Average total height in feet of dominant trees at 300 years of age.

Seed tree regeneration harvest will typically occur in northern spotted owl nesting/roosting or foraging habitat. The initial harvest (seed step) will eliminate key components of northern

spotted owl suitable habitat. Canopy closure and tree height diversity will be substantially reduced by the removal of the majority of trees within the stand. The removal of trees would likely include the removal of nest or potential nest trees that have various deformities (large cavities, broken tops, mistletoe infections, and other evidence of decadence) as these trees are less desirable to provide a viable seed source to restock the stand. Additionally, snags may be reduced and downed woody material would be reduced to prepare the stand for natural seeding. The reduction in these key components of northern spotted owl suitable habitat would render the harvested area unsuitable for northern spotted owl nesting/roosting, foraging, or dispersal as the remaining seed trees would be incapable of providing sufficient canopy closure needed by the northern spotted owl. The retention of seed trees throughout the stand could potentially provide nest trees in the future if not harvested through the removal step; however, these trees will remain unusable until the surrounding stand provides key components of nesting/roosting or foraging habitat.

Shelterwood Removal (Even-aged)

The shelterwood regeneration method reproduces a stand via a series of harvests (preparatory, seed, and removal). The preparatory step is utilized to improve the crown development, seed production capacity and wind firmness of designated seed trees. The seed step is utilized to promote natural reproduction from seed. The removal step is utilized when a fully stocked stand of reproduction has become established, and this step includes the removal of the protective overstory trees. The shelterwood regeneration method is normally utilized when some shade canopy is considered desirable for the establishment of regeneration.

In the shelterwood preparatory step, the CFPRs require that seed trees that are at least 18 inches dbh must be retained at a minimum of 30 ft^2/ac on site I, II, and III lands and 24 ft^2/ac on site IV and V lands. Overall, at least 125 ft^2/ac on site I lands, 75 ft^2/ac on site II and III lands, and 50 ft^2/ac on site IV and V lands must be retained. In the shelterwood seed step, the CFPRs require that seed trees that are at least 18 inches dbh must be retained at a minimum of 30 ft^2/ac on site I, II, and III lands and 24 ft^2/ac on site IV and V lands. Once the minimum stocking requirements have been met, as required by the CFPRs, then the shelterwood removal step may be utilized.

Shelterwood regeneration harvest will typically occur in northern spotted owl nesting/roosting or foraging habitat. The initial harvest (preparatory step) will eliminate key components of northern spotted owl suitable habitat, although not to the extent of a seed tree regeneration harvest, since additional basal area must be maintained within the stand. Canopy closure and tree height diversity will be reduced by the removal of overstory and mid-story trees within the stand. The removal of trees would likely include the removal of nest or potential nest trees that have various deformities (large cavities, broken tops, mistletoe infections, and other evidence of decadence) as these trees are less desirable to provide a viable seed source to restock the stand. Trees in the understory that provide perching opportunities for northern spotted owls and snags and downed woody material that provide shelter for northern spotted owl prey species would also be reduced. Based on the CFPRs retention standards, site I, II and III lands would likely maintain some characteristics of northern spotted owl foraging and/or dispersal habitat. Site IV lands would likely be reduced to northern spotted owl dispersal habitat. Once the shelterwood seed step was implemented, only the remaining overstory seed trees would be maintained. The

remaining seed trees would be incapable of providing sufficient canopy closure needed by the northern spotted owl, thus rendering the harvested area unsuitable for northern spotted owl foraging or dispersal. The retention of seed trees throughout the stand could potentially provide nest trees in the future if not harvested through the removal step; however, these trees will remain unusable until the surrounding stand provides key components of nesting/roosting or foraging habitat.

Selection/Group Selection (Uneven-aged)

This silvicultural method is used in heavily stocked, relatively healthy stands that have an uneven-aged structure. Merchantable trees are harvested from all size classes present. The intent is to maintain an uneven-aged structure, maintain stand health, and generate a harvest return. Harvest entries occur every 10 to 20 years. Selection harvest has also been applied to other stands throughout FGS ownership on the Hilt/Siskiyou forest, including those in watercourse protection zones and on potentially unstable slopes, including inner gorges and shallow, unstable soils.

Under the selection regeneration method, the trees are removed individually or in small groups sized from 0.25 acres to 2.5 acres. The CFPRs state that stocking should not be reduced below the following standards post-harvest: on site I lands at least 100 ft^2/ac shall be retained, on site II and III lands at least 75 ft^2/ac shall be retained, and on site IV and V lands at least 50 ft^2/ac of basal area shall be retained.

Selection harvest will typically occur in northern spotted owl nesting/roosting and foraging habitat. Selection harvest, whether individual or group selection, will reduce overall canopy closure but maintain a level of tree height diversity throughout the stand. Additionally, snags and downed woody material will be reduced. Overall, current nesting/roosting habitat for the northern spotted owl would be reduced to foraging or dispersal habitat and current foraging habitat would either be maintained at foraging or reduced to dispersal habitat, depending on site class and amount of timber removed.

Alternative Prescriptions

A number of alternative prescriptions are commonly used by FGS in its silvicultural management. All alternative prescriptions are analyzed and approved during the THP review process. In most cases where alternative prescriptions are employed, past management and timber harvest have created an irregular condition in stand structure and/or stocking. Standard silvicultural prescriptions as specified in the rules are difficult to apply in these irregular stands. FGS's management scheme is to maintain stand health and generate a periodic and economical harvest in these stands through the use of alternative prescriptions over the first one to four years, gradually building up inventory to a point when standard silvicultural prescriptions can be applied. These alternative prescriptions include, but are not limited to:

- Seedtree/shelterwood removal (uneven-aged)
- Modified selection
- Combination shelterwood removal/biomass thin

- Modified commercial thin
- Combination shelterwood removal/commercial thin

Alternative prescriptions are likely to degrade, downgrade, or remove northern spotted owl habitat within stands being treated. Without a definitive THP, it is difficult to determine actual effects, but effects would be a composite of the silvicultural treatments discussed previously.

Salvage Logging

Dead, dying, and downed trees are periodically salvaged. Salvage is primarily related to road maintenance, fire damage, insect damage, or storm damage. Generally the economics and logistics involved in the potential harvest determine the feasibility of salvage operations. Salvage operations are feasible when damaged or weakened trees occur adjacent to ongoing logging operations, or are in heavy enough concentrations over a large enough area to justify sending in a salvage logger. It is typically not feasible to harvest individual occurrences of one or two trees, or trees that have been dead for more than two years. Salvage operations typically occur in isolated locations throughout the Plan Area, and consist of harvesting dead and dying conifers as individuals or in small groups.

Patches of dead, dying and downed trees typically provide high quality foraging habitat for northern spotted owls, especially when these patches are interspersed within larger areas of suitable nesting/roosting and foraging habitat. The abundance of standing snags and downed logs provide quality habitat for northern spotted owl prey species and northern spotted owls typically have high foraging success within and adjacent to these patches. In vast expanses of tree mortality, northern spotted owls may avoid foraging in the center of these areas if canopy closure is absent and the potential for predation is high. Additionally, standing dead and dying trees provide nest sites for northern spotted owls. In summary, the removal of dead, dying and downed trees may remove northern spotted nest sites or potential nest sites, foraging habitat, and prey habitat and subsequently have adverse effects to northern spotted owls.

Road Construction and Maintenance

Implementation of the HCP is expected to result in less than one mile of new road construction per year and will mainly serve as temporary spurs to access isolated patches of timber. Construction of new roads in connection with timber management, including clearing vegetation from road rights-of-way, removing trees, grubbing (removing stumps and surface organics), grading, and compaction will remove suitable northern spotted owl habitat if present. In addition, new road construction will remove habitat for northern spotted owl prey species.

Maintenance of existing roads typically will not affect northern spotted owl habitat unless snags or hazard trees that provide nesting opportunities for the owl are removed for safety concerns. Removal of snags, hazard trees, or removal of brush along existing roads will likely have some negative impact on northern spotted owl prey species, which in turn may indirectly affect northern spotted owl foraging success.

Closure of roads, temporary (abandoned) or permanently (decommissioned), will have a net positive effect on northern spotted owl as noise disturbance from vehicle traffic will be eliminated and vegetation will be allowed to reestablish and grow. Decommission of seasonal roads under the HCP is estimated to be approximately one mile per year. Over half of FGS's permanent roads (not coop) are subject to seasonal closure and many are opened only during operations (approximately 500 miles are gated, 250 miles of which are gated year-round).

Stand Regeneration and Improvement

Timber stand regeneration and improvement includes activities necessary to establish, grow, and achieve the desired species composition, spacing, and rate of growth of forest stands on the ownership. Activities may include site preparation, prescribed burning, slash treatment, tree planting, vegetation management, and silvicultural thinning (includes biomass, pre-commercial thinning, and commercial thinning). Silvicultural thinning was described previously and will not be discussed here. Site preparation, prescribed burning, slash treatment, tree planting, and vegetation management will have no effect on existing suitable northern spotted owl habitat. However, these activities are likely to negatively affect northern spotted owl prey species, which in turn may indirectly affect northern spotted owl foraging success along the edges of the stand. A LOP for noise and smoke disturbance will be implemented around known northern spotted owl nest sites to reduce disturbance during the critical nesting period.

Minor Forest Product Harvest

Minor forest products include, but are not limited to, Christmas trees and bows, mistletoe, firewood, fence posts, poles, yew bark, stumps, root wads, and mushrooms. These are all very minor components of FGS's Covered Activities and are not considered a major contribution to habitat loss for the northern spotted owl; however, firewood cutting has the potential to reduce prey habitat by removing snags or downed wood on a local scale.

Fire Prevention and Suppression

Wildfire prevention involves vegetation management and the construction of fuel breaks strategically located throughout the Plan Area. These activities are designed and implemented by the area forester on a local basis, and are therefore generally limited in scale. The prescription typically includes thinning for shaded fuel breaks along property lines or between watersheds where FGS deems it beneficial.

Fuel break construction typically involves the retention of overstory trees and the removal of understory trees and shrubs, snags, and downed woody material. As a result, overstory canopy typically remains the same or may be slightly reduced; vertical structure, shrubs, and downed wood are reduced; and snags are eliminated. Typically this type of vegetation management will degrade or downgrade suitable northern spotted owl habitat and reduce the amount of suitable habitat available to prey species. In areas of non-suitable northern spotted owl habitat, habitat manipulation that reduces brush and downed woody material may have a negative effect on the local prey population, thereby reducing northern spotted owl foraging success along edges of suitable habitat.

Wildfire suppression is typically under the authority of local, State, or Federal agencies. In cases of escaped prescribed burns where local, State, or Federal agencies are not involved, or for initial responses until responsible agencies have arrived, FGS employs emergency fire suppression activities, such as construction of fuel breaks by hand or bulldozer, lighting backfires, applying aerial fire suppressants, falling trees or snags, and water drafting for fire suppression.

Construction of fuel breaks or the falling of trees or snags during emergency fire suppression can have substantial effects to suitable northern spotted owl habitat. Hand lines are created by crews using hand tools. The focus of hand crews is to create a line at the ground level. The vegetation is either scraped or cut away with hand tools, such as shovels and chainsaws, to create a bare ground strip to prevent ground fire from spreading. Ladder fuels that are close to the line may be cut away to prevent the fire from jumping into the higher canopy. Dozer lines vary in width and can be anywhere from eight to 20 feet. Dozer lines require the total removal of all vegetation including the overstory. Lighting backfires can have a substantial effect on existing northern spotted owl habitat by burning up habitat components (e.g., understory trees, snags, downed wood) and killing larger trees.

Activities that remove large trees, snags, shrubs, and downed wood, such as fireline construction, felling of snags and trees, and lighting backfires, can affect habitat by directly removing or damaging nesting and/or roosting and perching trees, and affect prey composition and/or availability by altering characteristics of the habitat upon which prey species depend. The effects of removing standing dead and down material on northern spotted owl prey species is described above. It may also be possible for prey species to be adversely affected by incidental loss of hardwoods, hazard trees, or snags during burning, felling, or fireline construction.

Applying aerial fire suppressants is unlikely to affect suitable northern spotted owl habitat, but could potentially kill a northern spotted owl if directly hit by the suppressant. This is discussed in the direct mortality section above.

Other Activities

Other activities that may occur on FGS lands include those activities that are consistent with the zoning of FGS's lands as a Timber Production Zone. These activities may include watershed management, fish and wildlife habitat improvement, use of roads, landings, and log decks. These activities are not anticipated to affect suitable northern spotted owl habitat.

Rock quarrying activities would be covered under the HCP. Fruit Growers Supply Company quarries rocks from a number of locations on its ownership for the purpose of obtaining material for road surfacing. FGS has four primary rock quarries on the ownership that are each less than two acres in size. These existing rock quarries will not affect suitable northern spotted owl habitat and will be subject to a LOP to minimize noise disturbance during the breeding season if within 0.25-mile of an active nest site. Typically, up to five or more local rock sources commonly referred to as "borrow pits," are developed as needed for road upgrades associated with THPs. Each local rock source is rarely larger than 0.5 acres in size and is most often located in the upper portions of watersheds away from Class 1 streams. There is the possibility

that these borrow pits may remove northern spotted owl habitat; however, it is anticipated that borrow pits will be located in areas with minimal vegetation.

Landscape Level Effects

Any individual or suite of site-specific effects discussed above could change the habitat function that a forested stand provides for owls. For the purpose of the following discussion, the degree of change to habitat function has been categorized using the following terms: removal, downgrade, and degrade. The term *removal* represents a complete loss of habitat function following an effect (i.e., an area that functioned as nesting/roosting, foraging, or dispersal habitat for northern spotted owls before the effect, no longer provides any habitat function for northern spotted owls after the effect). *Downgrade*, a subset of the term *removal*, refers to a reduction in the function of habitat (i.e., an area that functions as nesting/roosting habitat before an effect, provides only foraging or dispersal habitat following the effect). This term could be used also to signify a change in function from foraging to dispersal as well. *Degrade*, to be distinguished from *downgrade*, indicates a reduction in habitat quality, but not habitat function following the effect (i.e., an area that functioned as foraging habitat prior to the effect, still provides such function after the effect, but perhaps is more limited due to a temporary reduction in prey base).

Landscape-level changes in habitat availability, distribution, and configuration have implications to individual northern spotted owl survival and productivity, as well as to northern spotted owl population dynamics. For example, removal or downgrading of habitat within home ranges, and especially close to the nest site, can be expected to have negative effects on northern spotted owls. Bart (1995) reported a linear reduction in northern spotted owl productivity and survivorship as the amount of suitable habitat within a northern spotted owl home range declined. In addition, many researchers have stressed the importance of habitat availability within a 0.5-mile radius core area around the nest site (Hunter et al. 1995, Bingham and Noon 1997, Meyer et al. 1998, Wagner and Anthony 1999, Franklin et al. 2000, Zabel et al. 2003). In northwestern California, Franklin et al. (2000) found that survivorship of adult owls was higher where greater amounts of older forest were present around the activity center, but also found increased reproductive success where the amount of edge between older and younger forest was relatively high. Based on analysis of radio-telemetry data, Bingham and Noon (1997) reported that a sample of northern spotted owls in northern California focused their activities in heavily-used core areas that ranged in size from about 167 to 454 ac, with a mean of about 409 ac. These core areas, which included 60 to 70 percent of the owl telemetry locations during the breeding season, typically comprised only 20 percent of the area of the wider home range, and survivability of the owls was affected by the amount of habitat available within these core areas. Meyer et al. (1998) evaluated habitat available within a 2-mile circle around the nest site and found habitat within the 0.5-mile radius, or core, was profoundly different from that in the remainder of the home range, suggesting that owls are most strongly affected by landscape characteristics within the 0.5-mile core. These studies suggest that habitat removal within core areas could have disproportionate effects to owls.

Landscape-level, large scale timber harvest that produces relatively open stands (less than 40 percent canopy closure) or patch clear-cuts can fragment forest stands, creating more forest edge, and reducing the area of interior old forest habitat (Lehmkuhl et al. 1991). Habitat fragmentation

has the potential to isolate individual owls or populations of owls by increasing distances between suitable habitat patches and reducing habitat connectivity. Such isolation decreases the likelihood of successful dispersal of juvenile owls (Miller 1989), which in turn could reduce opportunities for genetic exchange between owl populations (Barrowclough and Coats 1985).

Currently there is little empirical data confirming that habitat fragmentation contributes to increased levels of predation on northern spotted owls. However, great horned owls, an effective predator on northern spotted owls, are known to be closely associated with fragmented forest habitats (Johnson 1992). As mature forests are harvested, it is possible that great horned owls could colonize the fragmented forest and possibly increase northern spotted owl vulnerability to predation events.

Recent studies indicate that barred owls are capable of utilizing a broader range of habitat types than northern spotted owls (Hamer 1988, Kelly et al. 2003). Thus, activities that modify suitable northern spotted owl habitat could benefit barred owls. Barred owls may be negatively affecting northern spotted owls through competition for resources, direct harm through aggressive behavior, and hybridization, and may also directly attack northern spotted owls. However, it is unclear whether forest management has an effect on the outcome of interactions between barred owls and the northern spotted owl (Gutiérrez et al. 2004).

Many recent silvicultural projects focus on managing fire behavior and severity to avoid loss of timber stands to high severity fire; however, some silvicultural activities have been shown to negatively affect fire behavior and severity. Odion et al. (2004) tested for modern human effects on the fire regime and severity and found that multi-aged, closed forests burned with much lower severity than open forest and shrubby non-forest vegetation. In addition, tree plantations experienced twice as much severe fire as multi-aged forests (Odion et al. 2004). Odion et al. (2004) hypothesize that coupled with a warming climate, tree plantations that now occur on one-third of the roaded landscape within their study area in the Klamath-Siskiyou region of northern California and southwestern Oregon may increase the size and severity of future fires. On the Shasta-Trinity National Forest, evidence of increasing fire severity in plantations and adjacent stands was noted after the 2008 fires (USDI FWS 2009). Although the risk of high severity fire is expected to decrease due to the reduction in clearcutting and other even-aged management practices under the FGS HCP, tree plantations will be created and continue to pose a potential fire threat.

Landscape level changes in habitat availability, distribution, and configuration have implications to individual northern spotted owl survival and productivity as well as to northern spotted owl population dynamics. Northern spotted owls are known to disperse through many kinds of forested areas including over and around roads, clear-cuts, burned areas, and non-forested areas (Forsman et al. 2002). Dispersing juveniles have been observed using a wide variety of conifer forests ranging from harvested areas to open sapling stands to mature and old-growth stands (Miller et al. 1997). Implementation of the FGS HCP has the potential to improve the dispersal ability of northern spotted owls within the Action Area with the reduction in clearcutting, seed tree and shelterwood harvesting, and other even-aged management practices across FGS's ownership. However, dispersal patterns may be disrupted by the fragmented landscape that is typical of heavily managed forests.

Plantation establishment, as a result of clearcutting, seed tree harvest, and shelterwood harvest within the Plan Area has the potential to affect northern spotted owls by changing and/or increasing fire severity within the area and surrounding areas, potentially leading to further habitat loss and disturbance in the Action Area and on adjacent Federal, private and State lands. Tree plantations have been found to experience twice as much severe fire as multi-aged forests, and multi-aged closed forests burn with much lower severity than open forest and shrubby non-forest vegetation (Odion et al. 2004). When viewing areas within the Shasta-Trinity National Forest after the 2008 fires, it was evident in the areas visited that even-aged stands and stands adjacent to plantations also experienced higher fire severity than those that were not (USDI FWS 2009). Creation of new plantations within the fire-prone California Klamath Province is not recommended (SEI 2008). The creation of new plantations within the Plan Area could potentially change and/or increase fire severity within adjacent Federal lands, leading to habitat loss and disturbance in these areas that we assume are contributing to the conservation of the northern spotted owl. However, based on FGS's MSP analysis and as stated on page 2-18 of the Final EIS, the HCP is expected to result in an increase in what the Service considers foraging habitat (i.e., CWHR habitat categories 4M and 4D) over time and a decrease in clearcutting and other even-aged management practices. Additionally, thinning and maintenance of existing plantations within the Plan Area would help balance the effects on fire severity. The fire tolerance of existing plantations can be increased by actively manipulating species composition, reducing density, promoting spatial heterogeneity in forest structure (avoiding large areas of homogeneously fire-prone plantations), treating surface fuels, and favoring the development of large, fire tolerant trees (SEI 2008).

4.1.3 Description of Effects to Northern Spotted Owls in the Action Area

4.1.3.1 Northern Spotted Owl Activity Centers in the Action Area

The population within the Action Area includes all northern spotted owls that could be directly or indirectly affected by FGS's operations. It encompasses the known northern spotted owl activity centers within 1.3 miles of FGS ownership, which is the average radius of northern spotted owl home ranges within the California Klamath and California Cascades Provinces (USDI FWS 1992b). Eighty-two historic activity centers supporting a total of up to 158 individual northern spotted owls were estimated to occur within the Action Area during development of the HCP. As described in section 3.2.2, northern spotted owls have been detected at these historic activity centers at some point since the owl was listed; however, in most cases the current status is unknown and many home ranges contain high amounts of low quality habitat due to repeated timber harvest entries and wildfire. Based on the distribution of the current population and habitat available, there is a very low probability of additional undetected activity centers within the Action Area.

The northern spotted owl population in the Action Area is divided by two ecological provinces: the California Klamath Province and the California Cascades Province. The effects analysis is conducted separately for these two provinces within the Action Area because they are distinct in terms of population demographics and trends, threats, and quantity and quality of northern spotted owl habitat.

California Klamath Province

Seventy-four of the 82 total activity centers in the Action Area are located in the California Klamath Province (see section 3.2.2). During HCP development, the Service identified 31 of these 74 activity centers where incidental take of owls is not likely. Implementation of Covered Activities within the home ranges of 11 of these activity centers is not expected to result in incidental take of owls because FGS has limited ownership in the core and/or home range (i.e., less than ten percent) and therefore has little potential to reduce the amount and distribution of habitat to the point that take will occur. For example, out of these 11 activity centers, FGS has suitable northern spotted owl habitat within only one activity center core (SK379). The core has 0.02 acres of suitable northern spotted owl nesting/roosting habitat on FGS's lands. It is not anticipated that removal or downgrading of this habitat would impact the ability of the core to support occupancy by northern spotted owls because of the negligible amount of habitat and since the core would still be within the range of habitat conditions described in the Service Take Avoidance Guidance (USDI FWS 2008c). All other suitable habitat within this core is managed by the USFS.

At the home range scale, FGS has suitable northern spotted owl habitat in nine of the 11 outer ring home ranges. Eight of these are currently within the range of habitat conditions described in the Service guidelines to support occupancy by owls (USDI FWS 2008c). Given current restrictions on timber harvest on other ownerships, if FGS harvested all suitable habitat within these eight outer ring home ranges, the outer ring home ranges would still retain adequate amounts of habitat to support northern spotted owl occupancy. It is unlikely that FGS' removal of habitat within the outer home ranges of these activity centers will result in take of spotted owls. Fruit Growers Supply Company's activities are not likely to impact the ability of the other activity center (SK537) to support occupancy by northern spotted owls because the activity center has a low likelihood of occupancy due to an inadequate amount of suitable habitat in both the core and outer ring home range. This activity center may be deemed abandoned with the appropriate level of protocol surveys determined by the Service.

Incidental take of owls is not expected to occur at an additional 20 activity centers within the California Klamath portion of the Action Area because adequate habitat within their home ranges will be retained as CSAs on FGS's ownership throughout the 50-year permit term to support occupancy. Fruit Growers Supply Company will adhere to habitat commitments for each CSA identified in Appendix D of the FGS HCP in addition to maintaining or creating general habitat conditions and features identified in the demographic support objective of the Terrestrial Species Conservation Program in section 5.3.1.1 of the FGS HCP. While FGS may be allowed to harvest suitable habitat within CSAs not specifically identified as part of their habitat commitments, FGS must first meet its habitat commitments and, in general, the activity centers must exceed the FGS HCP habitat standards, regardless of ownership. Any Covered Activities occurring in CSAs must be approved by the Service. These conservation measures will provide demographic support to northern spotted owls associated with these 20 activity centers located within 1.3 miles of the FGS ownership and whose home ranges overlap with CHUs in the Klamath portion of the Action Area. None of the actual activity centers occur on FGS lands; 22 occur on the KNF and two occur on other private lands.

The habitat targets that must be maintained in the CSAs under the FGS HCP have a higher threshold than those used to determine take of other northern spotted owl activity centers on private lands (i.e., CFPRs or the 2008 Service Take Avoidance Guidance – Interior Region, USDI FWS 2008c). The habitat commitments in the core remain the same as the 2008 Service Take Avoidance Guidance; 250 acres of nesting/roosting and 150 acres of foraging must be maintained in the 502-acre core. Additionally, all existing substrate for northern spotted owl nest structures (tree deformities, mistletoe brooms, tree cavities) will be maintained within the 502-acre core area where it does not create a hazard for public safety. Within the outer ring home range (2,894 acres), the minimum habitat that must be maintained is 350 acres of nesting/roosting habitat and 900 acres of foraging habitat, which provides greater retention of habitat than the 2008 Service Take Avoidance Guidance (USDI FWS 2008c).

Out of the 20 mitigation activity centers in the Klamath portion of the Action Area, habitat in the core of six and in the outer ring home range of 15 are currently above the HCP habitat targets. Table 12 shows both the cumulative current acres of habitat and amount of habitat FGS has committed to grow and/or maintain on its ownership within the 20 mitigation activity center cores and outer ring home ranges over the 50-year permit term. The habitat commitments would provide a cumulative decrease of 59 acres of nesting/roosting habitat and an increase of 396 acres of foraging habitat in the core areas, and a cumulative decrease of 1,134 acres of nesting/roosting habitat and an increase of 351 acres of foraging habitat in the outer ring home ranges compared to current levels on FGS ownership over the permit term. The reduction in nesting/roosting habitat is due to 1) harvest in the core of mitigation sites that currently or will (with ingrowth of habitat) exceed the HCP habitat targets specified in section 5.3.1.1 of the FGS HCP, and 2) harvest of small patches that do not function as nesting/roosting habitat due to their size and/or distance to the core. The exceptions to these reasons are the harvest of habitat in the outer ring home range of SK040, SK262b, and SK503 because of current conditions of vegetation (i.e., low potential to grow additional high-quality habitat) and planned timber projects as negotiated with the Service.

Table 12. Cumulative Current and Target Non-Overlapping Acres of Northern Spotted Owl Habitat on Fruit Growers Supply Company Ownership within the 20 Mitigation Sites in the Klamath Province portion of the Action Area.

	Current Habitat		**Target Habitat**	
Habitat	**502-acre Core**	**2,894-acre Outer Ring**	**502-acre Core**	**2,894-acre Outer Ring**
Foraging	481	3,484	877	3,835
Nesting/Roosting	119	1,183	60	49
Total	**600**	**4,667**	**937**	**3,884**

Currently, there are only six mitigation activity centers where both the core and outer ring home range are above threshold when nesting/roosting habitat is used as a surrogate for foraging. However, none of the activity centers meet the threshold according to the conditions identified in section 5.3.1.1 of the FGS HCP. To the degree that mitigation sites are currently below the HCP

habitat targets, sufficient ingrowth of habitat will need to occur before FGS can harvest suitable habitat.

Harvest by FGS within the home ranges of mitigation sites will maintain sufficient amounts and distribution of habitat to support occupancy and reproduction of owls, as determined by the Service. Any Covered Activities occurring in CSAs must be approved by the Service and are reliant upon FGS conducting protocol level surveys and implementing a LOP within 0.25-mile of active northern spotted owl nest sites where operations would not be authorized during the breeding season to avoid disturbance to nesting owls and their young. Any Covered Activities that occur within the home ranges of the 31 activity centers where incidental take of owls is not likely, or newly identified activity centers within the California Klamath Province, must undergo a review and approval process by the Service prior to any Covered Activities being implemented. Approval would be based on a rigorous evaluation of the quantity and quality of existing habitat, field reviews, and other criteria to insure that sufficient amounts and distribution of habitat to support occupancy and reproduction by owls is maintained.

The northern spotted owl conservation strategy in the FGS HCP is based on the conservative assumption that habitat at 43 historic activity centers that are not designated as mitigation or 'no take' sites would be harvested to the extent that take of up to 83 individual owls would occur as a result of FGS implementing Covered Activities under the HCP. Generally, take would occur indirectly from the loss or degradation of habitat within northern spotted owl cores and home ranges.

As described in section 3.2.2, this estimate of the potential for incidental take represents a worst-case scenario because it assumes that each of the activity centers supports northern spotted owls at their highest historical reproductive status and that modification of habitat would lead to the incidental take of all individual northern spotted owls occupying those activity centers. However, not all activity centers may be currently occupied and some activity centers are not likely to be occupied at their highest historic reproductive status.

This conservative approach is appropriate for landscape-level analysis and development of the conservation strategy in the HCP. However, in determining the amount and impact of take under section 7 of the Act, the Service must use the best scientific information available to evaluate as closely as possible the likelihood of significant impairment of feeding, breeding and sheltering behavior (take) of spotted owls. Determination of the likelihood of take is based primarily on 1) the rate, intensity, and extent of habitat modification potentially influencing the species and 2) the probability of individuals being present where habitat-modifying activities occur. In particular, because the 43 'take' sites were established based on a wide range of historical survey records, the Service conducted an evaluation of the probability of occupancy at the 43 sites where harvest would likely occur. Because updated surveys have not been conducted at the 43 sites where take could potentially occur, the Service determined the likelihood of take based on the combination of: 1) existing survey records, 2) results of habitat modeling (Zabel et al. 2003), and 3) evaluation of the amount and distribution of suitable habitat.

1) Evaluation of survey results

The amount, quality, and vintage of survey records at some of the 43 historic activity centers were not adequate to support classification of all of the sites into 'occupied' and 'not occupied' status. Because some surveys did not fully conform with the recommended Service survey protocols for the spotted owl, negative results (i.e., survey was conducted and owls were not detected) did not always result in a determination of 'unoccupied'. However, since development of the HCP, additional survey information is available because FGS has continued to survey historic activity centers associated with THPs. In cases where spotted owls were recently detected (2007-2011) or there were no detections during the past five years of protocol surveys, this information was used to determine occupancy status for the purposes of the BO. Using this information, the Service classified eight activity centers as currently occupied and 12 activity centers as likely not occupied (Table 13). The remaining activity centers have varying potential for occupancy.

Table 13. Likelihood of Occupancy for the 43 'Take' Activity Centers in the California Klamath Province portion of the Action Area.

Code	Category	Criteria	Activity Center	# Sites
1	Currently occupied	Spotted owl(s) detected during 2007-2011 surveys	SK205, SK262, SK322, SK370, SK380, SK450, SK467, SK500	8
2	Likely occupied	Spotted owl(s) detected prior to 2007, recent surveys lacking	SK020, SK046, SK065, SK130, SK310, SK359, SK454, SK469, SK472, SK477	10
3	Potentially occupied	Spotted owl(s) not detected 2007-2011, survey effort not to protocol but substantial	SK239, SK309, SK334, SK336, SK360, SK363, SK364, SK369, SK387, SK388, SK389, SK474, SK533	13
4	Likely not occupied	Spotted owl(s) not detected during >3 years protocol surveys	SK318, SK321, SK333, SK335, SK358, SK361, SK365, SK368, SK391, SK473, SK475, SK534	12

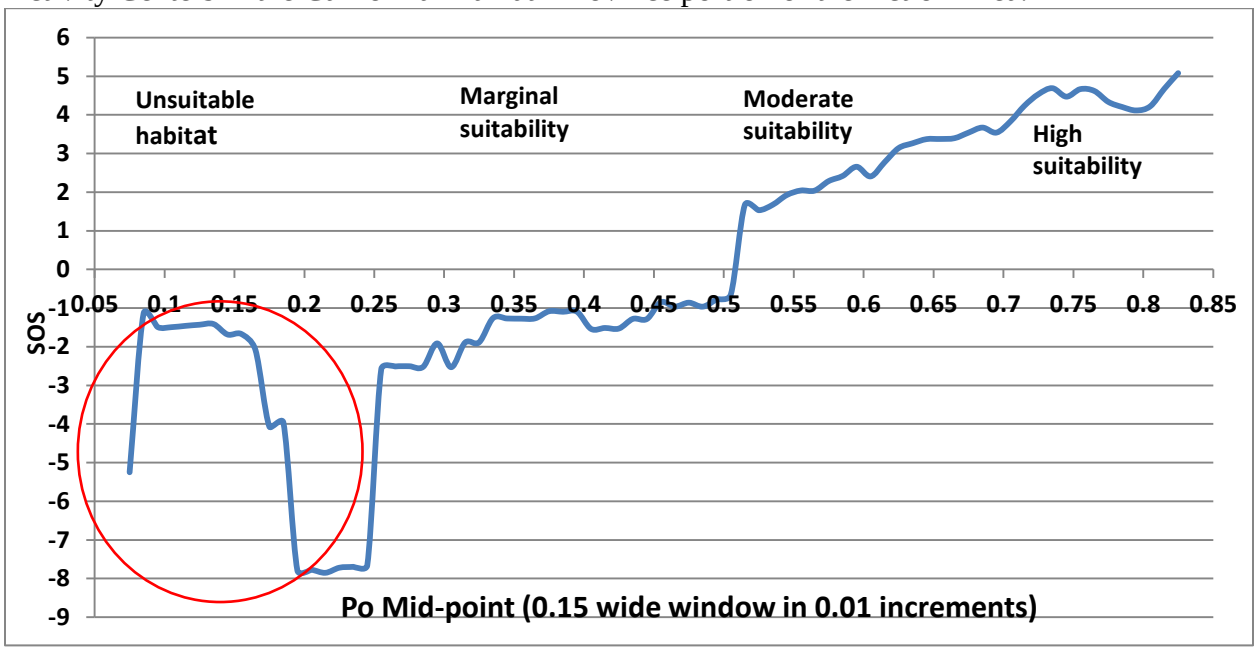
2) Relative habitat suitability modeling

Species distributional models are used to evaluate species-habitat relationships, evaluate an area's suitability for the species, and to predict a species' presence (Elith and Leathwick 2009). These models, also called environmental (or ecological) niche models, correlate environmental conditions with species distribution and thereby predict the relative suitability of habitat within some geographic area (Warren and Seifert 2011). In this context, we defined relative habitat suitability (RHS) as the relative similarity of environmental conditions (forest composition and structure) at spotted owl sites to the distribution of those conditions across the landscape. When translated into maps depicting the spatial distribution of predicted habitat suitability, these models have great utility for evaluating conservation reserve design and function (Zabel et al. 2003, Carroll and Johnson 2008, Carroll et al. 2010).

The spotted owl distribution model described by Zabel et al. (2003) was used in the development of the FGS HCP, and provided the Service with a useful method to evaluate the habitat quality at historic activity centers in the project's Action Area. As described in the Environmental Baseline section, the Zabel model predicts probability of occupancy based on habitat conditions within a 500-acre (0.5-mile radius) circular window. This spatial scale corresponds to 'core areas' that receive disproportionate use by nesting and foraging spotted owls in the Klamath region (Bingham and Noon 1997) and where differences between use and availability of habitat tend to be most pronounced (USDI FWS 2011b, Appendix C). This approach is appropriate for mapping broad-scale patterns of habitat suitability, but because spotted owls depend on a larger 'home range' area for resources, may not provide a reliable method for evaluating the quality of individual territories (Buchanan et al. 1998). To account for this, we analyzed the Zabel model results using a 'focal mean' method that incorporates a larger area (1-mile radius, or approximately 2,011 acres) into estimation of RHS at an activity center, while still emphasizing conditions within the core area. This larger area corresponds to the mean home range size (95% Fixed Kernel method) of spotted owls in the Klamath region (Irwin et al. 2007, Timber Products Company 2007).

The Service used a 'Strength of Selection' (SOS) approach to compare the distribution of RHS values at spotted owl territories to the overall landscape, and establish cutoff points for categories of habitat suitability (unsuitable, marginal suitability, moderate suitability, and high suitability). The observed use that areas with various RHS values receive (by nesting spotted owls in our case) were plotted relative to the abundance of such areas within the FGS HCP Action Area. For example, areas with a mid-point RHS less than 0.25 were used eight times less than expected based on their availability within the Action Area. Similarly, areas with RHS values greater than 0.75 were used about 4.5 times more than expected. Figure 6 shows the degree of selection by spotted owls for RHS values ranging from 0 to 100, and the four RHS categories used to inform our estimation of the likelihood of take. The portion of the curve circled in red exhibits an anomaly caused by the large proportion of the FGS Action Area occurring in the lowest RHS values and a very small sample of spotted owl records in low RHS value areas.

Figure 6. 'Strength of Selection' (SOS) and Relative Habitat Suitability for the 43 'Take' Activity Centers in the California Klamath Province portion of the Action Area.



To quantify habitat conditions and the subsequent likelihood of occupancy at each of the 43 historic spotted owl sites, we evaluated the distribution of RHS values in three categories (Table 14).

Table 14. Likelihood of Occupancy based on Relative Habitat Suitability (RHS) Values for the 43 'Take' Activity Centers in the California Klamath Province portion of the Action Area.

Code	Likelihood of Occupancy	Criteria	Activity Center	# Sites
1	High	Core and home range contain high proportions of moderate to high suitability habitat (RHS > 60%)	SK020, SK046, SK130, SK205, SK239, SK262, SK322, SK335, SK360, SK361, SK364, SK380, SK389, SK391, SK450, SK469, SK472	17
2	Moderate	Core and home range contain intermediate proportions of moderate to high suitability habitat (RHS = 51% to 60%)	SK065, SK310, SK318, SK336, SK359, SK363, SK365, SK368, SK370, SK387, SK477, SK500, SK534	13
3	Low	Core and home range contain high proportions of marginal and unsuitable habitat (RHS < 51%)	SK309, SK321, SK333, SK334, SK358, SK369, SK388, SK454, SK467, SK473, SK474, SK475, SK533	13

Evaluation of RHS at spotted owl core areas and home ranges provided a useful method for describing the likelihood of occupancy by spotted owls at the 43 historic sites. However, in a

number of cases the model outputs were unreliable due to changes in habitat condition (e.g., fires, timber harvest) that occurred after the model's underlying vegetation layer was developed or other inconsistencies in the habitat typing used in the modeling. To ensure that our determinations were based on the best site-specific information available, we verified the model results at each site by assessing the amount and distribution of habitat by comparing with 2009 digital orthophoto quadrangles (DOQs; see below).

3) Amount and distribution of suitable habitat

To provide a more site-specific evaluation of the likelihood of take, we augmented the habitat modeling results with a visual assessment of the amount and distribution of spotted owl habitat within the core areas and home ranges of the 43 historic activity centers. We used DOQs and maps generated from the 2005 northern spotted owl baseline habitat layer to estimate 1) the overall amount of nesting/roosting and foraging habitat and 2) the proportion of suitable habitat occurring on lands managed by FGS (and therefore likely to be harvested under the HCP) versus habitat on adjacent USFS land.

Table 8 (section 3.2.2) shows amount and distribution of suitable spotted owl habitat by ownership at each activity center within the Klamath Province portion of the Action Area. Compared to the Service Take Avoidance Guidance thresholds of 400 acres of suitable habitat (250 acres nesting/roosting and 150 acres foraging habitat) in the 502-acre core and 935 acres suitable habitat in the 2,894-acre outer ring of the home range (USDI FWS 2008c), out of the 43 'take' activity center cores, three are currently above the habitat thresholds and the remaining 40 activity centers are currently below. Of the 40 activity centers that are below, three are above threshold in total amount of suitable habitat, but are deficit in the amount of nesting/roosting habitat. Out of the 43 'take' activity center outer ring home ranges, 28 are currently above threshold and the remaining 15 activity centers are currently below threshold. Only three activity centers (SK239, SK380, and SK469) currently have both the core and home range above threshold. Table 15 shows the results of the Service's evaluation of the likelihood of occupancy at the 43 'take' activity centers based on amounts of nesting/roosting and foraging habitat within the core and home range.

Table 15. Likelihood of Occupancy based on Amounts of Nesting/Roosting and Foraging Habitat within the Core and Home Range of the 43 'Take' Activity Centers in the California Klamath Province portion of the Action Area.

Code	Likelihood of Occupancy	Criteria	Activity Center	# Sites
1	High	Core and home range contain adequate amounts of nesting/roosting and foraging habitat	SK239, SK380, SK469	3
2	Moderate	Core or home range is deficient in nesting/roosting or foraging habitat	SK046, SK065, SK130, SK205, SK262, SK321, SK322, SK333, SK334, SK335, SK336, SK358, SK359, SK360, SK361, SK364, SK365, SK368, SK370, SK388, SK391, SK450, SK472, SK477, SK500	25
3	Low	Core and home range contain insufficient amounts of nesting/roosting and foraging habitat	SK020, SK309, SK310, SK318, SK363, SK369, SK387, SK389, SK454, SK467, SK473, SK474, SK475, SK533, SK534	15

This evaluation focuses on quantification of the amounts of nesting/roosting habitat and foraging habitat at both the core area and home range scales, but also the distribution, patch size and other features that influence the suitability of an area for spotted owls. Because forest habitats in the vicinity of many of the historic spotted owl sites have been modified by wildfires and repeated harvest entries, current vegetation databases and habitat classification maps required verification by visual examination of DOQs. In a number of cases, the quantity and quality of habitat observed on DOQs differed substantially from amounts described in step 2 above. In these cases the likelihood of occupancy was revised to reflect current conditions.

4) Evaluation of extent of impacts to spotted owl territories

The Service evaluated the potential for FGS's Covered Activities to result in take based on the proportion of existing suitable habitat located on FGS's ownership within the core and home range of the 43 'take' activity centers. The Service used the habitat amounts in the core and outer ring of the home range from Table 7 (section 3.2.2) to calculate the proportion of suitable habitat on FGS's ownership. Table 16 shows the potential impact of FGS's activities on the currently suitable habitat for each 'take' site. Fruit Grower's activities have a low likelihood of taking spotted owls, if present, at 15 sites where FGS has a "low" potential for impact. However, in a number of cases the results are unreliable due to changes in habitat condition (e.g., fires, timber harvest) that occurred after the vegetation layer was developed or other inconsistencies in the habitat typing. As described in step 3 (above) in these cases the observed quantity and quality of habitat as observed on aerial photographs was used to revise the estimation of likelihood of take.

Table 16. Potential Impact on Suitable Habitat based on Proportion of FGS's Ownership in the Core and Outer Ring of the Home Range of the 43 'Take' Activity Centers in the California Klamath Province portion of the Action Area.

Code	Potential Impact	Criteria	Activity Center	# Sites
1	Low	FGS owns < 20% suitable habitat in core and/or home range	SK020, SK310, SK318, SK359, SK365, SK387, SK388, SK389, SK391, SK454, SK469, SK474, SK477, SK500, SK533	15
2	Moderate	FGS owns 20% to 40% suitable habitat in core and/or home range	SK065, SK130, SK205, SK239, SK309, SK321, SK334, SK335, SK368, SK472, SK473, SK534	12
3	High	FGS owns > 40% suitable habitat in core and/or home range	SK046, SK262, SK322, SK333, SK336, SK358, SK360, SK361, SK363, SK364, SK369, SK370, SK380, SK450, SK467, SK475	16

Summary

In total, of the 74 activity centers within the Klamath portion of the Action Area, incidental take of owls is not likely to occur at 43 activity centers (Figure 7). Eleven activity centers are not likely to be occupied by spotted owls based on more recent protocol survey results and a rigorous evaluation of the amount and distribution of suitable habitat using 2009 digital orthophoto quadrangles (DOQs), habitat maps generated from the 2005 northern spotted owl baseline habitat layer (see 2009 FGS HCP, Appendix A), and a Relative Habitat Suitability (RHS) model (Zabel et al. 2003). Spotted owls have not been detected at these 11 activity centers during protocol surveys within the last five years, and/or the core and/or home ranges contain high proportions of marginal and unsuitable habitat (RHS < 51 percent) and amounts of nesting/roosting and foraging habitat the Service considers insufficient to support occupancy and reproduction (USDI FWS 2008c). Incidental take of owls is also not likely to occur at the 20 mitigation sites, at the 11 activity centers that have low overlap with FGS ownership, and the one activity center (SK310) where only three percent of the suitable habitat in its home range is on FGS's ownership.

Based on the evaluation of survey records, habitat suitability models, habitat mapping, and evaluation of potential impacts of FGS activities, the Service identified 31 activity centers where incidental take of owls resulting from FGS's operations could reasonably occur over the course of the 50-year permit term (Table 17). Suitable habitat with the home ranges of these 31 activity centers is scheduled to be harvested to the extent that incidental take of up to 61 individual owls could reasonably occur as a result of FGS implementing Covered Activities under the HCP. Generally, take would occur indirectly from the loss or degradation of habitat within northern spotted owl cores and home ranges. Eleven of these 31 activity centers occur on FGS lands, 17 occur on KNF, and three occur on other private lands.

Figure 7. Northern Spotted Owl Activity Centers within the California Klamath Province portion of the Action Area.

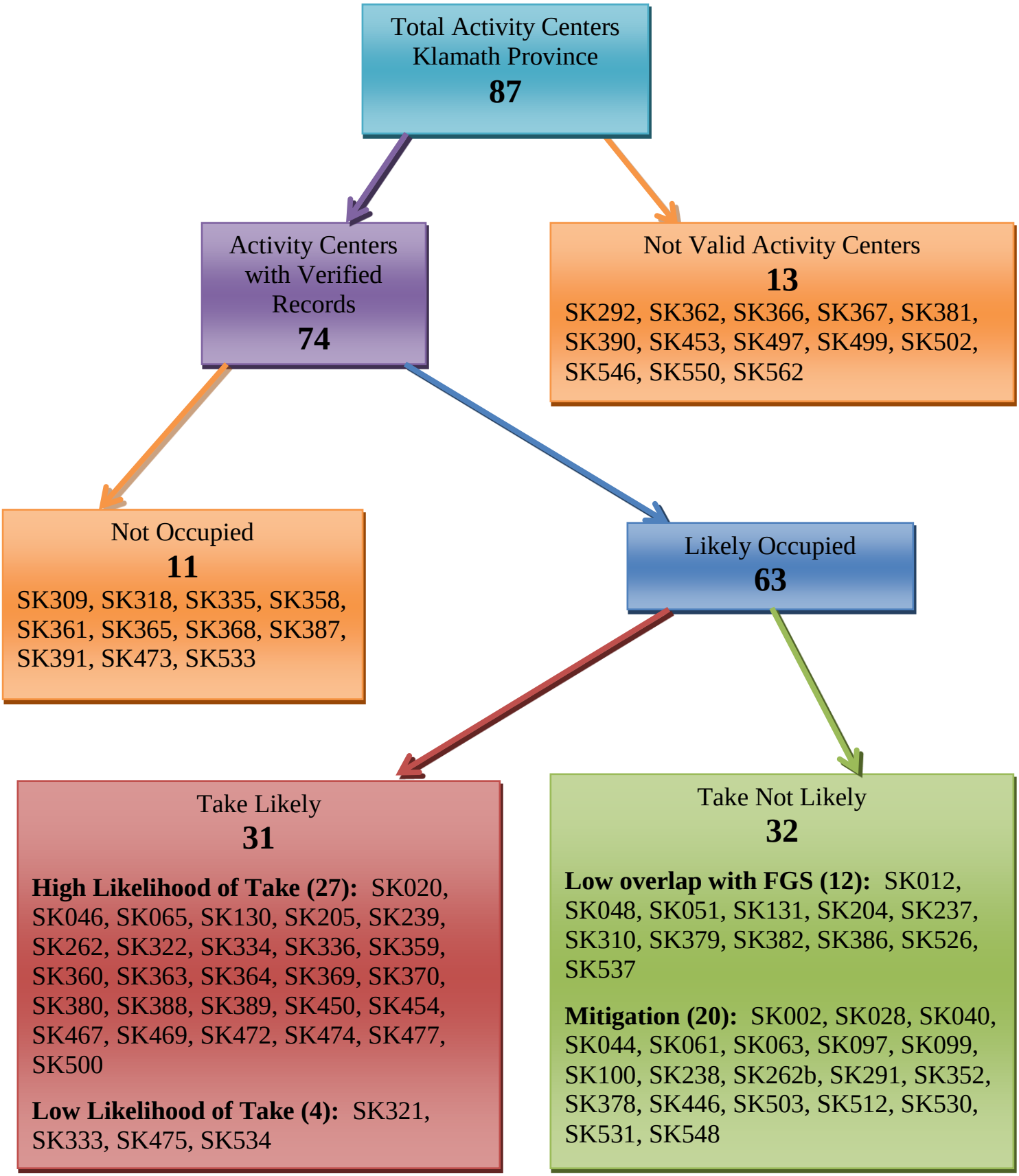


Table 17. Likelihood of Actual Take based on the Service's Evaluation for the 43 'Take' Activity Centers in the California Klamath Province Portion of the Action Area.

Code	Likelihood of Take	Criteria	Activity Center	# Sites
1	High	Detections within past 5 years, high Relative Habitat Suitability, high amounts of suitable habitat, and/or high potential impact of FGS's activities on existing suitable habitat.	SK130, SK239, SK262, SK322, SK370, SK380, SK450, SK467, SK469, SK500	10
2	Moderate/Low	Spotted owls(s) detected prior to 2007 and recent surveys lacking or inconclusive, moderate Relative Habitat Suitability, moderate amounts of suitable habitat, and/or moderate potential impact of FGS's activities on existing suitable habitat.	SK020, SK046, SK065, SK205, SK334, SK336, SK359, SK360, SK363, SK364, SK369, SK388, SK389, SK454, SK472, SK474, SK477	17
3	Very Low	Spotted owl(s) not detected during >3 years protocol surveys, low Relative Habitat Suitability, low amounts of suitable habitat, and/or low potential impact of FGS's activities on existing suitable habitat.	SK321, SK333, SK475, SK534	4
4	None	Spotted owl(s) not detected during >5 years protocol surveys, very low Relative Habitat Suitability, very low amounts of suitable habitat, and/or very low potential impact of FGS's activities on existing suitable habitat.	SK309, SK310, SK318, SK335, SK358, SK361, SK365, SK368, SK387, SK391, SK473, SK533	12

California Cascades Province

Eight of the activity centers in the Action Area are located in the California Cascades Province (see section 3.2.3). Incidental take of owls at these eight activity centers is not likely (Figure 8). Implementation of Covered Activities within the home ranges of four of these activity centers is not expected to result in incidental take of owls because FGS has limited ownership in the core and/or home range (i.e., less than ten percent) and therefore has little potential to reduce the amount and distribution of habitat to the point that take will occur. For example, FGS owns land that does not have any suitable northern spotted owl habitat available within either the core or outer ring home range of SK194 and SK442; therefore, incidental take due to FGS's activities will not occur. None of the four actual activity centers occur on FGS lands; three occur on the KNF and one occurs on other private lands.

Incidental take of owls will not occur at an additional four activity centers (SK153, SK284, SK428, SK462) within the California Cascades portion of the Action Area because habitat within their home ranges will be retained as CSAs on FGS's ownership throughout the 50-year permit term. Fruit Growers Supply Company will adhere to habitat commitments for each CSA

identified in Appendix D of the FGS HCP in addition to maintaining or creating general habitat conditions and features identified in the demographic support objective of the Terrestrial Species Conservation Program in section 5.3.1.1 of the FGS HCP. While FGS will be allowed to harvest suitable habitat within CSAs not specifically identified as part of their habitat commitments, FGS must first meet its habitat commitments and, in general, the mitigation activity centers must exceed the FGS HCP habitat targets, regardless of ownership. As described below, any Covered Activities occurring in CSAs must be approved by the Service. These conservation measures will provide demographic support to northern spotted owls associated with these four activity centers located within 1.3 miles of the FGS ownership and whose home ranges overlap with CHUs in the Cascades portion of the Action Area. None of the actual activity centers occur on FGS lands; all occur on the KNF.

All four mitigation activity center cores and outer ring home ranges in the Cascades portion of the Action Area are currently below the HCP habitat targets. Table 18 shows both the cumulative current acres of habitat and amount of habitat FGS has committed to grow and/or maintain on its ownership within the four mitigation activity center cores and outer ring home ranges over the 50-year permit term. The habitat commitments would maintain the same amount of nesting/roosting habitat and provide a cumulative increase of 226 acres of foraging habitat in the core areas, and a cumulative decrease of 12 acres of nesting/roosting habitat and an increase of 883 acres of foraging habitat in the outer ring home ranges compared to current levels on FGS ownership over the permit term. The reduction in nesting/roosting habitat is due to 1) harvest in the outer ring home range of mitigation sites that currently or will (with ingrowth of habitat) exceed the HCP habitat targets specified in section 5.3.1.1 of the FGS HCP, and 2) harvest of small patches that do not function as nesting/roosting habitat due to their size and/or distance to the core. The exception to these reasons is the harvest of habitat in the outer ring home range of SK428 because of current conditions of vegetation (i.e., low potential to grow additional high-quality habitat) and planned timber projects as negotiated with the Service.

Table 18. Cumulative Current and Target Non-Overlapping Acres of Northern Spotted Owl Habitat on Fruit Growers Supply Company Ownership within the Four Mitigation Sites in the Cascades Province portion of the Action Area.

	Current Habitat		**Target Habitat**	
Habitat	**502-acre Core**	**2,894-acre Outer Ring**	**502-acre Core**	**2,894-acre Outer Ring**
Foraging	193	1,001	419	1,884
Nesting/Roosting	6	12	6	0
Total	**199**	**1,013**	**425**	**1,884**

Currently, none of the mitigation activity centers in the Cascades portion of the Action Area are above threshold in both the core and outer ring home range when nesting/roosting habitat is used as a surrogate for foraging. To the degree that mitigation sites are currently below the HCP habitat targets, sufficient ingrowth of habitat will need to occur before FGS can harvest suitable habitat.

Harvest by FGS within the home ranges of mitigation sites will maintain sufficient amounts and distribution of habitat to support occupancy and reproduction of owls, as determined by the Service. Any Covered Activities occurring in CSAs must be approved by the Service and are reliant upon FGS conducting protocol level surveys within 1.3 miles of the treatment units and implementing a LOP within 0.25-mile of active northern spotted owl nest sites where operations would not be authorized during the breeding season to avoid disturbance to nesting owls and their young. Any Covered Activities that occur within the home ranges of the eight activity centers where incidental take of owls is not likely, or newly identified activity centers within the California Cascades Province, must undergo a review and approval process by the Service prior to any Covered Activities being implemented. Approval would be based on a rigorous evaluation of the quantity and quality of existing habitat, field reviews, and other criteria to insure that sufficient amounts and distribution of habitat to support occupancy and reproduction by owls is maintained.

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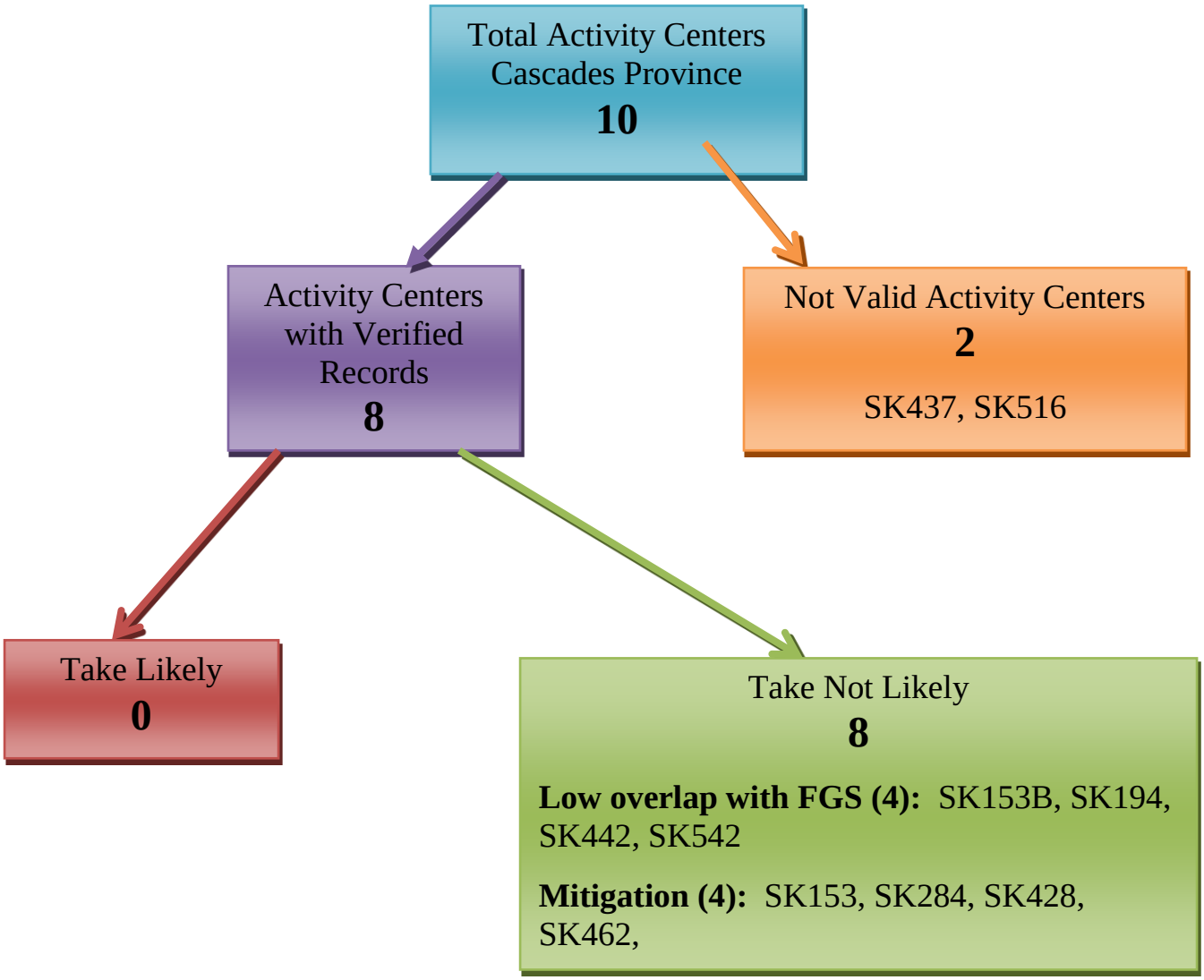
Figure 8. Northern Spotted Owl Activity Centers within the California Cascades Province portion of the Action Area.



4.1.3.2 Northern Spotted Owl Habitat in the Action Area

Based on the 2005 owl habitat layer, there are 92,762 acres of suitable foraging habitat, 49,394 acres of suitable nesting habitat, and 382,329 acres of unsuitable habitat within the entire 524,484-acre Action Area (Tables 6 and 9). Thirty-one percent of the total amount of suitable northern spotted owl habitat within the Action Area is likely to be affected by FGS's activities over the term of the ITP. Of the suitable habitat likely to be affected, it is anticipated that approximately 44 percent (19,340 acres) will be reduced to non-habitat on FGS's land at some point over the 50-year permit term. The remaining 51 percent on FGS's lands is not scheduled to be converted to plantation, and will continue to function as foraging or dispersal habitat. The quality of nesting/roosting and foraging habitat on FGS ownership has been degraded due to repeated timber harvest entries, and to a substantial degree does not support reliable occupancy or reproduction by spotted owls; higher-quality habitats are retained in CSAs. Spotted owl habitat on adjacent federally managed lands is much more likely to contain important habitat elements and support spotted owl occupancy.

An important aspect of the HCP is the ownership-wide increase in foraging and dispersal habitat that is predicted to occur due to changes in FGS's management practices. According to FGS's Maximum Sustainable Production (MSP) analysis and as stated on page 2-18 of the Final EIS, the HCP is expected to result in an increase in what the Service considers foraging habitat (i.e., CWHR habitat categories 4M and 4D) over time and a decrease in clearcutting and other even-aged management practices across the FGS ownership. Under the ITP, FGS would be allowed to harvest more of the currently suitable northern spotted owl habitat on its ownership within the home ranges of 'take' sites. Areas of suitable owl habitat generally have more and larger trees and provide more timber volume per acre than non-habitat areas. Fruit Growers Supply Company has indicated that this would reduce the amount of even-aged regeneration harvest necessary to meet financial targets. A reduction in clearcutting of moderate-complexity stands would allow these and other stands to grow into suitable northern spotted owl habitat over the duration of the permit. According to FGS's MSP analysis, it is anticipated that there would be about a 10 percent decrease in acres harvested each decade under the FGS HCP, including as much as a 25 percent decrease in even-age regeneration harvest compared to timber management under current regulations. As shown in Table 19, the amount of early- and mid-seral forest with high canopy coverage (CWHR classes 2M, 2D, 3M, and 3D) would decrease by up to 20 percent during the first three decades under the HCP compared to conditions under current regulations. The acreage of mid-to late-seral stands with low canopy coverage (CWHR classes 4S and 4P) would decrease over the 50-year permit term to levels less than 10 percent of the acreage in these stand types under current regulations as these stands are allowed to grow and increase in canopy coverage. Thus, the acreage in mid- to late-seral stands with high canopy coverage (CWHR classes 4M and 4D) would be nearly twice as high as under current regulations by the end of the permit term. The amount of late-seral forest in size class 5 would remain essentially the same as currently exists (near zero).

Table 19. Projected Acres in each CWHR Size/Canopy Cover Class Under the FGS HCP.

CWHR Class	2007	Decade 1	2	3	4	5
2S	0	0	0	0	0	0
2P	0	0	0	0	0	0
2M	221	1,688	1,132	782	0	3,145
2D	4,899	8,366	9,868	10,218	12,515	8,370
3S	7,619	2917	0	0	0	0
3P	28,634	21,820	7,140	220	27	0
3M	11,986	14,783	10,903	6,272	5,108	5,240
3D	11,844	20,315	21,737	24,053	28,011	32,021
4S	1,385	1,011	839	300	0	0
4P	36,257	16,886	31,611	16,861	14,767	4,768
4M	10,612	31,907	25,189	44,809	34,586	37,929
4D	16,318	10,064	21,086	25,759	34,761	38,301
5S	0	0	0	0	0	0
5P	0	0	269	0	0	0
5M	0	0	0	0	0	0
5D	0	16	0	0	0	0
Total	**129,774**	**129,774**	**129,774**	**129,774**	**129,774**	**129,774**

4.1.4 Relative Effects on Survival and Recovery of Northern Spotted Owl

Evaluation of the relative effects of the FGS HCP on the survival and recovery of the northern spotted owl is based on several factors, including:

- The estimated changes in number of spotted owls and their habitat that are likely to occur with implementation of the FGS HCP
- The current and future condition of the FGS landscape and its ability to support spotted owl survival and recovery
- The conservation and mitigation strategy employed in the HCP and its contribution to spotted owl recovery
- The adequacy of existing regulatory mechanisms to conserve spotted owls and habitat currently existing on FGS lands.

The importance of each of these factors, and the relative significance of effects, vary with the scale of analysis. For this consultation, the Service evaluated the relative effects at three spatial scales; the Action Area, Region (local population scale) and rangewide.

4.1.4.1 Effects to Northern Spotted Owls within Action Area

Effects to Northern Spotted Owl Population within Action Area

Fruit Growers Supply Company has requested incidental take of up to 83 owls within the Action Area. While the Service based its take evaluation (section 4.1.3.1) on potential impacts to owls at 43 activity centers within the Action Area, the analysis strongly indicates that 11 of these 43 historic activity centers (representing 20 owls) are no longer occupied because the home ranges of these 11 activity centers contain extremely low amounts of suitable habitat due to repeated timber harvest entries and wildfire, and several consecutive years of protocol surveys have not detected owls at most of these sites. Fruit Growers Supply Company is also not likely to incidentally take the two owls associated with one activity center (SK310) because the company owns only three percent of the remaining suitable habitat in the home range. Therefore, 61 owls are likely to be incidentally taken over the permit term during HCP implementation. The take authorization of the 22 additional owls, for a total of 83 owls under the proposed ITP, is based on uncertainty regarding the potential displacement and movement of owls in response to Covered Activities within the Action Area during the 50-year permit term. Based on analysis of owl activity centers and habitat suitability, the Service concludes that authorization of take of an additional 22 owls would, at most, likely have a minor impact to the species' survival and recovery because 11 of the activity centers used in the estimate of the baseline population are of low quality and are not likely to support owls now or perhaps in the future, and because FGS has very low potential to reduce the habitat quality in the home range of SK310. Habitat loss expected to occur within the home ranges of the 22 owls has already been identified and evaluated in the habitat sections of this BO.

Based on the take evaluation (section 4.1.3.1) and as described above, the Service anticipates that incidental take of up to 61 northern spotted owls resulting from FGS's Covered Activities within the Action Area could reasonably occur as a result of implementation of the FGS HCP over the 50-year permit term. This number corresponds to 44% of the individual owls the Service considers potentially occupying the Action Area. However, as described in section 3.2.2, actual take is not likely to be this high because historic activity centers may not be currently occupied or occupied by owl pairs.

The significance of the loss of 61 owls is strongly influenced by the current condition of forest habitats on FGS ownership; in particular the amount and quality of habitat within spotted owl home ranges and core areas. Spotted owl activity centers on and immediately adjacent to FGS ownership have received multiple timber harvest entries during the past 25 years, and most of these activity centers are considered deficit in nesting/roosting and foraging habitat. Repeated harvest entries have removed or reduced important habitat elements such as high canopy cover, snags and large, defective trees, resulting in degraded habitat conditions even in stands classified as nesting/roosting or foraging. These conditions, combined with the Service's review of survey

records for many of the historic activity centers, were the bases for the Service's conclusion that occupancy rates at many of these sites are low and that over time the observed pattern of site abandonment will continue regardless of whether an HCP is implemented.

Given the above conditions, existing regulatory mechanisms will be unlikely to conserve activity centers that are strongly influenced by FGS ownership. Under the current CFPRs and Section 9 of the ESA, take is deemed unlikely if an activity center is determined to be abandoned; subsequently all habitat within the home range can be removed without compensatory mitigation. Because occupancy rates at many of the historic activity centers on FGS ownership are low, take of spotted owls as a result of habitat removal and degradation at these sites is expected to be low. This circumstance acts to further reduce both the extent and the effects of the potential take estimated under the HCP.

Estimation and description of the local or population-level effects of proposed take is based on the significance of the take to survival and recovery of the listed species as a whole. Northern spotted owl populations encompass large regions (physiographic provinces), and owls within the FGS Action Area constitute a very small portion of two, much larger, widespread populations in two physiographic provinces. For the northern spotted owl, the significance of impacts is most strongly influenced by losses of owl pairs occupying sites likely to support long-term occupancy and reproductive success; these sites contribute disproportionately to population stability and recovery. Low-quality sites supporting territorial singles or low rates of occupancy and reproduction by owl pairs contribute substantially less to the conservation of the species, but may provide habitat for dispersing spotted owls and occasional occupancy and even reproduction. Because some of the activity centers proposed to be lost or degraded currently support owl pairs and some reproduction, implementation of the FGS HCP is likely to result in a measurable reduction in the numbers and distribution of spotted owls within the Action Area; however, as discussed below in "Relative Effects to Northern Spotted Owl across its Range" (section 4.1.4.3), the effect of this loss on the survival and the recovery of spotted owls across the species range is minor and insignificant. Even when the impact of the anticipated take is considered within the Action Area, the significance of this impact is reduced substantially by the low occupancy and reproductive rates of many territories anticipated to be lost, and the low likelihood that these activity centers would persist through time via existing regulatory mechanisms. For this reason, the Service concludes that implementation of the FGS HCP is likely to have a measurable impact on occupancy, survival, and reproduction of individual spotted owls within the Action Area. However, as described in the following sections, this impact is insignificant at the scale of regional or provincial populations.

Relative Effects to Northern Spotted Owl Habitat within Action Area

<u>California Klamath Province</u>

Within the California Klamath Province portion of the Action Area there are 339,543 acres of land, of which FGS manages 104,493 acres (31 percent). In addition, 30 percent (103,608 acres) of the total Action Area in this province is managed by other private landowners. Thirty-nine percent (130,895 acres) is administered by Federal agencies, approximately 29,663 acres (23 percent) of which are in federally designated CHUs. Approximately 33 percent of the Klamath

Action Area (112,078 acres) is considered suitable northern spotted owl habitat; 42,045 acres of nesting/roosting and 70,033 acres of foraging habitat. Currently, 38,958 acres of the suitable northern spotted owl habitat (35 percent) is located on the FGS ownership; 8,410 acres of nesting/roosting and 30,548 acres of foraging habitat. Approximately 4,771 acres have been identified by FGS as habitat commitments in CSAs, of which 109 acres are targeted as nesting/roosting, 2,850 acres as high-quality foraging, and 1,812 acres as low-quality foraging habitat. Northern spotted owls will benefit from an additional 5,017 acres that will be protected outside of the CSAs in WLPZs under the Aquatic Species Conservation Program. The majority of suitable habitat outside of the habitat commitments made for CSAs and WLPZs on FGS's lands in this province are likely to be harvested over the term of the ITP, which equates to 34,954 acres. Of these 34,954 acres of suitable habitat planned for harvest, 7,118 acres are currently nesting/roosting and 27,836 acres are foraging habitat.

Implementation of the FGS HCP is anticipated to result in a 17 percent reduction in spotted owl nesting/roosting habitat and 31 percent reduction in foraging habitat from current levels within the California Klamath Action Area. Much of this reduction will occur within the spotted owl activity centers (described in 4.2.1.1, above) where take is anticipated. As described above, the quality of nesting/roosting and foraging habitat on FGS ownership has been degraded due to repeated timber harvest entries, and to a substantial degree does not support reliable occupancy or reproduction by spotted owls; higher-quality habitats are retained in CSAs. Spotted owl habitat on adjacent federally managed lands is much more likely to contain important habitat elements and support spotted owl occupancy. However, in the short term (five to 25 years), the FGS habitat could be used by single territorial owls, dispersing owls, and some pairs. The loss of this habitat is therefore anticipated to have a negative impact on numbers and distribution of spotted owls within the Action Area. The significance of this impact over longer time periods (>25 years) is reduced by the increase in foraging habitat expected to occur across FGS ownership, as modeled by the company's MSP analysis.

<u>California Cascades Province</u>

Within the California Cascades Province portion of the Action Area there are 184,942 acres of land, of which FGS manages 42,967 acres (23 percent). Currently, 21 percent (38,785 acres) of the total Action Area in this province is managed by other private landowners and 56 percent (103,190 acres) is administered by Federal agencies. Approximately 13,054 acres (13 percent) of the Federal lands are in federally designated CHUs for the northern spotted owl. Approximately 16 percent of the Cascades Action Area (30,077 acres) is considered suitable northern spotted owl habitat; 7,349 acres of nesting/roosting and 22,728 acres of foraging habitat. Currently, 4,799 acres of the suitable northern spotted owl habitat (16 percent) is located on the FGS ownership; 619 acres of nesting/roosting and 4,180 acres of foraging habitat. Approximately 2,359 acres have been identified by FGS as habitat commitments in CSAs, of which six acres are targeted as nesting/roosting, 871 acres as high-quality foraging, and 1,482 acres as low-quality foraging habitat. Northern spotted owls will benefit from an additional 631 acres that will be protected outside of the CSAs in WLPZs under the Aquatic Species Conservation Program. The majority of suitable habitat outside of the habitat commitments made for CSAs and WLPZs on FGS's lands in this province are likely to be harvested over the term of the ITP, which equates to 4,605 acres. Of these 4,605 acres of suitable habitat planned

for harvest, 609 acres are currently nesting/roosting and 3,996 acres are foraging habitat.

Implementation of the FGS HCP is anticipated to result in an eight percent reduction in spotted owl nesting/roosting habitat and an 18 percent reduction in foraging habitat from current levels within the California Cascades Action Area. Because spotted owl activity centers are located primarily on federal lands adjacent to FGS ownership, and because home ranges that overlap FGS ownership are managed in CSAs, this degree of habitat loss is not anticipated to have a significant negative impact on survival and recovery of spotted owls within the California Cascades Action Area.

4.1.4.2 Relative Effects to Northern Spotted Owl within Region

Relative Effects to Northern Spotted Owl Population within Region

The Service analyzed the relative impacts of the proposed take of northern spotted owls within a 20-mile buffer surrounding FGS ownership (see section 6.2.1.3 of the FGS HCP). This area, termed the Area of Analysis, is intended to represent the regional population or subpopulation of owls. The Area of Analysis encompasses 3,304,840 acres and represents 35 percent of the 6-million acre California Klamath Province and 46 percent of the 2.5-million acre California Cascades Province. The Service evaluated relative impacts at the regional rather than provincial scale because it provides a more meaningful analysis of potential impacts of FGS's operations that are reasonably expected to affect dispersal and long-term distribution of owls over the 50-year permit term. Additionally, information about northern spotted owl population size and distribution is not available at the larger provincial scale. Even though the number of currently active owl sites is unknown at the regional scale, there is even greater uncertainty with using data at the provincial level.

The Service estimated the baseline population for the California Klamath Province Area of Analysis using a predictive model (probability of occupancy model; Zabel et al. 2003). A detailed description of this process can be found in section 4.9.1.3 of the FGS HCP (2009). Results of the modeling indicated that approximately 186 activity centers (372 owls) may be supported within the California Klamath Province Area of Analysis. The Service was unable to apply the Klamath model to the California Cascades Area of Analysis, so instead used a 2008 query of the CDFG Northern Spotted Owl Database to estimate the potential number of spotted owl activity centers there. There are records for 54 northern spotted owl activity centers (108 owls) within the California Cascades Area of Analysis. The Service estimated that there are 240 activity centers potentially supporting 480 northern spotted owls within the combined Areas of Analysis.

The Service estimates that up to 61 northern spotted owls within the Action Area may be taken as a result of implementation of the FGS HCP. This would represent a 13 percent reduction in the number of individual owls within the regional population (Area of Analysis). Incidental take authorization of the additional 22 owls requested by FGS constitutes, at most, a minor additional impact to the species' survival and recovery at the regional and provincial scales because the Service concluded that the habitat within the home ranges of these owls is of low quality and is unlikely to support owls over the permit term, and FGS has very low potential to affect the

habitat quality in the home range of the additional site.

As described under the Action Area (4.2.1.1, above), the relative impact of this loss on survival and recovery of the species at the regional and provincial levels is substantially reduced by the poor quality and low occupancy rates at many of the spotted owl activity centers that could reasonably be lost or degraded during HCP operations. Because spotted owl population performance is largely driven by survival and reproduction of owls occupying high-quality territories, activity centers on federally managed lands surrounding FGS ownership contribute disproportionately to the regional population. These federal lands constitute about 60 percent of the Area of Analysis and support a large majority of the owls estimated to occur there. Spotted owl activity centers located on FGS lands constitute a very small proportion of the regional population, and due to their low quality contribute little to reproductive output and population stability.

Conservation measures within the FGS HCP act to further mitigate the negative impacts associated with take of owls. The HCP's Terrestrial Species Conservation Program takes into account the wide variation in quality and conservation value among spotted owl activity centers within the Action Area, retaining higher-value activity centers supported by CSAs. The conservation value of the 'take' versus mitigation activity centers has an important influence on the relative impact of the anticipated take at the broader population scales. As part of the HCP development process, the Service identified 24 activity centers within the HCP area that contain or can grow sufficient amounts of suitable habitat to support occupancy by breeding pairs, and are in close proximity to federally designated CHUs. These activity centers were designated mitigation sites to offset the loss of owls associated with the lower quality take activity centers and to provide demographic support to the Federal conservation strategy. Fruit Growers has committed to maintaining habitat within the home ranges of the 24 mitigation sites to support occupancy by reproductive owls throughout the 50-year permit term.

The mitigation sites have some of the highest conservation value because in general they:

- Are in close proximity to a CHU
- Contain high amounts of federal land in the core and home range
- Have consistent occupancy and productivity
- Contain relatively high quality habitat

Conservation values were derived for each activity center in the Action Area using the above four factors (section 6.2.1.3 of the FGS HCP). The 24 mitigation activity centers have some of the highest conservation values; all are generally greater than 40 on a scale of 0 to 111. Seventeen of the mitigation sites have a conservation value greater than 60, 19 have a conservation value greater than 40, and five have a conservation value less than 40. Of the 15 activity centers where take is not likely because of low overlap with FGS's ownership, eight have a relatively high conservation value of greater than 60; the remaining seven activity centers have a conservation value ranging from 0 to 37. All take activity centers have conservation values less than 42, with the majority having values less than 20 (see Figure 6-6 of the FGS HCP). Almost half of the take sites have conservation values less than 10 on a scale of 0 to 111. Therefore, the mitigation sites are those with the highest likelihood of contributing significantly

to the conservation and recovery of the northern spotted owl.

If take of 83 owls were to occur across the landscape, which as discussed above, the Service considers very unlikely, there would be a corresponding reduction of 18 percent of the total conservation value of activity centers in the Action Area because most of the activity centers where incidental take is likely to occur under the HCP provide a minimal contribution to the conservation strategy outlined in the Recovery Plan. The 24 mitigation activity centers and the 15 activity centers in which incidental take is unlikely because of low overlap with FGS's ownership represent 55 percent and 27 percent of the total conservation value of activity centers in the Action Area, respectively, for a combined total of 82 percent.

The vast majority of activity centers within the Area of Analysis are located within high quality habitat on Federal lands, and the FGS ownership contains relatively poor habitat for spotted owls due to repeated timber harvest entries into owl home ranges. At many of the 'take' sites on FGS's lands, the amount and distribution of existing suitable habitat is not sufficient to support owls currently or in the long-term due to the lack of high quality habitat that is essential for nesting and roosting. The take sites that do not contain adequate amounts of suitable habitat, particularly nesting/roosting sites, provide little contribution to the overall population in the region because they are not likely to support owls, especially once they are determined to be unoccupied or abandoned. For these reasons, and because the activity centers most likely to contribute to spotted owl occupancy, survival and reproduction within the Action Area receive protection with CSAs, the relative impact resulting from implementation of the FGS HCP is expected to have a measurable but small negative impact on the survival and recovery of northern spotted owls within the Area of Analysis. Because the Klamath and Cascades provinces encompass much larger areas and owl populations, potential effects would be even less.

Relative Effects to Northern Spotted Owl Habitat within Region

<u>California Klamath Province</u>

The majority of the FGS HCP is located within the Klamath Province, a large expanse of federally administered land managed under the NWFP. Within the Klamath Province, there are approximately 3 million acres of high-quality (nesting/roosting) spotted owl habitat, 2.5 million acres of which are Federal. Approximately half of the acres on Federal lands are within Federal Reserves such as Wilderness and Late-successional Reserves (Davis, in press).

Within the California Klamath Province portion of the Area of Analysis (the FGS ownership plus an approximate 20-mile radius area around the ownership) there are 2,157,945 acres of land, of which FGS manages 109,370 acres (5 percent). Currently, 35 percent (748,477 acres) of the total Area of Analysis in this province is managed by other private landowners and 60 percent (1,292,400 acres) is administered by Federal agencies. Approximately 291,000 acres (22 percent) of the Federal lands are in federally designated CHUs for the northern spotted owl. Approximately 27 percent of the Area of Analysis (572,460 acres) in this province is considered suitable northern spotted owl habitat; 286,335 acres of nesting/roosting and 286,125 acres of foraging habitat. Currently, 40,443 acres of the suitable northern spotted owl habitat (7 percent)

is located on the FGS ownership; 9,413 acres of nesting/roosting and 31,030 acres of foraging habitat. Of the 40,443 acres of suitable habitat, 38,958 acres are covered under the HCP; the remaining 1,485 acres are located in Oregon and are not included in the HCP. Of those lands covered under the HCP, there are a total of 8,410 acres of nesting/roosting and 30,548 acres of foraging habitat that could potentially be affected by FGS's Covered Activities.

Approximately three percent of the total nesting/roosting habitat and 11 percent of the total foraging habitat available within the Klamath Area of Analysis may potentially be affected by implementation of the FGS HCP. However, accounting for FGS habitat commitments within CSAs and WLPZs, the percentage of suitable habitat potentially affected would also be three percent for nesting/roosting habitat, but less (eight percent) for foraging habitat. As described under 4.2.1.2, above, the quality of nesting/roosting and foraging habitat on FGS ownership has been degraded due to repeated timber harvest entries, and to a substantial degree does not support reliable occupancy or reproduction by spotted owls; higher-quality habitats are retained in CSAs. Spotted owl habitat on adjacent federally managed lands is much more likely to contain important habitat elements and support spotted owl occupancy. Relative to the quantity and quality of spotted owl habitat on adjacent federally managed lands and protected within CSAs, habitat expected to be removed or downgraded on FGS lands contributes little to spotted owl survival and reproduction. The significance of this habitat loss over longer time periods (>25 years) is further reduced by the increase in foraging habitat expected to occur across FGS's ownership, as modeled by the company's MSP analysis. In addition, forest stands that are considered unsuitable or dispersal habitat, and nesting/roosting and foraging habitat that is not removed but downgraded or degraded by FGS's Covered Activities, will be allowed to grow and mature across the ownership in the Klamath Area of Analysis over the term of the ITP, thereby offsetting some of the initial approximately 17,588 acres of habitat removed during the first decade of the HCP.

Because the large majority of high-quality spotted owl habitat, particularly habitat within spotted owl sites likely to be occupied, occurs on federally managed lands within the Area of Analysis, the Service concludes that the small proportions of lower-quality nesting/roosting and foraging habitat (3 percent and 11 percent, respectively) likely to be affected by implementation of the FGS HCP does not constitute a significant effect to survival and recovery of spotted owls within the regional population.

<u>California Cascades Province</u>

Within the California Cascades Province portion of the Area of Analysis there are 1,146,898 acres of land, of which FGS manages 42,967 acres (4 percent). Currently, 47 percent (540,116 acres) of the total Area of Analysis in this province is managed by other private landowners and 49 percent (563,185 acres) is administered by Federal agencies. Approximately 85,948 acres (15 percent) of the Federal lands are in federally designated CHUs for the northern spotted owl. Approximately 15 percent of the Area of Analysis (168,623 acres) in this province is considered suitable northern spotted owl habitat; 50,309 acres of nesting/roosting and 118,314 acres of foraging habitat. Currently, 4,799 acres of the suitable northern spotted owl habitat (3 percent) is located on the FGS ownership; 619 acres of nesting/roosting and 4,180 acres of foraging habitat.

The total potentially affected suitable habitat accounts for one percent of the total nesting/roosting habitat and four percent of the total foraging habitat available within the Cascades Area of Analysis. However, accounting for FGS habitat commitments within CSAs and WLPZs, the percentage of suitable habitat potentially affected would also be one percent for nesting/roosting habitat, but less (one percent) for foraging habitat. As described under 4.2.1.2, above, the quality of nesting/roosting and foraging habitat on FGS ownership has been degraded due to repeated timber harvest entries, and to a substantial degree does not support reliable occupancy or reproduction by spotted owls; higher-quality habitats are retained in CSAs. Spotted owl habitat on adjacent federally managed lands is much more likely to contain important habitat elements and support spotted owl occupancy. Relative to the quantity and quality of spotted owl habitat on adjacent federally managed lands and protected within CSAs, the habitat expected to be removed or downgraded on FGS lands contributes little to spotted owl survival and reproduction. The Service concludes that the loss of small amounts of spotted owl habitat expected to result from implementation of the FGS HCP will have an insignificant effect on survival and recovery of the species in the California Cascades Area of Analysis.

4.1.4.3 Relative Effects to Northern Spotted Owl across its Range

The range of the northern spotted owl encompasses roughly 50 million acres distributed across three states and several physiographic provinces. Rangewide population estimates are unavailable, but recent population modeling suggested that roughly 5,000 to 6,000 owl sites may currently exist (USDI FWS 2011b). Against this backdrop, the significance of the estimated potential take of 61 owls and modification of 39,000 acres of low-quality habitat resulting from issuance of an ITP to FGS is considered not significant. However, additional population factors such as demographic trends and isolated populations or genetic units are evaluated below to determine whether the estimated take may have a disproportionate effect on the species.

Estimates from demographic studies suggest the rangewide population declined by three percent per year from 1985 to 2006. The most precipitous declines in northern spotted owl populations have occurred 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 21 year study period (Forsman et al. 2011). Northern 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 five to 15 percent. Two of the three demographic study areas (DSAs) closest to the HCP area support stationary populations (Klamath and South Cascades DSAs) and one (Northwestern California) is marginally declining (Forsman et al. 2011).

Genetic analyses have confirmed genetic mixing between the northern and California spotted owls, especially in the eastern Klamath region. Most gene flow is directional from the California spotted owl northward into the historical range of the northern spotted owl in the Klamath region of northern California and southern Oregon (Barrowclough et al. 1999; Haig et al. 2001, 2004). Mitochondrial DNA sequence analysis by Haig et al. (2004) of 213 owls demonstrated California spotted owl gene flow into the traditional geographic range of the northern spotted owl (15 or 11.5% of 131 owls). When the analysis was limited to the Klamath region, this value went up to 12 or 20.3% of 59 birds, suggesting most of the genetic overlap is in the area surrounding the

zone of contact between the two subspecies.

The FGS HCP area is located within a region which supports a fairly large, well-distributed, and genetically robust population of northern spotted owls. Demographic monitoring within the Klamath and southern Cascades regions indicates that spotted owl populations are stable or slightly decreasing. This information suggests that the estimated potential loss of 61 owls over a 50 year period will not occur within a small, isolated population area, or contribute significantly to genetic isolation or population vulnerability within a significant portion of the species' range.

As described in section 4.1.4.1, FGS has requested incidental take authorization for 22 owls in addition to the 61 owls of which FWS expects take to reasonably occur over the permit term. The Service has determined that habitat within the home ranges of 20 of these owls is unlikely to support occupancy by spotted owls. This determination is based on extremely low amounts of suitable habitat due to repeated timber harvest entries and wildfire within the home ranges of these owls, as well as several consecutive years of protocol surveys with no owl detections. At one additional site (SK310), only three percent of suitable habitat occurs on FGS ownership. Due to the fact that the habitat within the home ranges of 20 of these owls is of low quality and is unlikely to support owls over the permit term, and FGS has very low potential to reduce the habitat quality in the home range of SK310, the Service concludes that the take authorization of the additional 22 owls constitutes at most a minor, discountable impact to the species' survival and recovery across its range. Habitat loss expected to occur within the home ranges of the 22 owls has already been included in the habitat sections of this BO.

In 1994, it was estimated that there was 7,400,000 acres of suitable nesting/roosting habitat on NWFP lands within the range of the northern spotted owl. There is no range-wide estimate on the amount of suitable nesting/roosting habitat on non-NWFP lands. Additionally, there are no range-wide estimates for suitable foraging habitat on NWFP lands or non-NWFP lands since foraging habitat characteristics vary widely across the range of the northern spotted owl. The Service has tracked nesting/roosting habitat removed or downgraded since the northern spotted owl was listed through the Section 7 process and technical assistance documents. As of March 30, 2011, the Service has documented the removal or downgrading of 188,971 acres of nesting/roosting habitat as a result of management activities on NWFP lands. Additionally, the Service has documented the removal or downgrading of 472,772 acres of nesting/roosting habitat associated with Tribal lands, HCPs/SHAs, other Federal, State, county, and private lands. The Service also tracks the amount of nesting/roosting habitat removed or downgraded as a result of natural disturbances (e.g., wildfire, insect infestations, windthrow). The Service has documented the removal or downgrading of 207,262 acres of nesting/roosting habitat on NWFP lands, although this figure does not take into account the habitat lost due to the 2008 wildfires that occurred in northern California. Those figures are still being calculated through the emergency consultation process and technical assistance. The Service recognizes the need to develop a new range-wide habitat baseline for the northern spotted owl. The current (1994) habitat baseline that is being used to track changes to available suitable habitat through management actions and natural events does not take into account habitat that has developed since the baseline was established. That is to say, the Service does not know the amount of non-habitat, dispersal habitat or foraging habitat that has grown into suitable dispersal, foraging or nesting/roosting habitat since the 1994 baseline was established.

As a result of issuing an ITP to FGS, the HCP would result in the potential modification of 7,727 acres of suitable nesting/roosting habitat and 31,832 acres of foraging habitat through harvest operations. Of this, approximately 49% or 19,340 acres (4,159 acres nesting/roosting and 15,182 acres foraging habitat) are scheduled for regeneration harvests over the term of the ITP. Regeneration harvests result in plantations, which may provide dispersal and potentially foraging habitat at various stages of their rotation during the permit term, but are not expected to become nesting/roosting habitat because of the even-aged structure and density. The modification of approximately 39,559 acres of low-quality habitat is considered minor with respect to the available suitable habitat range-wide for the northern spotted owl. This relative impact is substantially reduced by 1) the generally low quality of habitat within the FGS HCP area as a result of repeated timber harvest entries and subsequent low rates of occupancy by spotted owls, and 2) predicted increases in foraging habitat across FGS's ownership, as modeled by the company's MSP analysis. Based on this analysis, the Service concludes that the loss of spotted owl habitat expected to occur with implementation of the FGS HCP will not significantly impact the species' survival and recovery across its range.

4.1.4.4 Consistency with Objectives of Northern Spotted Owl Recovery Plan

The Revised Recovery Plan for the Northern Spotted Owl (USDI FWS 2011b; RRP) acknowledges the important role that State, private, and Tribal lands can play toward recovering the northern spotted owl. Contributions from non-Federal lands are recognized as important to the range-wide goal of achieving conservation and recovery of the spotted owl. While the RRP recommends retention of all occupied sites and unoccupied, high quality northern spotted owl habitat on all lands to the greatest extent feasible, the Service recognized that this goal will be especially difficult to meet on non-Federal lands.

Recovery Action 14 in the RRP states: *Encourage applicants to develop Habitat Conservation Plans/Safe Harbor Agreements that are consistent with the recovery objectives.* Habitat Conservation Plans (HCPs) and Safe Harbor Agreements (SHAs) are important tools that non-Federal landowners can voluntarily use to assist in the recovery of the spotted owl. Although HCPs authorize take of listed species, the conservation measures developed to mitigate the impact of the taking must be consistent with the recovery plan objectives. Although HCPs do not require recovery standards, voluntary Recovery Actions included in an HCP can promote recovery. The Service estimates that 71 activity centers may currently be occupied within the FGS HCP Action Area; the Service has determined that take is unlikely at 40 sites because 1) FGS identified 24 activity centers where CSAs will be established to provide demographic support to the recovery of northern spotted owl under the HCP, and 2) the home ranges of 16 activity centers have low overlap with FGS's ownership or remaining suitable habitat on FGS's ownership.

The RRP suggests that spotted owl recovery will require conservation of occupied and high quality owl habitat to ameliorate impacts from barred owls and buffer potential declines in habitat due to climate change. This strategy is described in Recovery Action 10 – *Conserve spotted owl sites and high value habitat to provide additional demographic support to the spotted owl population.* This recovery action focuses on retention of high quality habitat and

long-term occupancy and reproduction at spotted owl sites in order to bolster demographic rates in the larger landscape. Because the CSAs in the FGS HCP are intended to support higher-quality spotted owl activity centers that are associated with existing conservation reserve networks (Critical Habitat Units), and because the majority of activity centers where take is likely to occur exhibit low occupancy rates and poor overall habitat quality, the HCP is generally consistent with this objective.

Recovery Acton 32 is intended to reduce negative impacts of barred owls and other stressors on spotted owls by maintaining and restoring high-quality habitat that can serve as refugia where such habitat is limited. High-quality habitat is described as stands with large-diameter trees, high canopy cover, and decadence components such as broken-topped live trees, mistletoe, cavities, large snags, and fallen trees. Because of the long history of intensive timber management on FGS lands, stands meeting this description are limited to a few spotted owl nest stands and patches of riparian habitat. Some of the existing RA32 habitat will be conserved with CSAs; whereas an unknown quantity will be harvested at the spotted owl activity centers where take is authorized. Stands meeting the RA 32 definition of habitat must be identified in the field on a case by case basis and are not mapped at a broad-scale resolution. Because RA32 stands have not been identified on FGS lands, the degree to which effective RA32 habitat may be removed by implementation of the FGS HCP is unknown.

In the RRP, the Service recognizes the threat posed by the barred owl to spotted owl recovery, and proposes nine Recovery Actions focused on better understanding and ameliorating this threat. The objectives of Recovery Action 30 – *Manage to reduce the negative effects of barred owls on spotted owls so that Recovery Criterion 1 can be met* and Recovery Action 31 – *Develop mechanisms for landowners and land managers to support barred owl management using a collaborative process* – are both addressed in the FGS HCP. In the HCP, the Company is required to survey for barred owls, report detections of barred owls to the Service, and facilitate removal of barred owls from FGS lands if and when a Migratory Bird Treaty Act Permit is obtained.

Although the bulk of conservation and recovery activities described in the RRP are focused on Federal lands, the above-listed Recovery Actions pertain to management of private timberlands and are to varying degrees incorporated into the FGS HCP. The FGS HCP does not detract from the broader objectives of the RRP; it does not result in significant losses of high-quality spotted owl sites with consistent occupancy and reproduction or high-quality habitat, it contains provisions that facilitate conservation of existing higher-quality spotted owl sites associated with Critical Habitat, and it facilitates the potential control of barred owls. The Service therefore concludes that the FGS HCP is consistent with the above-described provisions of the RRP and with recovery of the northern spotted owl.

4.2 Fisher

4.2.1 Biological Requirements of the Fisher

Section 2.2.2 describes the fisher's life history, including its home range sizes, habitat associations, food habits, and dispersal distances (also see Powell 1993, Powell and Zielinski

1994, and Lofroth et al. 2010). Relationships between these factors and the individual fitness or population performance of fishers have not been rigorously established. Nonetheless, the large body of literature concerning fishers suggests that they have the following biological requirements:

1. Home range and density estimates vary substantially among studies and geographic areas but fishers generally have large spatial requirements (100s to 10,000s of acres each).

2. Although they are capable of moving long distances, fishers appear to have limited dispersal abilities and thus, require habitat that is well connected at landscape scales.

3. Fisher home ranges often consist of a mosaic of vegetation types and structural stages but typically contain a large component of mid- to late-successional forest. Thus, suitable landscapes for fishers likewise contain a large component of mid- to late-successional forest.

4. Fishers require a well-distributed network of suitable denning and resting sites within their home ranges. Fishers favor relatively dense, old, decadent forest conditions for denning and resting. Suitable denning and resting sites often include dense, multi-layered canopies, large-diameter trees, snags, and logs, or defective trees (e.g., with cavities or mistletoe brooms). Oaks and other hardwoods are often favored for denning or resting when available.

5. Fishers use a wider variety of conditions when active than when denning or resting but still generally favor areas with relatively complex structure, dense canopy cover, large trees, snags, and logs, and a component of hardwoods.

6. Fishers are associated with several abiotic habitat features. Perhaps most important among these are lower to middle elevations at which relatively dense conifer or conifer-hardwood forests and low to moderate snowfall occur, and riparian areas, where denser forest and prey may be concentrated.

7. Fishers have broad diets that include prey with a wide variety of habitat associations. Nonetheless, many of their primary prey species are associated with structures and resources that are also favored by fishers, such as multi-layered canopies, hardwoods, and large-diameter trees, snags, and logs.

4.2.2 Potential Effects of Habitat Modification

Given that the habitat associations of fishers and northern spotted owls overlap substantially, many of the effects of the Covered Activities on northern spotted owls as described above in section 4.1 are also likely to impact fishers. Forest management is the primary activity in the Plan Area and will be conducted in a variety of ways and settings and could, therefore, have a variety of short- and long-term effects on fishers. For example, depending on the setting and prescription, forest thinning could remove structures important to fishers and their prey or could result in their accelerated development or prevent their loss to severe natural disturbances.

Timber harvest practices that clearly degrade habitat for fishers or their prey (e.g., by excessively reducing canopy cover, structural complexity, large or deformed trees, or dead woody materials) have the most obvious potential to negatively affect the species. Fishers could also be accidentally killed or injured if they are struck by vehicles associated with management operations or if their den or rest trees are felled while in use. Covered Activities other than timber harvesting include harvesting minor forest products, fire prevention, and watershed management. These activities could result in varying levels of habitat modification and disturbance for fishers.

4.2.3 Habitat Model

The Service modified the Zielinski et al. (2010) model by using FGS forest inventory data in place of the original model's vegetation data for FGS lands (section 3.3.1.1; also see "Fisher Spatial Analysis" in Appendix E of the HCP) to quantify changes to both the total amount of modeled habitat suitable for fishers and the amount of modeled habitat in large (female home range-size) blocks (7.7 mile^2) in the Klamath Province. The Service selected modeled values greater than or equal to 0.41 as a threshold to represent preferred habitat (hereafter 'suitable habitat') using the FGS fisher model. To quantify changes to modeled habitat suitability under the Proposed Action, the Service compared the current predicted amount of suitable habitat to amounts at five subsequent 10-year time steps. Analysis of changes to female home range-size blocks of suitable habitat provided a spatially explicit means of analyzing habitat changes over this period. This approach does not provide an absolute estimate of the size of the area's fisher population but, rather, serves as a reasonable index for changes to the number of female fishers that the area can support over time under the Proposed Action.

Appendix E of the HCP describes some limitations to the application and interpretation of the FGS fisher model. First, the Service only applied the model to the California Klamath Province. The Zielinski et al. (2010) model was developed specifically for fishers in the Klamath Province and thus, might not have accurately predicted habitat suitability in the California Cascades Province. Furthermore, few fisher detection locations were available for testing the model's validity in the California Cascades Province. Second, the FGS inventory data used to build the modified model were spatially coarse compared with those used for non-FGS ownerships (EVEG: USDA FS 2011). It is unknown whether or how this difference in vegetation data influenced the modeling results. Third, the resolution of the habitat suitability model, regardless of the vegetation data used, is too coarse to detect changes to the availability of important fine-scale habitat elements (e.g., structures and sites suitable for denning and resting).

Despite its limitations, the modeling effort used the best available science to describe fisher habitat in the Klamath Province. This model represents the most current description of fisher habitat in the Klamath Action Area and provides the best estimate of potential changes to habitat under the Proposed Action.

4.2.4 Summary of Effects to Fisher in the Action Area

The Action Area occurs in two ecological provinces: the California Klamath Province and the California Cascades Province. The Service is providing separate effects analyses for these

provinces because they are distinct in terms of their ecology, the availability and quality of information for fishers, and the apparent abundances of fishers and their habitat. The Action Area encompasses the local fisher population on FGS ownership that could be directly affected by FGS's operations (FGS ownership with a 1.6-mile buffer).

Effects to Fisher in Klamath Action Area

Table 20 describes changes to the predicted amount of suitable fisher habitat in the California Klamath Province portion of the Action Area (both total and in large blocks), as well as the number of hypothetical female home ranges. The amount of suitable habitat was projected to increase by nearly 17% with large a block increase of 21% during the 50-year permit term. Projected increases in large blocks of suitable habitat and the number of hypothetical female home ranges suggest that the Proposed Action will lead to a slight increase in the number of fishers that the Klamath Action Area can support. Fishers would also benefit from the increases in habitat from the northern spotted owl and aquatic conservation measures, and increases in habitat over the ownership with the expected reduction of even-aged management practices. However, at a finer scale, timber harvest activities at northern spotted owl take sites are expected to reduce habitat suitability, forest complexity, and the availability of structures that are essential to fishers for resting and denning at these locations. Overall, the adverse and beneficial effects of the FGS HCP on fisher are expected to be less than significant.

Table 20. Changes to the amount of suitable fisher habitat (total and in blocks of at least 7.7 mile^2) and the number of hypothetical female home ranges in the Klamath Action Area under the Proposed Action.

	Total		**Large Blocks**		**Hypothetical Female**
Time Step	**Acres**	**% Change**	**Acres**	**% Change**	**Home Ranges**
Current	137,163	–	126,036	–	25.5
Decade 1	141,205	2.95%	126,468	0.34%	25.6
Decade 2	157,751	11.72%	144,032	13.89%	29.1
Decade 3	160,143	1.52%	150,798	4.70%	30.5
Decade 4	166,832	4.18%	152,545	1.16%	30.9
Decade 5	160,113	-4.03%	152,251	-0.19%	30.8

Effects to Fisher in Cascades Action Area

The Service was unable to model changes in habitat suitability for fishers in the California Cascades Province. However, given that the habitat associations of fishers and northern spotted owls overlap substantially, many of the effects of the Covered Activities on northern spotted owls (see section 4.1) are also likely to impact fishers. It is important to acknowledge, however, that protections of northern spotted owls provided by the CFPRs do not apply to fishers. Fishers may incidentally benefit from spatial or temporal restrictions on activities near northern spotted owl nests but some areas important to fishers may be unprotected.

5.0 CUMULATIVE EFFECTS

Cumulative effects are those effects of future State, tribal, and private actions that are reasonably certain to occur within the Action Area. Future Federal actions will be subject to the consultation requirements established in section 7 of the ESA and, therefore, are not considered cumulative to the Proposed Action.

Approximately 152,178 acres within the Action Area is owned by FGS. The effects of the proposed Covered Activities on northern spotted owl and fisher are evaluated elsewhere in this BO and therefore are not included in this section.

In 1990, CFPRs, which govern timber harvest on private lands, were amended to require surveys for northern spotted owls in suitable habitat and to provide protection around activity centers (CALFIRE 2001). Under the CFPRs, 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, for example, under an HCP or Safe Harbor Agreement. The CFPRs do not contain specific provisions for fishers other than including intent language about reducing significant impacts to non-listed species and maintaining functional wildlife habitat. However, this language is not associated with specific enforceable measures. Fishers may incidentally benefit from the CFPRs' spatial and temporal restrictions on activities near northern spotted owl nests; however, some areas important to fishers may be unprotected.

Other private lands account for 142,393 acres within the Action Area. Of these lands, 116,745 acres are currently unsuitable northern spotted owl habitat; suitable habitat includes 8,192 acres of nesting/roosting habitat and 17,456 acres of foraging habitat. These adjoining other private lands are typically managed for commercial timber harvest, or are agricultural lands with rural residential use. The majority of agricultural lands are not suitable northern spotted owl or fisher habitat due to their location on the landscape (i.e., meadows, valleys, grasslands); therefore, they will not provide northern spotted owl or fisher habitat even in the absence of agricultural practices. Commercial timberlands in the Action Area have been actively managed since the early 1900s, and it can be expected that commercial timber harvest on other private lands will continue in the future.

The Service anticipates that FGS's Covered Activities will remove habitat to the extent that incidental take of up to 83 owls is likely over the 50-year permit term. The take prohibition of the CFPRs will still apply to other private landowners who want to harvest suitable habitat within the home ranges of these take sites. Before harvest of additional habitat can occur, other private landowners will be required to survey for owls at these sites. However, the Service has found that the effects of repeated entries within northern spotted owl home ranges reduces habitat quality and leads to reduced occupancy rates and apparent site abandonment. If the Service issues a letter of non-occupancy after making the determination that the activity center is no longer occupied (i.e., abandoned) and doesn't contain sufficient amounts of habitat to support owls, suitable habitat on other private lands within the home ranges of owl sites may be harvested, further reducing suitable owl and fisher habitat available within the Action Area. Because we have no information that actions on private lands will occur during the 50-year term of the permit and we have no information that the rate of non-occupancy will change, we assume

that at least the present rate of apparent northern spotted owl site abandonment will continue for the 50-year term of the permit. Likewise we have no information that any other activities likely to affect fishers are reasonably certain to occur in the Action Area.

State Lands account for 686 acres within the Action Area; 644 acres which are currently unsuitable and 42 acres of foraging owl habitat. It is not anticipated that suitable owl or fisher habitat on State lands would change considerably over the term of the ITP. There are no tribal lands within the Action Area.

The Service does not have information to support analysis of the effects of specific actions that are expected to occur on state and private lands within the Action Area; however, activities reasonably certain to occur include the continued harvesting of some proportion of forest habitat suitable for fisher and northern spotted owl. After nearly a century of intensive timber management, the current condition of these forests does not contribute substantially to the survival and recovery of these species, and activity centers on private lands in the Action Area generally exhibit low occupancy rates. For these reasons, the Service concludes that the loss of habitat expected to occur with implementation of FGS HCP, in combination with activities reasonably certain to occur on other private and State lands within the Action Area, will not have a significant negative cumulative effect on the survival and recovery of the northern spotted owl or be likely to jeopardize the continued existence of the West Coast DPS of fishers.

6.0 CONCLUSION

Under Section 7(a)(2) of the ESA, Federal agencies must ensure that actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of critical habitat. Regulations implementing this Section of the ESA define "jeopardize the continued existence of" as: "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (FR §402.02).

6.1 Northern Spotted Owl

After reviewing the current status of the northern spotted owl, the environmental baseline, the effects of the Proposed Action, and the cumulative effects, it is the Service's biological opinion that implementation of the FGS HCP discussed herein is not likely to jeopardize the continued existence of the northern spotted owl or impede its recovery, and will not destroy or adversely modify designated critical habitat. The bases for this determination are as follows.

Relative Impacts to Populations

Action Area:

- Although the Service analyzed the potential impact of incidental take of up to 61 northern spotted owls within the Action Area as a result of implementation of the FGS HCP over the 50-year permit term, actual take is likely to be lower because historic activity centers

may not be currently occupied or occupied by owl pairs. Thus the Service concludes the level of take and impact of that take is likely to be substantially lower due to the low occupancy and reproductive rates of many of the territories.

- Authorization of incidental take under the FGS HCP of an additional 22 northern spotted owls, for a total of 83 owls, as requested by FGS, constitutes at most a minor additional impact at the Action Area scale because the Service has determined that habitat within the home ranges of 20 of these owls is of low quality and not likely to support owls now or perhaps in the future, and FGS has very low potential to reduce the habitat quality in the home range of SK310.
- The Service concluded that population growth beyond the owl population baseline within the Klamath Action Area is unlikely over the permit term based on an evaluation of current conditions and habitat suitability modeled (Zabel et al. 2003) by decade.

Regional scale:

- Incidental take of up to 61 northern spotted owls represents a 13 percent reduction in the number of individual owls within the regional population, as defined by a 20-mile buffer surrounding FGS ownership (Area of Analysis). Spotted owl activity centers located on FGS lands constitute a very small proportion of the regional population and, due to their low quality, contribute little to reproductive output and population stability. In contrast, federal lands constitute about 60 percent of the Area of Analysis and support the majority of high-quality territories that contribute disproportionately to the local population. Therefore, the relative impact resulting from implementation of the FGS HCP is expected to have a measurable but small negative impact on the regional population. However, the potential adverse effects will not impede the survival and recovery of the northern spotted owl, and the establishment of CSAs on FGS's ownership to support existing higher-quality spotted owl sites associated with CHUs is consistent with the Revised Recovery Plan's strategy to conserve occupied and high quality owl habitat.

Provincial scale:

- The FGS HCP area is located within two physiographic provinces that support a fairly large, well-distributed, and genetically robust population of northern spotted owls. The estimated take of owls will not occur within a small, isolated population area, or contribute significantly to genetic isolation.

Rangewide:

- Given that recent population modeling suggests that roughly 5,000 to 6,000 owl sites may currently exist (USDI FWS 2011b) across the species range, the estimated incidental take of up to 61 owls resulting from issuance of an ITP to FGS is not likely to jeopardize the continued existence or impede recovery of the northern spotted owl across its range because it represents a less than one percent reduction in activity centers range-wide. Additionally, the majority of activity centers where take is likely to occur do not substantially contribute to the Federal conservation strategy outlined in the Revised Recovery Plan because the sites exhibit low occupancy rates, poor overall habitat quality, and/or are not in close proximity to the Federal conservation reserve network. In contrast, most of the activity centers designated as mitigation sites contribute

disproportionately to overall population stability and recovery because they are more likely to support long-term occupancy and reproductive success by owl pairs, in accordance with the Revised Recovery Plan.

Relative Impact of Habitat Modification

- Implementation of the FGS HCP is anticipated to result in a 17 percent reduction in spotted owl nesting/roosting habitat and 31 percent reduction in foraging habitat from current levels within the California Klamath portion of the Action Area, and an eight percent reduction in spotted owl nesting/roosting habitat and an 18 percent reduction in foraging habitat from current levels within the California Cascades portion of the Action Area. The degree of this impact over longer time periods (>25 years) is reduced by the increase in foraging habitat expected to occur across FGS ownership, as modeled by the company's MSP analysis.
- Approximately three percent of the total nesting/roosting habitat and 11 percent of the total foraging habitat available within the Klamath portion of the Area of Analysis, and one percent of the total nesting/roosting habitat and four percent of the total foraging habitat available within the Cascades portion of the Area of Analysis may potentially be affected by implementation of the FGS HCP. Relative to the quantity and quality of spotted owl habitat on adjacent federally managed lands and protected within CSAs, habitat expected to be removed or downgraded on FGS lands contributes little in terms of quantity or quality to spotted owl survival and reproduction. The significance of this habitat loss over longer time periods (>25 years) is further reduced by the increase in foraging habitat expected to occur across FGS's ownership, as modeled by the company's MSP analysis.
- Given that the range of the northern spotted owl encompasses roughly 50 million acres distributed across three states and several physiographic provinces, the Service considers the estimated modification of 39,000 acres of lower quality habitat resulting from issuance of an ITP to FGS to be insignificant. The relative impact is substantially reduced by the generally low quality of habitat within the FGS HCP area as a result of repeated timber harvest entries and subsequent low rates of occupancy by spotted owls, and predicted increases in foraging habitat across FGS's ownership over the permit term, as modeled by the company's MSP analysis.

Conservation Planning and Mitigation

- If take of 83 owls were to occur across the landscape, there would be a corresponding reduction of 18 percent of the total conservation value of activity centers in the Action Area. Most of the activity centers where incidental take is likely to occur under the HCP provide a minimal contribution to the recovery of northern spotted owls under the federal conservation strategy outlined in the Revised Recovery Plan (USDI FWS 2011b). The 24 mitigation activity centers and the 15 activity centers in which incidental take is unlikely because of low overlap with FGS's ownership represent 55 percent and 27 percent of the total conservation value of activity centers in the Action Area, respectively, for a combined total of 82 percent.

- Existing regulatory mechanisms will be unlikely to conserve activity centers that are strongly influenced by FGS ownership, which acts to further reduce the relative impact of the estimated taking because under the current CFPRs, if an activity center is determined to be unoccupied or abandoned, all habitat within the home range can be removed without compensatory mitigation. For this reason, the HCP would provide more certainty that habitat would be conserved thru time than would existing regulatory mechanisms because habitat within CSAs would be maintained throughout the 50-year permit term, regardless of occupancy.
- The FGS HCP is consistent with the provisions of the Revised Recovery Plan (USDI FWS 2011b) because it does not result in significant losses of high-quality spotted owl sites with consistent occupancy and reproduction or high-quality habitat, it contains provisions that facilitate conservation of existing higher-quality spotted owl sites associated with Critical Habitat, and it facilitates the potential control of barred owls.

Impacts to Northern Spotted Owl Critical Habitat

- Critical habitat for the northern spotted owl has been designated on federal lands only; no direct destruction or adverse modification of critical habitat is anticipated due to implementation of the FGS HCP because modification of habitat will occur solely on FGS's private ownership.
- The Service considered whether implementation of the FGS HCP would indirectly affect critical habitat by creating fragmentation and 'edge effects' along the boundaries of FGS lands and adjacent critical habitat, potentially reducing the quality of critical habitat along those edges. Because of the long history of intensive timber management on FGS lands, there currently is a high degree of contrast between forest conditions on FGS's ownership and adjacent critical habitat on Federal lands. While Covered Activities may increase edge contrast in some limited areas, overall the Service anticipates that implementation of the FGS HCP will reduce this contrast during the 50-year permit term as stands develop as forecasted in the MSP modeling. In addition, the diversity of naturally occurring and anthropogenic habitat types in the project area, combined with the association of spotted owls with edge habitat in the Klamath Province (USDI FWS 2011b) suggest that any changes in edge characteristics will not have a significant negative effect on critical habitat. Therefore, the Service does not expect any indirect effects to critical habitat to result from implementation of the FGS HCP.

6.2 Fisher

After reviewing the current status of the fisher, the environmental baseline for the Action Area, the effects of implementing the proposed action and the cumulative effects, it is the Service's conference opinion that the FGS HCP, as proposed, is not likely to jeopardize the continued existence of the fisher within the West Coast DPS. No critical habitat has been designated for this species; therefore, none will be destroyed or adversely modified. The Service reached the non-jeopardy conclusion based on the following factors:

- Where modeled, the amount of suitable fisher habitat was estimated to increase during the 50-year permit term. Although the resolution of the fisher habitat suitability model was too coarse to detect changes to the availability of important fine-scale habitat elements (e.g., structures and sites suitable for denning and resting) and portions of FGS's lands associated with owl takes sites will likely be downgraded, the modeling results suggest an increasing trend in the amount of suitable fisher habitat at the landscape scale.
- The fisher habitat model also projected a slight increase in the number of fishers that the area can support.

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 further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the ESA provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement. Sections 7(b)(4) and 7(o)(2) of the ESA do not apply to listed plant species.

Amount or Extent of Take

Loss and fragmentation of habitat, together with the legacy of past harvesting on this landscape, may result in reduced resources such as prey and cover, increased predation, and exacerbate competition with barred owls and other spotted owls and therefore reduce the ability of spotted owls to survive and reproduce successfully within the Action Area. Given that many of the activity centers in the Action Area currently have less habitat than what is currently understood to be the minimum required to avoid take, the Service has determined that issuance of an ITP will create a likelihood of injury to owls by harming them to such an extent as to significantly disrupt their normal behavioral patterns such as breeding, feeding, or sheltering. The Service does not anticipate that incidental take of northern spotted owl in the form of harassment will occur because protocol surveys and restrictions on operations during the breeding season should act to avoid or adequately minimize disturbance to owls at occupied sites.

Based on review of survey records, habitat suitability models, habitat mapping, and evaluation of potential impacts of FGS activities on existing suitable habitat, the Service anticipates take, in the form of harm, of up to 61 northern spotted owls within the Action Area to occur over the course of the 50-year permit term as a result of FGS's Covered Activities (Table 16). Under the

proposed ITP, the Service would authorize take of an additional 22 northern spotted owls for a total of 83 individual owls. However, the Service's evaluation (see section 3.2.2) indicates that take of this additional 22 owls is unlikely because negative survey results and/or lack of sufficient amounts of suitable habitat suggest the owls are not likely to occupy the Action Area now or throughout the permit term. The authorization of take of these 22 owls, *in addition to* the 61 owls deemed likely to be taken, reflects the total number of historic activity centers within the Action Area that could be adversely affected by timber harvest and other Covered Activities during the permit term, including activity centers that have little possibility of occupancy during the permit term due to deficient habitat conditions. However, because it is possible that owls might occupy these areas over the permit term, and because the proposed habitat conservation plan includes conservation measures to minimize and mitigate take of up to 83 owls, based on the number of historical activity centers, we have conservatively authorized take of up to 83 owls over the life of the permit. Estimating take based on impacts to historical activity centers also accounts for potential displacement of owls by Covered Activities and subsequent movement to alternate activity centers within the Action Area during the permit term.

The Service based its estimation of take on an analysis of historic activity centers, current habitat conditions, and modeled future conditions. Based on this analysis, the Service concludes that it is unlikely that there are additional undetected activity centers on FGS ownership given the low amounts of suitable habitat and extensive survey efforts that have been undertaken over time on the property. The Service also concluded that population growth beyond the current owl population baseline within the Klamath Action Area is unlikely over the permit term. However, because the future location of spotted owl habitat and activity centers within the Action Area cannot be predicted with certainty, the Service recognizes that the take of owls will occur across the Action Area over the permit term and not be based solely on the current activity centers. The Service will continue to provide technical assistance to FGS and will monitor the timing and extent of take throughout the permit term.

Effect of the Take

For the reasons stated in the analyses of the proposed project's effects, the Service determined that the anticipated incidental take of up to 61 northern spotted owls, in combination with the unlikely take of up to 22 additional individuals associated with low-quality habitat, is not likely to jeopardize the continued existence of or impede the recovery of the threatened northern spotted owl across its range. The Service has also determined that the proposed action is not likely to jeopardize the continued existence of the federal candidate West Coast DPS of fisher.

Reasonable and Prudent Measures and Terms and Conditions

The FGS HCP and accompanying documents identify anticipated adverse effects to the northern spotted owl likely to result from the proposed taking, and the specific measures and levels of species and habitat protection that are necessary and appropriate to minimize those adverse effects. All conservation measures described in the proposed HCP, together with the terms and conditions described in the associated Implementing Agreement and any section 10(a)(1)(B) permits issued with respect to the proposed HCP 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 for the exemptions under section 10(a)(1)(B) and section 7(o)(2) of the ESA to apply. If FGS fails to adhere to these terms and conditions, the protective coverage of the section 10(a)(1)(B) permit and section 7(o)(2) may lapse. The Service finds that no further measures are necessary beyond those specified in the FGS HCP, Implementing Agreement, and any section 10(a)(1)(B) permit or permits issued with respect to the proposed HCP Because the Service will provide technical assistance to FGS throughout the term of the ITP, the Service will be in a position to monitor and influence how the HCP is implemented. In order to monitor the impact of incidental take, FGS must report the progress of the action and its impact on the species to the Service as specified below.

Reporting Requirements

As described in Chapter 7 of the HCP and Section 8 of the IA, FGS will submit periodic reports describing its activities and results of the compliance and effectiveness monitoring programs implemented by FGS during the prior calendar year. By January 1st of each calendar year during the Permit Term, and following the adoption of FGS's budget by its Board of Directors, FGS will also provide the Service with a Yearly Expenditure Report (YER). The YER will identify all HCP obligations undertaken the prior year, and the funds expended to implement those obligations. The YER will also identify: (1) all HCP-required obligations FGS will implement in the upcoming calendar year (e.g., monitoring, surveying, road work), (2) the funds budgeted for those purposes, (3) whether the budgeted funds are THP-related or not, and 4) all out-of-pocket expenditures required to carry out the obligations (e.g., hiring of outside specialists). Fruit Growers Supply Company will provide, within 30 days of being requested by the Service, any additional information in its possession or control related to implementation of the HCP that is requested by the Service for the purpose of assessing whether the terms and conditions of the permit and the HCP are being fully implemented. Fruit Growers Supply Company shall notify the Service of any transfer of ownership of real property or harvesting rights therein subject to the IA at the time of transfer of ownership, except where prior notification occurs pursuant to section 10. Such notice shall describe the lands to be transferred with particularity, identify the name and address of the transferee and include a detailed map showing the transferred lands.

Disposition of Sick, Injured, or Dead Specimens

Any dead or injured northern spotted owl must be reported to the Service's Law Enforcement Division (916-414-6660) as soon as possible, and turned over to the Law Enforcement Division or to a game warden or biologist of the CDFG for care or analysis. Care should be taken in handling sick or injured specimens to ensure effective treatment and care or handling of dead specimens to preserve biological material in the best possible state for later analysis of cause of death. In conjunction with the care of any sick or injured northern spotted owl or preservation of biological materials from a dead animal, the finder has the responsibility to carry out instructions provided by Law Enforcement to ensure that evidence intrinsic to the specimen is not unnecessarily disturbed. The Service is to be notified in writing within three working days of the accidental death of, or injury to, a northern spotted owl, or of the finding of any dead or injured northern spotted owl during implementation of the proposed action. Notification must include the date, time, and location of the incident or discovery of a dead or injured northern spotted owl,

as well as any pertinent information on circumstances surrounding the incident or discovery. The Service contact for this written information is the Field Supervisor at (530) 842-5763.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs Federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. In this case, the conservation measures of the project are sufficient to minimize take of northern spotted owl; therefore, the Service finds that no further measures are necessary beyond those specified in the FGS HCP, IA, and the conditions of the Permit.

REINITIATION-CLOSING STATEMENT

This concludes formal consultation on the issuance of the ITP to implement the FGS HCP. As provided in 50 CFR §402.16, reinitiation of consultation shall be required if: (1) the amount or extent of incidental take of northern spotted owl is exceeded; (2) new information reveals effects of the action that may affect northern spotted owl in a manner or to an extent not considered in this biological opinion or affect northern spotted owl critical habitat; (3) the action is subsequently modified in a manner that causes an effect to the species that was not considered in this biological opinion or to critical habitat; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

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