

**Biological Assessment of Impacts to Terrestrial
Threatened, Endangered and Candidate Species from the
Sudden Oak Death Management Program
in Redwood National and State Parks**

October 2012

I. INTRODUCTION

The purpose of this biological assessment (BA) is to review the proposed Redwood National and State Parks (RNSP or “parks”) action, Sudden Oak Death Management Program, in sufficient detail to determine if the proposed action may affect any threatened or endangered species and/or their critical habitats. This biological assessment is prepared in accordance with legal requirements set forth under section 7 of the Endangered Species Act (19 U.S.C. 1536 (c), 50 CFR 402), and meets the criteria for formal consultation with the United States Fish and Wildlife Service (USFWS). This consultation covers Sudden Oak Death management activities through December, 2017.

II. CONSULTATION TO DATE

Redwood National and State Parks obtained a list from the Arcata Fish and Wildlife Service Office website identifying the endangered, threatened, and candidate species that may be present in the parks, dated 31 May 2011, (Ref. Doc. No. 695620425-121457). This list included 24 species currently listed as threatened or endangered, and 4 species that are candidates for listing in Humboldt and Del Norte counties.

Endangered

Beach Layia (*Layia carnosa*)
Western Lily (*Lilium occidentale*)
Black Abalone (*Haliotis cracherdii*)
Tidewater Goby (*Eucyclobius newberryi*)
Leatherback Turtle (*Dermochelys coriacea*)
Short-tailed Albatross (*Phoebastria albatrus*)
Sperm Whale (*Physeter macrocephalus*)
Blue Whale (*Balaenoptera musculus*)
Humpback Whale (*Megaptera novaengliae*)
Fin Whale (*Balaenoptera physalius*)
Sei Whale (*Balaenoptera borealis*)

Threatened

Oregon Silverspot Butterfly (*Speyeria zerene hippolyta*)
Green Sturgeon (*Acipenser medirostris*)
California Coastal Chinook Salmon (*Oncorhynchus tshawytscha*)
Northern California Steelhead (*Oncorhynchus mykiss*)
Southern Oregon/ Northern California Coho Salmon (*Oncorhynchus kisutch*)
Southern Eulachon DPS (*Thaleichthys pacificus*)
Green Turtle (*Chelonia mydas*)
Olive Ridley Sea Turtle (*Lepidochelys olivacea*)
Loggerhead Turtle (*Caretta caretta*)
Northern Spotted Owl (*Strix occidentalis caurina*)

Marbled Murrelet (*Brachyramphus marmoratus*)
Western Snowy Plover (*Charadrius nivosus*)
Steller Sea Lion (*Eumetopias jubatus*)

Candidate

Mardon Skipper (*Polites mardon*)
Xantus's Murrelet (*Synthliboramphus hypoleucus*)
Yellow-billed Cuckoo (*Coccyzus americanus*)
Fisher (*Martes pennanti*)

The bald eagle (*Haliaeetus leucocephalus*) is the one California state threatened species, not federally listed, that occurs in the parks.

Critical habitat was designated for 11 species on RNSP's list of threatened and endangered species. Critical habitats for coho and Chinook salmon, steelhead, and the marbled murrelet occur within the parks. Marbled murrelet critical habitat occurs in two units: unit CA-02-a includes Jedediah Smith Redwoods and Del Norte Coast Redwoods State Parks and unit CA-02-b includes Prairie Creek Redwoods State Park. Critical habitat for the marbled murrelet does not occur on federal parklands. The 0.25 mi of offshore ocean included within the parks' boundary falls within designated critical habitat for the green sturgeon. Proposed critical habitat for the southern eulachon DPS occurs within lower Redwood Creek and the estuary. Critical habitats for the tidewater goby, Oregon silverspot, northern spotted owl, western snowy plover, and Steller sea lion are not designated within the parks. Proposed revised critical habitat for the leatherback turtle would not include the parks.

Two candidate species on the list, Xantus's murrelet and yellow-billed cuckoo, do not occur in the parks except as extremely rare vagrants. The green sturgeon Southern Distinct Population Segment is listed in California south of the Eel River.

The RNSP Sudden Oak Death Management Plan (SODMP) was first presented at an interagency consultation team meeting on 10 May 2011. The primary concerns brought up during that meeting were disturbance effects to spotted owl, marbled murrelets and Pacific fishers and possible disturbance or harm to spotted owl fledglings.

III. CURRENT MANAGEMENT DIRECTION

Redwood National and State Parks are located in Humboldt and Del Norte counties in northwestern California and encompass 131,983 acres (53,412 hectares). Numerous federal and state laws, regulations, and policies guide management.

The National Park Service (NPS) Organic Act of 1916 states that national parks will be established "to conserve the scenery and the natural and historic objects, and the wildlife therein, and to provide for the enjoyment of the same in such a manner and by such means as will leave them unimpaired for the enjoyment of future generations."

The management of Redwood National Park is guided by the 1968 enabling legislation (PL 90-545) in which Congress directed the Park to preserve significant examples of primeval coast redwood forest, and the streams and seashores with which they are associated, for purposes of public inspiration, enjoyment, and scientific study. The 1978 park expansion legislation (PL 95-250) directed Redwood National Park to establish a more meaningful park for the use and enjoyment of the visitors, and directed the NPS to implement a watershed rehabilitation program to reduce erosion caused primarily by roads built in association with timber harvest. Title 36, *Code of Federal Regulations*, Parts 1 through 7 gives the park Superintendent discretionary authority regarding designations, closures, permits, and miscellaneous restrictions. These items are described in a compendium that provides direction for a wide variety of public activities that may occur within the park.

The *California Public Resources Code* (sec. 5019.53 et seq.) provides general management policies for the state parks that include preservation of “outstanding natural, scenic, and cultural values, indigenous aquatic and terrestrial fauna and flora, and the most significant example of such ecological regions of California as the...coastal strip...redwoods...foothills and low coastal mountains...” Additionally, the California Park and Recreation Commission established declarations of purpose for each of the three state parks (Jedediah Smith Redwoods, Del Norte Coast Redwoods, and Prairie Creek Redwoods State Parks) which direct that scenic, historic, and scientific values within the parks are to be preserved.

The *General Management Plan/General Plan and Environmental Impact Statement/Report for Redwood National and State Parks* (USDI and CDPR 1999) provides comprehensive guidance for managing the national and state parks as one complex with similar resources. The General Management Plan/General Plan (GMP) provides overall vision and direction for the parks and identifies future planning needs. Under the GMP, the agencies will emphasize the protection of resources and will also provide a variety of opportunities for visitors to enjoy the parks. New visitor services and facilities will be provided to enhance the visitor experience if these services and facilities do not impact sensitive resources. The park agencies will cooperate with adjacent communities and landowners, local American Indian tribes, and other government agencies to accomplish long-range resource management planning to reduce threats to park resources. Hiking, mountain biking, and camping are currently important components of the activities available to people that visit RNSP. No areas within RNSP are currently closed to visitor use but many areas are managed to exclude public use of motor vehicles.

The GMP identifies individual action plans designed to address specific park activities such as estuary, second-growth, trail, fire and fuels, vegetation, and transportation management. Relative to management of listed threatened and endangered species the GMP directs park staff to “...avoid, minimize, rectify, reduce, compensate, or otherwise mitigate any potential adverse impacts on state or federally listed or proposed or candidate threatened or endangered species...” in association with construction, visitor use, or restoration activities (GMP p. 37). These actions will be achieved primarily by restricting work temporally and spatially so as not to disturb T&E species and designating almost one-third of the parks as “primitive zones” where disturbance to all species from human activities would be limited to those “...necessary to restore and maintain ecosystem function” (GMP p. 38).

The National Park Service signed the Interagency Memorandum of Understanding implementing the *Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl* (USDA and USDI 1994; Northwest Forest Plan ROD). National Park lands within the range of the northern spotted owl are designated as congressionally reserved. Redwood National and State Parks manage their lands by using an ecosystem management strategy, similar to the strategy presented in the Northwest Forest Plan ROD. Implementation of RNSP operations consistent with federal and state enabling legislation (i.e., to preserve, and restore where needed, the old-growth forest ecosystem) will augment the lands designated as Riparian and Late Successional reserves on other nearby federal lands. Redwood National and State Parks policies and guidelines relative to watershed restoration are similar to those outlined by the Aquatic Conservation Strategy in the Northwest Forest Plan ROD.

Although the NPS and California Department of Parks and Recreation signed a Memorandum of Understanding providing for joint management of the four parks as a partnership, each agency retains full and independent authority for determining and implementing management actions on their lands.

Section 7(a)1 of the Endangered Species Act (ESA) of 1973, as amended, requires that federal agencies utilize their authorities in furtherance of the purposes of the Act by carrying out programs for the conservation of endangered and threatened species. Section 7(a)2 of the ESA requires that a federal agency, in consultation with and with the assistance of the Secretary of the Interior, ensures that any action it authorizes, funds, or carries out is not likely to jeopardize the continued existence of any listed species or results in the destruction or adverse modification of critical habitat.

IV. DESCRIPTION OF THE PROPOSED ACTION

Background

Sudden Oak Death syndrome (SOD) is caused by *Phytophthora ramorum*, an invasive plant pathogen with suspected origins in Asia. Millions of oaks and tanoaks have been killed by this pathogen in forests and wildland-urban interfaces of coastal California covering an estimated 2 million acres since the disease became evident in the mid 1990's. Some watersheds have lost over 90 percent of their tanoak component. Extensive areas of mortality have led to concerns about changes in fire frequency and intensity, changes in species composition resulting in shifts in ecosystem processes and function; loss of food resources and habitat for wildlife; and decreased water quality due to an increase in exposed soil surfaces. The disease has killed oaks and tanoaks over thousands of acres in southern Humboldt County to the south of Redwood National and State Parks and is found in small, isolated locations in Curry County, Oregon to the north of the parks. A wide variety of host plants can harbor *P. ramorum* but not die from the disease. Some of these host plants serve as primary vectors for the pathogen including California bay laurel, rhododendron, and huckleberry which are commonly found in the parks.

P. ramorum spreads from tree to tree as zoospores or sporangia in water including rain splash,

drip and stem flow. Local spread of the pathogen is facilitated by transfer of sporangia dislodged from upper crown infections in clouds and wind driven rain. Most newly infected trees are found within about 300 to 600 feet of previously infected trees, a pattern consistent with wind and rain dispersal. However, new disease sites have been detected up to three miles from nearest known infested areas. This type of longer distance or landscape scale spread is believed to be facilitated by turbulent transfer of sporangia dislodged from upper crown infections in storm driven wind events. Extremely long distance spread of *P. ramorum* occurs when infected live plant stock is moved from place to place, such as nursery plants.

SOD has been positively identified on tanoak trees in the Redwood Creek drainage several miles upstream of the parks. Leaf baiting of Redwood Creek near Orick, approximately 15 miles downstream of the infestation site, has confirmed the presence of the SOD organism in the creek. Between the infection site and the bait station in Orick lies Redwood National Park, with high visitor use areas such as the Redwood Creek trail and Tall Trees Grove on or intersecting the waters of Redwood Creek. It can thus be assumed that SOD will become established in the parks soon.

Proposed Action

SOD can become established in any forested area within the parks and thus the exact location of any potential treatment area is unknown. A similar set of evaluation criteria and possible actions, however, are being proposed to determine the appropriate response and management to the discovery of an initial infestation. The proposed SOD management is thus programmatic and not time or site specific.

Monitoring for SOD will be conducted throughout the parks' forested areas. Upon discovery, the extent of the infestation will be mapped, and an inventory of the stand will be taken to determine the presence and cover of tanoaks, California bay laurel, rhododendron, and huckleberry in close proximity of the infection site. If tanoak and California bay laurel are absent within 300 feet of an infection, no action is contemplated. If tanoak or bay laurel are present, the extent of the infestation will be mapped, and a 300 foot buffer will be extended around the infected site. All tanoaks, California bay laurel, rhododendron or huckleberry, greater than 1 foot tall, will be cut down with chainsaws by hand crews within the established 300 foot buffer zone. All attempts will be made to fall target tree/shrub species away from non-target tree species. Cut materials will be bucked to get them in contact with the ground and all materials will be left on site. The goal of the treatment will be to get infected trees and shrubs, and nearby potentially infected trees and shrubs, to the ground so that they cannot facilitate the release of *P. ramorum* spores into the air during rain and wind events – thus preventing the spread of the disease into adjacent stands. Both monitoring crews and treatment crews will disinfect all gear prior to leaving an infected site.

Tree and shrub cutting could occur at any time of the year, regardless of location. However, all attempts will be made to restrict the use of chainsaws to outside of the marbled murrelet, spotted owl, and Pacific fisher noise restriction periods in or within 500 feet of each species respective suitable, unsurveyed and assumed occupied habitats (24 March – 15 September, 1 February – 9

July, 1 March – 15 June, respectively) in order to minimize disturbance. Staff, funding, safety and weather restrictions, however, will not always make adherence to the noise restrictions possible. SOD treatment must occur during the first dry season post discovery to be effective, thus limiting work timing flexibility. If tree and shrub cutting must occur in or within 500 feet of suitable marbled murrelet habitat during the murrelet noise restriction period, then chainsaw use will be restricted to the period from two hours after sunrise to two hours before sunset to minimize noise disturbance during the key crepuscular period. If tree and shrub cutting must occur within unsurveyed, suitable spotted owl nesting and roosting habitat during the spotted nesting season (1 February to 31 July) or post fledging period (9 July to 15 September), then a full spot check (spotted owl calling) and visual survey of all trees to be cut will be made to look for potential suitable nesting cavities or platforms and roosting adults or fledged juveniles. Any trees that contain potentially suitable nesting cavities or platforms will not be cut until after the spotted nesting period (1 February to 31 July). Cavities of felled trees will be examined for evidence of historic spotted owl nesting activity. If any spotted owls are discovered within a treatment polygon, then no shrub or tree cutting will occur within that polygon and RNSP will reconsult with the USFWS. If SOD treatment using chainsaws must occur during the marbled murrelet, spotted owl and/or Pacific fisher noise restriction periods (24 March – 15 September, 1 February – 9 July, 1 March – 15 June, respectively) in unsurveyed, suitable habitat, then an absolute maximum area treated limit will be utilized. Total per year maximum noise restriction period treatment areas are summarized in Table 1.

Table 1. Maximum SOD area treated using chainsaws during the marbled murrelet, spotted owl and/or Pacific fisher noise restriction periods (24 March – 15 September, 1 February – 9 July, 1 March – 15 June, respectively) in or within 500 feet of each species respective, unsurveyed habitat.

	Area Treated per Year	Total Area Treated Over 5 Year Plan
In Or Within 500 Feet of Unsurveyed Marbled Murrelet/Spotted Owl/Pacific Fisher Habitat (i.e. old-growth forest)	10 x 15 acre polygons totaling 150 acres	750 acres
In or Within 500 Feet of Unsurveyed Spotted Owl/Pacific Fisher Habitat (i.e. 40 plus year old second-growth forest)	5 x 15 acre polygons totaling 75 acres	375 acres

No treatment with chainsaws will occur within 0.25 miles of known bald eagle nests during their noise restriction period (1 January to 31 August) in order to minimize disturbance. Visual and auditory surveys for bald eagles will be conducted by park biologists before any SOD treatments begin within suitable nesting habitat. Any newly discovered active bald eagle nests will be avoided until after the noise restriction period.

No mechanical removal or burning of cut material is proposed on National Park Service (NPS) lands, unless those activities have been already approved as part of a separate management effort (e.g. second-growth forest restoration, watershed restoration, fire management). Small pile burning may occur on California State Parks (CSP) lands. CSP pile burning will only occur outside of the marbled murrelet, spotted owl, bald eagle and Pacific fisher breeding season restriction periods in or within 500 feet of each species respective suitable habitats (24 March – 15 September, 1 February – 9 July, 1 January – 31 August, 1 March – 15 June, respectively) in order to minimize drifting smoke from disturbing or affecting immobile nesting/denning adults and juveniles. Stumps and cut stobs will be painted with herbicide, Roundup™ or Aquamaster™, to prevent resprouting on NPS lands, but not on CSP lands. No herbicide will be used in riparian areas (150 foot buffers zones extending from bank full width) on NPS lands. Resprouts in riparian areas will be hand cut in out years until resprouting ceases. No herbicide will be sprayed.

A single tree SOD infection will result in a 7 acre treatment area. Multiple infected trees in one location with 300ft buffer areas overlapping will be joined together to form a single treatment area (polygon). The maximum single treatment area size will be dependent on the canopy cover of the tanoak and bay laurel trees in combination. The maximum cumulative total of all treatment areas for the lifespan of this consultation (2012 – 2017), will also be dependent on the canopy cover of tanoak and bay trees in combination. Finally, the linear feet limit of treated riparian area trees that contribute to stream shading will also vary depending on the canopy cover of tanoak and bay trees in combination (Table 2).

Table 2. Maximum single treated area, cumulative treated area and maximum riparian treated length.

California Bay/Tanoak Relative Canopy Cover at Infection Site			
	0 to 25% of the canopy cover	26% to 50% of the canopy cover	51% to 75% of the canopy cover①
Average stand canopy cover = 50 to 75 percent	50 acre total treatment polygon	25 acre total treatment polygon	13 acre total treatment polygon
Average stand canopy cover = 76 to 100 percent	100 acre total treatment polygon	40 acre total treatment polygon	25 acre total treatment polygon
Maximum Cumulative Treated Area 2012 - 2017	Unlimited	500 acres	100 acres
Maximum Length of Riparian Area Treated Per Stream	Unlimited	2,000 feet	1,000 feet

- ① Site will be planted after treatment with conifer/non host tree species.

Post treatment monitoring will occur in each treated area every year to determine SOD persistence, as indicated by symptomatic host species within or adjacent to the treated area. Any infected resprouts will be removed by non-mechanized handtools during the noise restriction periods in or within 500 feet of suitable marbled murrelet, spotted owl, bald eagle, and Pacific fisher habitat (24 March – 15 September, 1 February – 9 July, 1 March – 15 June, respectively), or within 0.25 miles of known bald eagle nests (1 January to 31 August), otherwise the most efficient tool available will be used to control resprouts, including chainsaws.

The exact location(s), date(s), and amount of suitable spotted owl and marbled murrelet habitat affected by SOD management activities would be reported in RNSP's annual incidental take report to the USFWS.

Tiering

Specific SOD management projects would be tiered to this BA through use of the tiering form attached in Appendix 1. Tiered projects would be reviewed by a RNSP biologist to ensure consistency with the project description in this BA.

V. STATUS AND DISTRIBUTION OF LISTED SPECIES

This action has the potential to impact the marbled murrelet, northern spotted owl, fisher, and the state-listed bald eagle. These species will be considered in this document

1. Northern Spotted Owl (*Strix occidentalis caurina*), Threatened

A. *Species Account*

The northern spotted owl historically was distributed throughout mature and old-growth conifer forests of western Washington and Oregon, and northwestern California from sea level to approximately 5,000 feet. Since 1850 the amount of mature and old-growth forest in this region has been significantly reduced, primarily by logging in recent decades (Thomas et al. 1990). As a result, the spotted owl has been extirpated or is uncommon in certain portions of its historic range, particularly in areas in Washington and Oregon where federal and state lands are intermingled with private lands. Habitat loss due to timber harvest, exacerbated by natural events such as fire and windstorms, was cited as the primary reason for which this species was listed as threatened in 1990 (USDI 1990).

Critical habitat for this species was designated on January 15, 1992 (USDI 1992a). No RNSP lands were designated as critical habitat for the northern spotted owl. A final recovery plan for the northern spotted owl was published in 2008 (USFWS 2008). The foundation of the recovery plan is a network of Managed Owl Conservation Areas (MOCAs) on federal lands supported by Conservation Support Areas (CSAs) on adjacent non-federal lands. Redwood National Park south of Prairie Creek was a designated MOCA and the 3 state parks were designated CSAs.

Currently the 2008 Recovery Plan is under revision, and the draft revised plan recommends elimination of the MOCAs and habitat conservation will be based on the outcome of a habitat modeling exercise (USFWS 2010).

The first parks-wide inventory of suitable habitat was conducted between 1993 and 1995 (Tanner 1999). Up to 40 spotted owl territories were identified in RNSP during that original inventory. We currently track 39 territories (including three that were not part of the original inventory) in our spotted owl database. After 1995 park staff continued to survey some proportion of the suitable habitat in the parks annually. In each year 2001- 2004 approximately 50% of all suitable spotted owl habitat within the parks was surveyed, with approximately 65% of those acres in old-growth and 35% in second-growth forests. The amount of suitable habitat surveyed declined beginning in 2005 and in 2007 only 10% of the suitable habitat acres in the parks were surveyed. The reasons for the decline in survey coverage include indications from previous surveys that many of the historic owl territories are probably no longer occupied by spotted owls, or we are no longer able to detect them in their territories, and many of the historic spotted owl territories are now occupied by one or more barred owl (*Strix varia*) pairs or resident singles.

Surveys of suitable habitat in the vicinity of annual maintenance projects have been conducted annually since 1998. These surveys have detected a few “floater” spotted owls, individuals that could not be relocated during daytime follow up visits.

In 2002, territory-wide inventories of “inactive” sites (activity centers where no owls were detected in ≥ 3 consecutive years) were begun. Inventories include a thorough survey of all suitable habitat within a 1.0 mi radius of the historic activity center following the standards in the two-year survey protocol (USFWS 1992, RNSP 2003). As of 2010 twenty of 39 territories were inventoried. Spotted owls were relocated in 5 of these historic sites, although since then spotted owls have again gone undetected in at least 2 of these territories.

Survey results from the home range inventories indicate that spotted owls probably no longer occur within the majority of territories with persistently unoccupied activity centers. We have documented high levels of barred owl activity at all but 2 of the inventoried territories. We have been able to confirm pair occupancy in only 1 of these sites. Territories with completed inventories and no spotted owls detected are classified as “extirpated”. As long as barred owls persist at these sites, we believe it is unlikely that spotted owls will re-occupy their former activity centers in the near future.

Barred owl records in the parks pre-date 1993, however, the initial spotted owl inventory began documenting barred owls in RNSP with regularity. By 1995 barred owls were documented at or near ten of the newly located spotted owl activity centers (Tanner unpub. data). As of 2009 barred owls have been observed in 31 (79%) of the known spotted owl territories within the parks. An additional 20 barred owl sites have been located apart from any known historic spotted owl activity centers. Barred owls routinely out-reproduce spotted owls, with numerous sites producing 2-3 fledglings each year compared to zero, one, or two spotted owl sites producing 1 fledgling in recent years (Schmidt 2010).

B. Habitat Status

Suitable northern spotted owl nesting, roosting, and foraging habitat has been well described in the literature (e.g., Forsman et al. 1984, Carey et al. 1990, Solis and Gutierrez 1990, Ripple et al. 1991, Blakesley et al. 1992, Hunter et al. 1995). Spotted owl home ranges are known to include structurally complex mature and old-growth (>200 year old) conifer forest in greater amounts and with less fragmentation than that available over the landscape (Hunter et al. 1995). Likewise, spotted owl nest, roost, and foraging sites show the same trend of being in the largest patches of old forest available (e.g., Solis and Gutierrez 1990 and Ripple et al. 1997). Dominant and codominant overstory canopy closure in suitable spotted owl habitat tends to be >60% with well-developed intermediate and shrub canopy layers.

In the coastal redwood (*Sequoia sempervirens*) forests of northern California spotted owls show a similar pattern of using mature and old forests. Thomas et al. (1990) defined suitable spotted owl nesting and roosting habitat as old-growth forested stands with canopy closures $\geq 70\%$, with at least 40% of the canopy contributed by trees ≥ 21 inches diameter at breast height (dbh). Stands with conifers ≥ 18 inches dbh or with less than 40% overstory canopy may be suitable if large hardwoods fill in the canopy to 60% total closure. Second-growth stands >40 years of age are considered suitable habitat, especially if large residual trees occur in the stand.

In the original inventory of spotted owl habitat in RNSP spotted owls were found roosting in old-growth forests more often than expected, and second-growth less often than expected, when compared to the proportional availability of these cover types (Tanner 1999). Spotted owl roost sites also were shown to have greater structural complexity and a higher basal area of old-growth redwood relative to random sites. All but two spotted owl nests in RNSP have been located in large old redwood trees, while the remaining nests were in a large Douglas fir (*Pseudotsuga menziesii*) tree and Douglas fir snag (both in the same territory). Spotted owls in RNSP have used cavities, platforms on tree limbs, tree deformities, and other animal nests for nesting (Tanner 1999).

Within RNSP there are an estimated 41,000 ac (16,600 ha) of old-growth forest, all of which is considered suitable nesting, roosting, and foraging habitat. An additional 35,000 ac (14,164 ha) of second-growth forest is now ≥ 40 yrs old and may be suitable nesting, roosting, and foraging habitat. Two hundred and seventy acres (109 ha) of second growth forest contain residual old-growth trees in patches between 1 and 5 ac. Some proportion of these stands qualify as suitable nesting, roosting, and foraging habitat. Some proportion of the remaining 30,000 ac (12,140 ha) of second-growth <40 yrs of age may be suitable for spotted owl foraging.

It should be noted that spotted owls also are known to successfully nest in previously harvested 30-80 year old redwood forests. Redwood stands are believed to develop characteristics of mature forests (thus, suitable spotted owl habitat) more rapidly than other stand types due to a variety of species-specific and coastal environment conditions (USDI 1990 and Thomas et al. 1990). In precommercially thinned forests on Green Diamond Resource Company (GDRC) land, including land adjacent to RNSP, spotted owls nested in stands with a median age of 59 years, with 83% of nesting pairs using stands between 30 and 80 years old. Conifer-dominated nest stands tended to have more basal area of large (>90 cm dbh) conifers and more vertical vegetation layers than in randomly sampled stands. Likewise nest trees in GDRC stands were

usually dominant trees in the canopy or residual trees that were very large and older than the surrounding stand (Foliard 1993). In contrast, spotted owls are not known to use second-growth stands for nesting in RNSP. Except for some stands in Del Norte Coast Redwoods State Park, second-growth in the parks differs from that on GDRC land in that almost none of the previously harvested stands have been thinned. Many of the second-growth redwood stands in RNSP are extremely dense, and may be passing through a stem exclusion stage which causes mortality of smaller overstory trees and suppression of most understory regeneration and shrub communities (Bailey and Tappeiner 1998). These stands may not support spotted owl prey, supply adequate roost and nest sites, or allow for easy flight due to their high stem densities.

Twenty (55%) of the original 36 RNSP owl territories have >1336 ac and >500 ac (minimum “threshold” acres believed necessary to sustain spotted owls in a territory) of suitable nesting and roosting habitat within the 1.3 mi and 0.7 mi radius home range circles, respectively. An additional five (14%) territories are above threshold in the 1.3 mi radius circle but below in the 0.7 mi radius circle. The amount of old-growth within these territories ranges from 36-100% of the suitable habitat acres; 12 territories have >80% of the suitable habitat acres in old-growth.

2. Marbled murrelet (*Brachyramphus marmoratus*), Threatened

A. *Species Account*

The marbled murrelet, a seabird in the Alcid family that nests in large trees in coastal old-growth forests, has a disjunct distribution from Alaska through central California (USDI 1992b). In California, three separate areas were identified where marbled murrelets concentrate at sea, corresponding to the three largest remaining blocks of coastal old-growth forest inland (USDI 1992b). Mostly in response to loss of nesting habitat, the marbled murrelet was federally listed as threatened in 1992 in California, Oregon, and Washington (USDI 1992b), and listed by the state of California as endangered the same year. A recovery plan was completed in 1997. Two 5-year status reviews have been conducted, one as recently as 2009. The 2009 review recommended the marbled murrelet maintain its status as “threatened” under the federal Endangered Species Act (USFWS 2009).

Murrelets nest from mid-March through mid-August in California (Hebert and Golightly 2006). Clutch size is one egg, with one clutch laid per year, although a replacement clutch may be laid if the nest fails early in the breeding season (Hebert et al. 2003). No nest is constructed; eggs are laid on large limbs covered with moss and lichen high in a conifer tree canopy. Incubation shifts of 24 hours each are alternated between both parents (Sealy 1972). Parents make daily trips to the nest site to feed young. Fledging dates are protracted and are estimated to range from late May to mid-September in California (data compiled in Hamer et al. unpubl., Hamer and Nelson 1995).

The marbled murrelet recovery plan divided the range of the murrelet into 6 Conservation Zones (CZs) beginning with CZ 1 in northern Washington and ending with CZ 6 in Santa Cruz County. Redwood National and State Parks (RNSP) fall in CZ 4. Zones 1-5 are in the area of effectiveness monitoring of the Northwest Forest Plan (NWP). In 2008, the estimated population of murrelets in CZs 1-5 was 17,700 ($\pm$ 3,200, 95% C.I.; Falxa et al. 2009). Estimates for 2007 and 2008 represent the smallest population estimates since monitoring began and indicate a

population decline since 2000. At the scale of the CZ in the NWP area marbled murrelet at-sea density estimates in 2009 ranged from 0.767 birds/km² to 4.18 birds/km² in CZ 4 (no surveys were conducted in CZ5 in 2009; USFWS 2009). There was a loss of 490 (S.E. 241) to 870 (S.E. 129) birds per year or about 3,900 ($\pm$ 4,553, 95% C.I.) to 6,900 ($\pm$ 2,533, 95% C.I.) birds from 2000 to 2008 equating with an overall population decline of 19 – 34% (USFWS 2009).

In CZ 6 at-sea surveys by Peery et al. (2008) estimated the entire population in 2008 to be 174 birds (95% C.I. 91-256). When combining data from CZ 6 with the other five zones, the 2008 population estimate represents a decline of approximately 26% throughout the species' listed range (USFWS 2009).

Similarly, at-sea detections of adult:juvenile ratios (an indirect index of reproductive success) indicate an extremely low breeding success throughout the range in the coterminous United States. In northern California the ratios were 0.003 to 0.008 (Long et al. 2008). Beissinger and Peery (2007) suggested that conserving marbled murrelets in the long term will require improving the ratio to 0.2 to 0.3.

The 2009 status review indicated that the historic decline of murrelet reproduction is likely caused by a shift of available prey to a reduced trophic level (citations in USFWS 2009: Becker et al. 2007, Becker and Beissinger 2006). Those researchers suggested that murrelets today eat at a lower trophic level than historic murrelets and that the change in available prey is linked to fishing pressure. A lack of high quality forage at the appropriate time of year may explain the low nest initiation rates and nesting success observed by murrelet researchers. The status review states “[b]ecause of the difference in energy content between prey species Kuletz (2006) found that murrelets delivering fish other than age-1 herring may have to increase prey deliveries by up to 4.2 times per day to deliver the kJoules necessary for a chick to reach fledging weight....Increases in prey capture and delivery efforts by the adults result in reduced adult body condition by the end of the breeding season and increases the predation risk to adults and chicks as more trips inland are required (Kuletz 2006)”. The trophic level shift along with increased predation is likely responsible for the murrelets' poor reproductive success (USFWS 2009).

Compounding the problem with declining food resources is the loss of potential nesting habitat, which may have been underestimated for the period from 1994-2003. Additional habitat fragmentation could isolate remaining populations genetically and demographically which ultimately increases the risk of local extinctions (citations in USFWS 2009).

Marbled murrelets' use of forests within RNSP is influenced by topography (Miller and Ralph 1995). Highest detection rates per station and the greatest number of occupied stations occurred in the major drainages and at lower elevations; detection rates on major ridges were three times lower (Miller and Ralph 1995). No significant difference in occupancy based on stand size was detected, however, sample size in the largest stands was very small. In RNSP Golightly et al. (2009) measured habitat characteristics at the stand scale for 10 marbled murrelet nest sites and 11 random sites. Distance to the nearest paved road and tree canopy height were the variables that best discriminated between nest and random sites. Nests were farther from paved roads and were in stands with lower canopy heights than random sites. There also were increased numbers of downed logs in the vicinity of murrelet nest trees. Golightly et al. (2009) suggested that

numbers of downed logs indicates openings in the canopy that increase access to nest sites. Murrelet nest trees had a greater mean dbh than the mean of all other trees measured in a plot around the nest tree, but were not necessarily the largest trees in the plot, indicating that large limbs and complex tree canopies are not limited to the largest trees in a stand. We assume that all stands with trees providing nesting opportunities for marbled murrelets have the potential to be occupied.

In 1999-2001, 2003-2004, and 2006-2007 the park contracted surveys of all suitable marbled murrelet habitat within 0.25 mi of old logging roads proposed for removal throughout the Lost Man Creek watershed. This habitat included contiguous old-growth, second-growth stands with residual predominant trees that could provide nesting opportunities ("residual old-growth"), and second growth stands without residual old-growth. These surveys confirmed occupied behaviors in all three stand types, including a high likelihood of nesting in one residual old-growth stand (Stauffer and LeValley 2004). The contractor determined the below-canopy behaviors in the second-growth sites were most likely fly-throughs to the adjacent old growth stand (LeValley 2001). It is still unclear what value second-growth and residual old-growth habitats possess for the species.

In 2001 RNSP became a cooperator in a multi-agency research project, the primary objectives of which were to locate marbled murrelet nests in RNSP, determine the relationship between nesting success and proximity to park trails and highways, and measure behavioral responses of murrelet adults and chicks at the nest to noise disturbance caused by trail users and maintenance activities. Thirty-eight nests were initiated (including re-nests) by radio-marked birds during the three year study. Reproductive success was very low, between 3% and 9% of initiated nests. The majority of the reproductive failures were attributed to predation of eggs and nestlings by corvids (Golightly pers. comm., Hebert and Golightly 2006). Results from trials with noise (from chainsaws), and people walking and talking in the vicinity of an occupied nest, indicated that these forms of disturbance may not directly influence nesting success. There was no significant difference between successful and unsuccessful nests in the vicinity of human presence (e.g., trails) or noise, however, Hebert and Golightly (2006) cautioned that these results were based on small samples and trials were run in the middle of the afternoon when murrelet activity is at low levels. In addition, seven murrelet egg shells at the bases of trees were found in RNSP in 2010 and were located immediately adjacent to high use trails based on the presence of murrelet egg shells found at the base of suitable nest trees. In 2011, three of six of these trees were found to contain marbled murrelet nests. The fate of the nestlings was unknown (RNSP unpubl. data). In contrast, Hamer and Nelson (1995) found that pedestrian activity within 131 ft (40 m) and within line-of-sight of murrelet nests caused flushing or aborted feeding 27% of the time. In old growth redwood trees nests tend to be much higher from the ground and nest disturbance may be less due to this factor (McShane et al. 2004). A number of studies have shown that murrelet response to vehicular noise at nest sites is minimal for both chicks and nesting adults (McShane et al. 2004).

As indicated by the Hebert and Golightly (2006) study and posited by Golightly and Gabriel (2009) in their analysis of declining regional populations, the most significant threat to the marbled murrelet in RNSP is the high level of predation on murrelet eggs and chicks. Of the 14 known or suspected nest predators, 8 are known to occur commonly in suitable murrelet nesting

habitat in RNSP including the Steller's jay (*Cyanocitta stelleri*), common raven (*Corvus corax*), great horned owl (*Bubo virginianus*), sharp-shinned hawk (*Accipiter striatus*), Cooper's hawk (*A. cooperii*), Pacific fisher (*Martes pennanti*), Townsend's chipmunk (*Tamias townsendi*), and Douglas squirrel (*Tamasciurus douglasii*) (Nelson and Hamer 1995, Marzluff et al. 1996).

Corvids (jays, crows, and ravens) have been implicated as the primary predator of murrelet nests (Nelson and Hamer 1995, Raphael et al. 2002), including within RNSP (Hebert and Golightly 2006, Golightly and Gabriel 2009). Corvids are extremely intelligent and efficient predators, using a highly refined search image for locating prey. Corvid numbers have increased significantly throughout the west and locally in the last century in response to habitat change and human development (Marzluff et al. 1994, Liebezeit and George 2002). The densities of many corvid species have been found to be higher in landscapes fragmented by agriculture and human development than in forested landscapes. It appears that among corvids, Steller's jays are the main marbled murrelet nest predators (Golightly and Gabriel 2009, Malt and Lank 2009). Marzluff and Neatherlin (2006) postulated that it is mainly along urban/wildland interfaces that corvid predation markedly increases. McShane et al. (2004) cited numerous studies that found jays to be more abundant along forest edges where they appear to be attracted to supplemental food sources, especially if associated with human settlements and campgrounds. Malt and Lank (2009) found that proxy murrelet nests near "hard" or human created habitat edges (i.e. recent clear cuts) had a two and half time greater chance of being predated than did proxy nests near regenerating clear cut edges or "natural" edges along riparian areas. These observations are a corroboration of Marzluff et al.'s (2004) study of the home range use of 25 radio tagged Steller's jays. Steller's jay use hard habitat edges more while foraging and of hard habitat edges, those associated with human settlements and campgrounds were used the most.

In redwood forest habitat a variety of studies on real and simulated nests suggest that Steller's jays are the most significant predator on murrelet eggs and chicks (Carey et al. 2003). Steller's jays have been documented preying on murrelet eggs in RNSP (Hebert and Golightly 2006). In one study in redwood forest habitat (Brand and George 2001) Steller's jay counts were highest within 100 m of the forest edge. In the Headwaters Forest Preserve Steller's jays were most numerous in old-growth that had evidence of harvest and clearings with shrubs and forbs. Carey et al. (2003) stated "...harvest that produces landscapes including regenerating clearcuts and old-growth forests with some tree removal will likely elevate Steller's jay abundance". Raphael et al. (2002) found Steller's jay abundance to be highest in forest fragments far from human activity, and this study along with a number of others in Oregon and Washington found this species to be most abundant along forest edges bordered by early seral vegetation with berry-producing shrubs. Point count data from residual old-growth habitat in South Fork Lost Man Creek (RNSP unpub. data) indicate a relatively high abundance of Steller's jays in that area which fits the definition of high quality jay habitat described by Carey et al. (2003) in the Headwaters Preserve. Luginbuhl et al. (2001) described a positive correlation at the landscape scale (5-50 km²) between corvid abundance and predation rates (egg survivorship). Raphael et al. (2002) stated that far from human campgrounds or settlements corvid nest predation was lowest 100 m from the fragment edge, however, those results were not statistically significant. Three years of corvid monitoring in RNSP has shown that Steller's jays are three to six times more common in park campgrounds within suitable marbled murrelet habitat than in suitable murrelet habitat located away from park campgrounds (Bensen 2009a).

The recovery plan for the marbled murrelet outlined a number of recovery objectives that include stabilizing and then increasing population size throughout the range and gathering information necessary for the development of delisting criteria. Recovery actions for the Siskiyou Coast Range Zone (including RNSP) include preventing the loss of occupied nesting habitat, minimizing the loss of unoccupied habitat, and- most pertinent to the park- decreasing the time for development of new suitable habitat. The recovery actions for this zone related to state and national parks call for consideration of the maintenance of high quality habitat when planning for new developments associated with recreation. The recovery plan also describes potential threats associated with increased corvid predation and nest disturbance from facility construction and use (campgrounds, picnic areas, visitor centers, and parking lots), and the importance of proper trash disposal in reducing some of these threats (USFWS 1997). Peery and Henry (2010) used population viability analysis to demonstrate that reducing corvid predation of marbled murrelets in central California was by far the most effective management strategy to prevent murrelet extinction when compared to all other negative population pressures. The purpose of RNSP Corvid Management Strategy (RNSP 2008) is to reduce corvid densities in high use visitor areas within the parks in order to lower predation rates on nesting marbled murrelets by reducing anthropogenic food sources and other means.

B. Habitat Status

In RNSP there are approximately 41,000 ac (16,592 ha) of old-growth forest occurring in contiguous stands greater than 0.5 ac in size that would presumably be suitable marbled murrelet nesting habitat. The old-growth stands in RNSP are fragmented with only a few existing large contiguous blocks of nesting habitat. There also are an additional 362 ac (146 ha) of residual old-growth forest (stands with isolated old-growth trees surrounded by mature residual trees) occurring within RNSP which may provide lower quality suitable nesting habitat.

The following table shows the number and size of suitable marbled murrelet nesting habitat stands in Redwood National and State Parks:

Suitable Marbled Murrelet Nesting Habitat Stand Size (in acres)	Number of Stands
Less than 5	38
5 to 100	63
100 to 1,000	13
1,000 to 5,000	5
Greater than 5,000	3

In California 50 ha (123 ac) circles centered on marbled murrelet survey stations were always occupied if they contained >20% old-growth with >6% of that >100 m from an edge, and mean patch size of old-growth ≥ 11 ha (27 ac) with a mean core area >3 ha (7 ac) (Meyer 1999). In RNSP there are 63 stands of potentially suitable murrelet nesting habitat between 5 and 100 ac, however, it is not known what percentage of these stands meet the suitability criteria described by Meyer (1999) (Figure 2).

Approximately 50,000 ac (20,234 ha) of second-growth coniferous forest exists in RNSP that is

currently unsuitable marbled murrelet nesting habitat. It is reasonable to expect that some, if not most, of the stands making up this younger forest will eventually obtain suitable nesting habitat characteristics. All of these second-growth stands were cut within the last century with over 90% having been clearcut since 1940. Habitat recovery rates will vary greatly from stand to stand depending on how the stand was harvested, site capacity, reseeding method, and post-harvest manipulation. Unfortunately, even under the best of circumstances, it is not expected that these disturbed stands will become suitable nesting habitat for more than a century. Figure 2 shows the location of old-growth stands potentially suitable for nesting murrelets within RNSP.

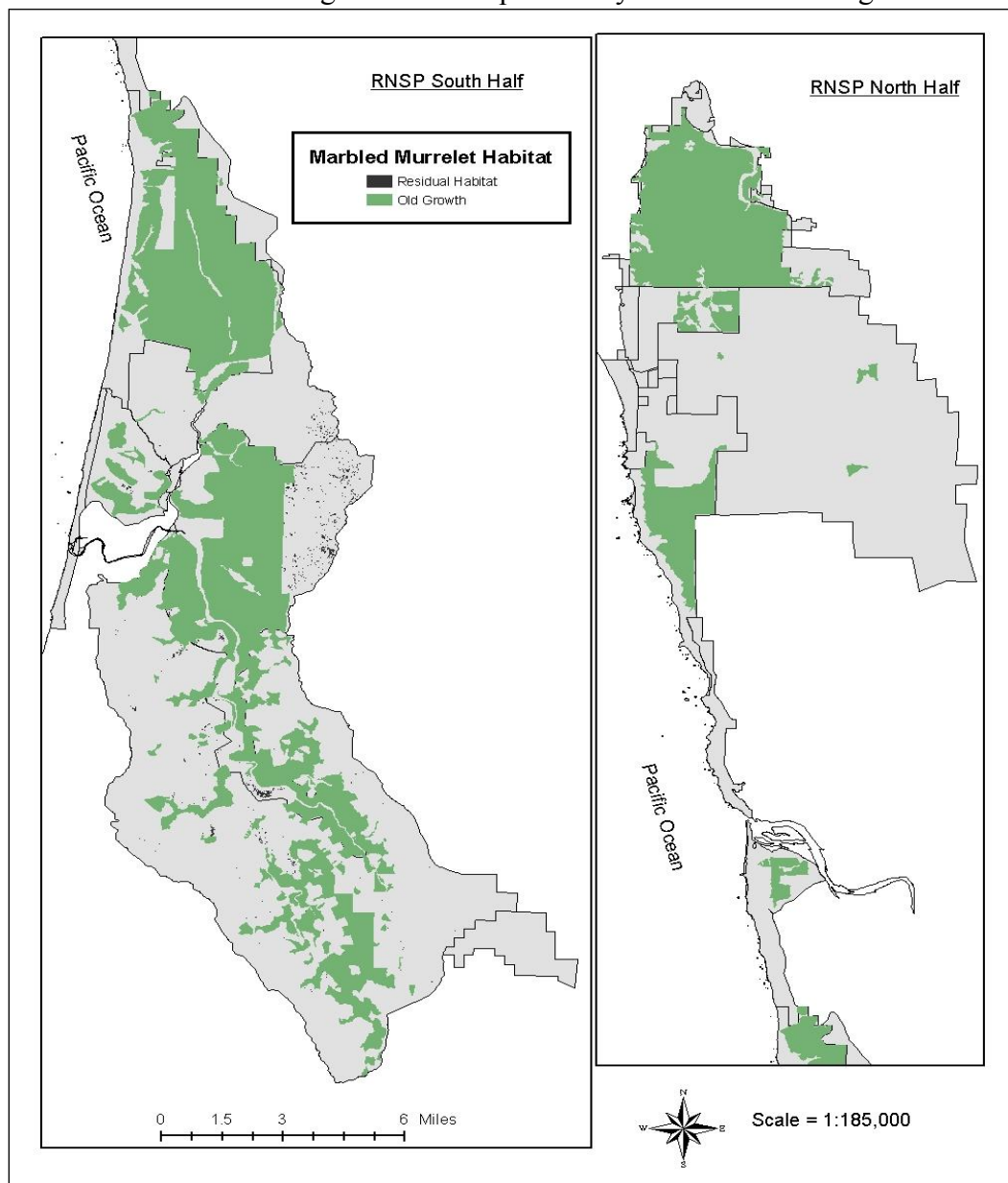


Figure 2. Suitable marbled murrelet nesting habitat in Redwood National and State Parks.

Marbled Murrelet Critical Habitat

The designation of critical habitat identifies areas essential to the conservation of the species.

The USFWS has determined that the physical and biological habitat features (referred to as “primary constituent elements”) associated with the terrestrial environment that support nesting, roosting, and other normal behaviors are essential to the conservation of the species and require special management considerations. For successful murrelet nesting the USFWS has focused on the following primary constituent elements:

- 1) individual trees with potential nesting platforms;
- 2) forested areas within 0.5 mi (0.8 km) of individual trees with potential nesting platforms, and with a forested canopy height of at least one-half the site-potential tree height.

This includes all such forest, regardless of contiguity. These primary constituent elements essentially provide and support suitable nesting habitat for successful reproduction of the marbled murrelet. Within the boundaries of designated critical habitat units, only those areas that contain one or more primary constituent elements are, by definition, critical habitat (USDI 1996).

Destruction or adverse modification of critical habitat is defined as “...a direct or indirect alteration that appreciably diminishes the value of critical habitat for both the survival and recovery of listed species. Such alterations include, but are not limited to, alterations adversely modifying any of those physical or biological features that were the basis for determining the habitat to be critical.” Many activities may take place in critical habitat without resulting in the destruction or adverse modification of the critical habitat.

Within RNSP old-growth forest habitats within the three state parks have been designated critical habitat. Jedediah Smith Redwoods State Park contains approximately 9,480 ac (3,836 ha) of critical habitat, Del Norte Coast Redwoods State Park contains approximately 3,220 ac (1,202 ha) of critical habitat, and Prairie Creek Redwoods State Park contains approximately 10,745 ac (4,348 ha) of critical habitat.

3. Fisher (*Martes pennanti*), Candidate

A. *Species Account*

Prior to European settlement, fishers occurred throughout most conifer forest habitats in the Pacific states (Grinnell et al. 1937), including commercially valuable and easily accessible timber in low-mid elevations. These forests have relatively continuous canopy and complex structure near the forest floor (Aubry and Houston 1992, Powell and Zielinski 1994). Since 1850, the amount of mature and old-growth forest in the Pacific states has been significantly reduced, primarily by logging in recent decades (Thomas et al. 1990). Grinnell et al. (1937) determined that over trapping was the primary initial cause of fisher population decline. Even though fisher trapping was regulated or prohibited in the 1930s and 1940s, populations were probably prevented from recovering due to the loss and fragmentation of habitat over a large portion of the range in Washington, Oregon, and California (Aubry and Houston 1992, Powell and Zielinski 1994). As a result, the fisher has most likely been extirpated, or is uncommon, in much of its historic range (Aubry and Lewis 2003, Powell and Zielinski 1994).

Results of standardized fisher surveys show that the current geographic distribution in the west is

limited to several relatively small disjunct populations. There have been 50 verifiable records of fishers from Oregon between 1954 and 2001, most from southwest Oregon in the vicinity of the Siskiyou Mountains near the California border, and in the vicinity of 1977-1981 translocation sites in the southern Cascades (Aubry and Lewis 2003). Fishers occur in two areas in California: the north coast ranges and Klamath Mountains, and the southern Sierra Nevada (Zielinski et al. 1995). This contrasts with Grinnell et al.'s (1937) assertion that fishers occurred around Mt. Shasta and Mt. Lassen and throughout the Sierra Nevada. In Del Norte and Humboldt counties, fisher populations are consistent with their historic distribution (Zielinski et al. 1995). The fisher population in northwest California is probably the largest in the western United States, although it is isolated (Aubry and Lewis 2003).

To date there have been 5 separate surveys for forest mesocarnivores in RNSP. Two were U.S. Forest Service surveys in areas of proposed highway construction at Cushing Creek (Gellman et al. 1993) and Wilson Creek (McKenzie et al. 1994), both in Del Norte county and both within a few of miles of the coast. In a state-sponsored distribution study, habitats were surveyed within 50 air km (31 mi) of the coast between the Oregon border and southern Humboldt County (Beyer and Golightly 1996). A park-sponsored survey took place in 2002 with the main objective of determining presence of the Humboldt marten (*M. americana* ssp. *humboldtensis*) in the parks (Slauson et al. 2003). And in 2010 study was conducted throughout the parks by U.S. Forest Service research in partnership with RNSP. In the winter and spring of 2011, CSP again in a collaborative effort with the USFS, conducted surveys focusing on the Humboldt marten. Fishers were detected in all 6 of these surveys. Beyer and Golightly (1996) reported a "...high detection ratio...in an area of...[Redwood] National Park...". Slauson et al. (2003) detected fishers in old-growth, older second-growth, and along the edges of these two types. Sample units with detections were distributed throughout the park, from Jedediah Smith State Park in the north to Devil's Creek (a tributary of Redwood Creek) in the south. Data from the 2010 and 2011 study have yet to be analyzed; however, fisher were detected at more stations in second growth than in old growth (A. Transou pers. comm., CSP NCRD unpub. data). Fisher were detected in the East Fork Mill Creek and Bummer Lake watersheds of Del Norte Coast Redwoods State Park, in Tom McDonald Creek watershed of RNP, and in Sweet Creek within Prairie Creek Redwoods State Park. The 2011 winter and spring survey efforts focused on the Humboldt marten so only old growth habitat in Prairie Creek Redwoods State Park was surveyed. Pacific fisher were detected during the winter survey but not the spring survey (A. Transou pers. comm., CSP NCRD unpub. data). There is a modest number of fisher observations in the parks' wildlife observations database; reliable observations were recorded in Lost Man Creek and Prairie Creek watersheds, near the Wolf Creek Education Center, and along Newton B. Drury parkway as well as from the A-9 Road, C-9 Road, Bald Hills Road, and Maneze Prairie. The survey results coupled with the reliable database records indicate that fishers are probably well-distributed throughout the parks.

There are no records of fishers breeding within RNSP, although they are known to reproduce in private managed timberlands adjacent to the park (J. Thompson pers. comm.), and it is likely that RNSP harbors a breeding population. Data from studies in the western U.S. indicate fishers give birth in mid-March to early April, and breed shortly after. For example, 26 wild caught captive fishers from British Columbia showed a mean parturition date of 31 March (range 23 March-7 April) and a mean date of 12 April for mating (range 5 April – 27 April) (Hall 1942). Seglund

(1995) documented a female entering a natal den on 10 April and moving to a maternal den on 26 April where she remained until 2 June. On managed forests in the redwood and redwood/Douglas-fir transition zone it appeared that parturition was occurring in late March (J. Thompson unpub. data). Raley (2002) documented similar dates for radio-collared fishers in the southern Oregon Cascades. In that study females gave birth in late March, bred between late March and early April, and remained in natal dens until kits were about 8 weeks old. Other studies have documented kits remaining in natal dens until 6-10 weeks of age (citations in Powell and Zielinski 1994, Seglund 1995).

Fishers are known to avoid areas of human disturbance. Seglund's (1995) study showed that fisher rest sites occurred >100 m (328 ft) from roads, homes, and campgrounds. However, fishers are frequently observed near roads in the park (RNSP unpub. data). Slauson et al. (2003) detected fishers at road-side track plate stations, including those near Newton B. Drury parkway, and near Alder Camp, Howland Hill Road, and Bald Hills Road. Conversely, Beyer and Golightly (1996) attributed low and high detection ratios at certain sites to proximity of a major highway and limited human access, respectively. From a management standpoint, disturbance to females with young kits is of primary importance. Seglund (1995) indicated that denning females may be especially vulnerable when disturbed by loud noise near a natal den site. However, the mere presence of humans, for example walking on a trail in suitable denning or resting habitat, under most circumstances would not warrant concern (B. Zielinski pers. comm.).

Fishers consume a wide variety of foods. In the southern Sierra Nevada, Zielinski and Duncan (2004) noted fisher diets included mammals (mainly sciurids and cricetids), birds, lizards, insects, and plants (including fungi and fruit). Golightly (unpub. data) found gray squirrel, Douglas-squirrel, ground squirrel, chipmunk, woodrat, and voles in the genera *Microtus* and *Clethrionomys* in fisher scats from northwest California. In addition to the prey items mentioned above, Raley (2002) reported brush rabbit, opossum, striped skunk, porcupine, deer, elk, berries, and yellowjackets in scats from den and rest sites in the southern Oregon Cascades.

B. Habitat Status

Fishers are generally associated with large unfragmented blocks of late successional conifer forest. Buskirk and Powell (1994) described it as one of the most habitat-specialized mammals in western North America. Fisher home ranges are large; in northwest California female home ranges covered between 5.8 and 10 mi² (1,498 - 2,612 ha) and male home ranges covered between 7.8 and 22 mi² (2,020 - 5,806 ha) (Mullis 1985, Seglund 1995, Zielinski et al. 2004a). In one study (Zielinski et al. 2004a), mid and late seral Douglas-fir composed 24.5% and 14% of mean proportions of forest cover, respectively, in home ranges of both sexes. White oak and grassland types were poorly represented in these home ranges. Buskirk and Powell (1994) suggested that the species contributing to vegetation cover were not as important as the successional stages and structure of cover; fishers show preference for low and closed but not uniform canopies, and structural complexity near the forest floor. Fishers are known to occur in commercially managed forests in the redwood/ redwood-Douglas-fir zone where stand heterogeneity remained post-harvest, including the presence of residual trees, logs, and hardwoods (L. Diller pers.comm., J. Thompson unpub. data).

Connectivity between preferred habitat patches also is important. Unsuitable forest habitat may

be used for travel, and suitable forest patches separated by openings may not be used (Buskirk and Powell 1994). Stand use in northwestern California was determined to be negatively correlated with the amount of stand edge (Rosenburg and Raphael 1986). However, Aubry (pers. comm.) and Diller (pers. comm.) reported instances of rest sites near the edges of clearcuts and indicated that the presence of a structure may be more important than “where” that structure is located. Riparian areas also have been noted as important components of fisher home ranges, and may be used as travel routes (Buck et al. 1994, Seglund 1995, Diller pers. comm.).

Fishers require large structures well-distributed throughout the home range for denning and resting; reuse of rest sites is rare (Seglund 1995, Zielinski et al. 2004a). In northwestern California, 46% of rest sites were in large live trees and 44% were in large snags and logs, with females using snags more often than males (32% of the time for females versus 18% of the time for males). Large black oaks were often used when available. Zielinski et al. (2004b) determined the best predictors of suitable resting habitat include the presence of large trees (averaging 148 cm dbh), high canopy closure (95%), and the presence of one or more large snags >100 cm dbh. Rest sites in Seglund’s (1995) study area on the Shasta-Trinity National Forest were within 100 m of perennial, annual, or ephemeral streams, associated with large amounts of down woody debris <12 cm in diameter, had up to four vertical vegetation layers, and were >100 m from human disturbance (a road, house, clearcut, or campground).

The only information on fisher habitat use in RNSP has been in association with detections at track plates. These sites may represent foraging locations, and in some instances may be in proximity to rest sites (Zielinski et al. 2004b). Beyer and Golightly (1996) found that canopy closure at detection sites in coastal habitats averaged 86.8% and tree diameters averaged 52.3 cm at breast height. Slauson et al. (2003) placed track plate sample units throughout RNSP in old-growth and second-growth forest and at the edges of these two types. Fishers visited track plates in 39-72 year old second-growth more often than expected and stations in old-growth less often than expected; most of the sites in second-growth appeared to lack any residual old-growth trees. However, many of the detections in second-growth were within 0.5 mi of old growth. Fishers often were detected at stations on the edge of second-growth and old-growth. Detection sites in old-growth had combined mean over- and understory tree canopy closures of approximately 60% and nearly 100% combined large and small shrub cover. A mean of 11 snags >90 cm dbh per hectare occurred at these sites along with a mean number of 55 logs >90 cm diam per hectare. Detection sites in second-growth had a mean of almost 100% combined over- and understory tree canopy closure and an equally high amount of large and small shrub cover. A mean of 4.3 snags >90 cm dbh per hectare occurred at second growth sites along with a mean number of 12 logs >90 cm diam per hectare. Large stumps >90 cm also were present near detection sites in both old-growth and second-growth.

Within RNSP there are an estimated 41,000 ac (16,600 ha) of old-growth forest, all of which may be considered suitable for occupancy by fishers for denning, resting, and foraging. There are approximately 35,000 ac (14,164 ha) of second-growth forest ≥ 40 yrs old that also may be suitable for fisher occupancy. Stands >40 years old with a legacy component (e.g., residual old-growth, large snags and downed logs) may provide structures that could be used for resting and denning. Second-growth stands <40 yrs of age may be suitable for fishers if they contain residual habitat sufficient to provide structure and habitat heterogeneity.

4. Bald Eagle (*Haliaeetus leucocephalus*), State Threatened

A. *Species Account*

The distribution of the bald eagle extends from central Alaska, throughout much of Canada and the United States and into northern Mexico. The species is increasing in numbers throughout the United States and Canada with breeding activities occurring in areas of low human disturbance.

Detrich and Garcelon (1986) performed surveys to identify suitable nesting habitats throughout coastal California and noted that areas along the coast in Jedediah Smith, Del Norte Coast, and Prairie Creek Redwoods State Parks, along with certain areas in Redwood National Park, offered good to excellent habitat potential. However, at that time no bald eagles were known to nest in RNSP. Field surveys to identify potential nesting activities during the breeding season were begun in 1997 and have continued to the present. In 1997, a nest was located on the ridge just south of the town of Orick and eagles have been present in the territory in every year since then with the exception of 2006 when the nest blew down in a winter storm; the pair built a new nest near the old site the following year. This pair produced a total of 13 eaglets between 1999 and 2008, although reproduction did not occur in all of those years (Bensen 2009c).

Nearby Freshwater Lagoon (1.25 miles from the nest) provides suitable foraging habitat, and indeed is used for foraging by bald eagles, most likely including those from the Orick Valley territory.

A second bald eagle territory was discovered on the mainstem of Mill Creek south of Jedediah Smith Redwoods State Park in 2003 and appeared to have produced at least one young that year. Eagles were present in the territory in 2004 but the exact nest location wasn't found until 2005 (Bensen 2005). This pair fledged 1 or 2 eaglets each year between 2005-2009 (Bensen 2009b). The nest tree is located near the Mill Creek Horse Loop Trail and nesting eagles could potentially be disturbed by visitors walking or equestrians riding along the trail. Bald eagles, however, have shown some ability to habituate to minor disturbances on the ground (Fraser et al. 1985). The Mill Creek Horse Loop Trail was closed to public access for the fourth year in row (2007-2010) from 15 October to 31 March to protect developing salmon eggs from trampling at fords across Mill Creek. The lower visitor activity along this trail during the early portion of the bald eagle nesting season presumably lowered the amount of potential disturbance occurring along the trail. It may be assumed after the many successful breeding seasons that this pair has become habituated to the presence of people on the trail below their nest during the latter part of the nesting season.

The pattern of incidentally observing relatively significant numbers of adult and immature bald eagles along Gold Bluffs Beach was repeated in 2010. We suspect that nesting activity is occurring inland of the beach within Prairie Creek Redwoods State Park. Other areas where bald eagles are annually observed include Redwood Creek, Freshwater Lagoon, along the Smith River, coastal areas near the mouth of the Klamath River, and along the entire coastline of Del Norte Coast Redwood State Park.

On July 9, 2007 the USFWS published a final rule removing the bald eagle from the list of endangered and threatened wildlife in the lower 48 states (USDI 2007), claiming it recovered.

The bald eagle remains protected under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. It remains an endangered species under the California Endangered Species Act.

B. Habitat Status

Nesting habitat, in general, is composed of low elevation, late successional forested stands near permanent lakes and free-flowing rivers. In California, 87% of nest sites were within 1 mi (1.6 km) of water (Zeiner et al. 1990). Platform stick nests are built in large trees with open branches, but some foliage usually shades the nest (Call 1978). Nests are located 50-200 ft (16-61 m) above ground, usually below tree crowns (Zeiner et al. 1990). Tree height and size appear to be more important than species. Other required habitat elements include open hunting perches, often snags or broken-top trees, and communal winter roost areas (dense, sheltered conifer stands).

In RNSP approximately 12,900 ac (5,220 ha) of potentially suitable bald eagle nesting and roosting habitat is located within 200 m of streams, lagoons and the ocean. Large trees providing nest sites are located throughout many areas of RNSP.

VI. IMPACTS TO THREATENED AND ENDANGERED SPECIES

A. Direct Effects

1. Northern Spotted Owl

Disturbance

All attempts will be made to not treat SOD infected areas with chainsaws that are in unsurveyed, suitable spotted owl habitat during the noise restriction period (1 February to 9 July). However, there may be years when it is unavoidable. Given the limits proposed, the absolute maximum suitable habitat area that could be disturbed by above ambient noise per year would be 930 acres (ten 15 acre individual polygons in old-growth plus five 15 acre individual polygons in 40 plus year old second-growth – each surrounded by a 500 foot noise buffer zone). If this worst case scenario were to occur every year for the five years of the program, then a maximum of 4,650 acres of suitable, unsurveyed spotted owl nesting habitat would be disturbed by noise. It is highly unlikely that such a worst case scenario will occur, particularly every single year. It is expected that SOD infection treatment areas will be clustered, thus shrinking their noise footprint, and that only some infected areas will have to be treated during the noise restriction period while most will be treated after July 9th and before February 1st.

Habitat

SOD infected areas treated within old-growth will not be rendered unsuitable habitat for spotted owls post treatment because only subcanopy tanoak and bay laurel trees and rhododendron shrubs will be removed. The canopy of all old-growth areas within the parks are made up of conifers that will not be felled, thus, there will be no reduction in canopy cover. All logs and snags will be retained, providing owl nesting (snags) and abundant prey habitat (snags and logs).

There will, however, be a lowering of spotted owl nesting habitat quality due to the removal of some potentially suitable nesting cavities and platforms formed by large tanoaks and bay laurel trees that may be felled. The habitat quality diminution will be minimal, however, due to the abundant large tanoaks and bay laurels in untreated areas immediately adjacent to treated areas as well as large cavity and platform forming conifers and other large untreated hardwoods within treated areas. Prey habitat, again in the form of denning cavities and platforms, will be affected similarly as spotted owl nesting habitat.

SOD infected areas treated within suitable second-growth forest (defined broadly as >40 year old stands in RNSP) will not be rendered unsuitable habitat for spotted owls post treatment because only tanoak and bay laurel trees and rhododendron shrubs will be removed. In order for a stand of second-growth to be rendered unsuitable for spotted owls, canopy cover would have to be lowered below 60%. The vast majority of RNSP's second-growth stands greater than 40 years old are not made up of canopies where tanoak and bay laurel make up more than 40% of the canopy. Only very limited areas (less than 100 acre polygons) within the Coyote Creek, Copper Creek and Rock Creek drainages that are suitable spotted owl habitat have canopies dominated by tanoak and bay laurel. These polygons are surrounded by conifer dominated and/or other hardwood dominated canopies (RNSP unpub. data., L. Arguello pers. comm.). It is impossible to model exactly where SOD treatment areas are likely to occur, but under no spatial combination would a significantly large area, or areas in aggregate, within a hypothetical spotted owl territory, be reduced below suitability levels due to the proposed SOD treatment prescription.

Injury or Harm

The only potential for injury or harm from the proposed action is from the felling of a tanoak or bay laurel large enough to contain a suitable, and occupied, nesting cavity or platform within unsurveyed, suitable spotted owl nesting habitat during the nesting and post fledging period. The scenario would have to occur in the highly unlikely event that a brooding adult and/or an unfledged owlet was still in an unknown nest in a tree that was felled or a fledged owlet was roosting in a felled tree. The scenario is unlikely because there are few territorial spotted owl pairs left in RNSP (10% or less of all territories inventoried are still active) due to the multi-decadal invasion of barred owls (RNSP 2011). Despite the few known active spotted owl territories left in the parks, minimization measures will be taken to prevent harm or injury to spotted owls. As stated in the proposed action, a full spot check (spotted owl calling) and visual survey of all trees to be cut will be made to look for potential suitable nesting cavities or platforms and roosting adults or fledged juveniles in unsurveyed suitable habitat. Any trees that contain potentially suitable nesting cavities or platforms will not be cut until after the spotted nesting period (1 February to 31 July). Information about historic nesting may be gleaned from the examination of felled trees containing suitable cavities. If any spotted owls are discovered within a treatment polygon, then no shrub or tree cutting will occur within that polygon and RNSP will reconsult with the USFWS.

2. Marbled Murrelet

Disturbance

All attempts will be made to not treat SOD infected areas with chainsaws that are in or within 500 feet of suitable marbled murrelet nesting habitat during the noise restriction period (24 March to 15 September). However, there may be years when it is unavoidable. Given the limits proposed, the absolute maximum suitable habitat area that could be disturbed per year by above ambient noise would be 660 acres (ten 15 acre individual polygons in old-growth – each surrounded by a 500 noise buffer zone). If this worst case scenario were to occur every year for the five years of the program, then a maximum of 3,300 acres of suitable marbled murrelet nesting habitat would be disturbed by noise. It is highly unlikely that such a worst case scenario will occur, particularly every single year. It is expected that SOD infection treatment areas will be clustered, thus shrinking their noise footprint, and that only some infected areas will have to be treated during the noise restriction period while many will be treated after September 15th and before March 24th.

Habitat and Critical Habitat

SOD infected areas treated within suitable marbled murrelet nesting habitat will not be rendered unsuitable post treatment because only subcanopy tanoak and bay laurel trees and rhododendron shrubs will be removed. No nesting trees with suitable nesting platforms will be felled or damaged. A minimal amount of nesting habitat degradation may occur over an unknown number of acres due to the felling of large tanoaks and bay laurel that may be providing visual cover for some suitable nest platforms. In general, the majority of suitable nest platforms in RNSP are above the height of the tallest tanoaks and bay laurels because they occur on large, old-growth redwood trees that sprout suitably large limbs well above the hardwood subcanopy (pers. obs.). Additionally, no known marbled murrelet nests have occurred in locations where large tanoaks or bay laurels provided direct visual cover in RNSP (Golightly et al. 2009, RNSP unpub. data).

Injury and Harm

No nesting marbled murrelets will be harmed or injured by the proposed action because no felled trees will be allowed to strike any suitable nest platform limbs or trees.

4. Fisher

Disturbance

All attempts will be made to not treat SOD infected areas with chainsaws that are in unsurveyed, suitable fisher habitat during the noise restriction period (1 March to 15 June). However, there may be years when it is unavoidable. Given the limits proposed, the absolute maximum suitable habitat area that could be disturbed per year would be 930 acres (ten 15 acre individual polygons

in old-growth plus five 15 acre individual polygons in 40 plus year old second-growth – each surrounded by a 500 foot noise buffer zone). If this worst case scenario were to occur every year for the five years of the plan then a maximum of 4,650 acres of suitable, unsurveyed fisher denning habitat would be disturbed by noise. It is highly unlikely that such a worst case scenario will occur, particularly every single year. It is expected that SOD infection treatment areas will be clustered, thus shrinking their noise footprint, and that only some infected areas will have to be treated during the noise restriction period while most will be treated after June 15th and before March 1st.

Habitat

SOD infected areas treated within old-growth will not be rendered unsuitable habitat for fishers post treatment because only subcanopy tanoak and bay laurel trees and rhododendron shrubs will be removed. The canopy of all old-growth areas within the parks are made up of conifers that will not be felled, thus, there will be no reduction in canopy cover. All logs and snags will be retained, providing fisher denning and abundant prey habitat. There will, however, be a lowering of fisher denning habitat quality due to the removal of some potentially suitable denning cavities formed by large tanoaks and bay laurel trees that may be felled. Tanoak acorn mast will also be decreased, resulting in less prey food sources and subsequently potentially less fisher prey. The habitat quality diminution will be minimal, however, due to the abundant large tanoaks and bay laurels in untreated areas immediately adjacent to treated areas. Prey habitat, again in the form of denning cavities and platforms, will be affected similarly as fisher denning habitat.

SOD infected areas treated within suitable second-growth forest (defined broadly as >40 year old stands in RNSP) will not be rendered unsuitable habitat for fishers post treatment because only tanoak and bay laurel trees and rhododendron shrubs will be removed. In order for a stand of second-growth to be rendered unsuitable for fishers, canopy cover would have to be lowered below 60%. The vast majority of RNSP's second-growth stands greater than 40 years old are not made up of canopies where tanoak and bay laurel make up more than 40% of the canopy. Only very limited areas (less than 100 acre polygons) within the Coyote Creek, Copper Creek and Rock Creek drainages that are suitable fisher habitat have canopies dominated by tanoak and bay laurel. These polygons are surrounded by conifer dominated and/or other hardwood dominated canopies (RNSP unpub. data., L. Arguello pers. comm.). It is impossible to model exactly where SOD treatment areas are likely to occur, but under no spatial combination would a significantly large area, or areas in aggregate, within a hypothetical fisher territory, be reduced below suitability due to the proposed SOD treatment prescription. Similar to the effect in old growth stands, there will, however, be a lowering of fisher denning habitat quality due to the removal of some potentially suitable denning cavities formed by large tanoaks and bay laurel trees that may be felled. Tanoak acorn mast will also be decreased, resulting in less prey food sources and subsequently potentially less fisher prey. Again, the effect will be minimal over the next five years due to the abundant tanoaks and bay laurels in untreated areas immediately adjacent to treated areas. Prey habitat, again in the form of denning cavities and platforms, will be affected similarly as fisher denning habitat.

Injury or Harm

The only potential for injury or harm from the proposed action is from the felling of a tanoak or bay laurel large enough to contain a suitable and occupied denning cavity or platform within unsurveyed, suitable fisher denning habitat during the denning period. These types of trees almost exclusively exist in old-growth stands. Almost all hardwoods were removed in cut over areas of RNSP, very few residual large old hardwoods remain in second-growth forest (RNSP unpub. data, L. Arguello pers. comm.). The scenario would have to occur in the unlikely event that a den tree was felled while occupied by an adult female and kits. The large cavity protection measures described for spotted owls will prevent the felling of most suitable denning trees. There will likely be few occasions that SOD treatment will occur during the fisher denning season (1 March to 15 June) because of the wet working conditions present during that time of the year (L. Arguello pers. comm.). However, fishers can den in relatively small, hard to detect cavities. Thus, there is the potential that an unknown, but minimal, number of occupied fisher den trees could be felled during that time period. All attempts will be made to avoid or minimize this possibility.

5. Bald Eagle

Disturbance

No SOD infected areas will be treated with chainsaws near (i.e. within 0.25 miles) any known, occupied bald eagle nests during the noise restriction period (1 January to 31 August). Only two active territories are known to occur within RNSP (RNSP 2012). Both sites are monitored by park staff and so these areas will be easily planned around if they are occupied by eagles. Nesting bald eagles are active and obvious in their defense of nests, and so any unknown eagle nests will be easily discovered by park biologists during the pre-SOD treatment phase of any area where actions will take place and subsequently avoided during the noise restriction period.

Habitat

SOD infected areas treated within suitable bald eagle habitat (i.e. old-growth stands or residual old-growth trees) will not be rendered unsuitable habitat for bald eagles post treatment because only subcanopy tanoak and bay laurel trees and rhododendron shrubs will be removed. Suitable nest and pilot trees within the parks are made up of large conifers that will not be felled, thus, there will be no reduction in available nest or pilot trees.

Injury or Harm

There is no possibility to injure or harm any individual bald eagles from the proposed action because no tree felling will occur within 0.25 miles of any known or discovered bald eagle nest during the nesting period when adults or juveniles would be vulnerable within a nest tree.

B. Cumulative Effects

Cumulative effects are defined as all those state, tribal, local, and private actions that are reasonably certain to occur in the future that have the potential to impact listed species in the parks. SOD management activities will likely occur on adjacent private parcels and private timber lands that may cause additional impacts to the species considered in this document.

VII. DETERMINATION

Based on the nature and timing of the proposed actions, it is determined that the Sudden Oak Death Management Program in RNSP will have the following effects on the federal and state threatened, endangered and candidate species listed in this document:

may affect, likely to adversely affect spotted owls due to noise disturbance over a maximum of 930 acres/year or 4,650 total acres (over five years) of suitable nesting habitat – total disturbance acres will likely be much less than the maximum;

may affect, likely to adversely affect marbled murrelets due to noise disturbance over a maximum of 660 acres/year or 3,300 total acres (over five years) of suitable nesting habitat – total disturbance acres will likely be much less than the maximum;

may affect, likely to adversely affect fishers due to noise disturbance over a maximum of 930 acres/year or 4,650 total acres (over five years) of suitable denning habitat – total disturbance acres will likely be much less than the maximum;

may affect, not likely to adversely affect bald eagles.

VIII. MANAGEMENT RECOMMENDATIONS

RNSP is currently coordinating with adjacent land owners on their response to SOD management; this coordination should continue.

XIV. CONTRIBUTORS

Keith Bensen, Fish and Wildlife Biologist, Redwood National Park – analysis and report preparation.

Leonel Arguello, Vegetation Management Branch Chief, Redwood National Park – proposed action preparation.

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Appendix 1 – Tiering Form

**Redwood National and State Parks
Sudden Oak Death Management Program
Project Tiering Form**

Today's Date:

Project Name:

Project Location and Treatment Area(s) Size in Acres:

Proposed Implementation Date(s):

Preliminary Dates for Site Visit with RNSP Biologist:

Brief Description of Methods and Associated Activities:

Project Leader (name and phone extension):



United States Department of the Interior

FISH AND WILDLIFE SERVICE

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In Reply Refer To:
AFWO-13B0005-13F0010

APR 12 2013

Memorandum

To: Park Superintendents, Redwood National and State Parks
Crescent City, California

From: Field Supervisor, Arcata Fish and Wildlife Office
Arcata, California

Subject: Formal Consultation and Conference on the Sudden Oak Death Management
Program in Redwood National and State Parks, Humboldt and Del Norte
Counties, California

Nathan T. Hark
Acting Field Supervisor
4-12-2013

This document transmits the Fish and Wildlife Service's (Service) biological and conference opinions based on our review of the proposed implementation of the "Sudden Oak Death Management Program" in Redwood National and State Parks (Parks), Humboldt and Del Norte counties, California, and its effect on the Federally listed as threatened marbled murrelet (*Brachyramphus marmoratus*; hereafter, murrelet) and northern spotted owl (*Strix occidentalis caurina*; hereafter, spotted owl); and the fisher (*Martes pennanti*), a Federal candidate species, in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*). Your request for formal consultation and conference, dated October 17, 2012, was received on October 24, 2012.

These biological and conference opinions are based on information provided in the October 2012 biological assessment (Parks 2012) and other sources of information. A complete record of this consultation is on file at this office.

Consultation History

The Service has not previously issued a biological opinion to the Parks regarding management actions specifically related to the management of Sudden Oak Death syndrome (hereafter, SOD). During interagency coordination meetings in 2011, Park biologist Keith Bensen and Vegetation Management Branch Chief Leonel Arguello provided information regarding SOD and proposed management actions to Service staff biologist Bill McIver, and discussed the need for a formal consultation with the Service to properly implement management actions to effectively address SOD.

BIOLOGICAL AND CONFERENCE OPINIONS

DESCRIPTION OF THE PROPOSED ACTION

Background

SOD is caused by *Phytophthora ramorum*, an invasive plant pathogen with suspected origins in Asia. Millions of oaks (genus *Quercus*) and tanoaks (*Lithocarpus densiflorus*) have been killed by this pathogen in forests and wildland-urban interfaces of coastal California covering an estimated 2 million acres since the disease became evident in the mid 1990's. Some watersheds have lost over 90 percent of their tanoak component. Extensive areas of mortality have led to concerns about changes in fire frequency and intensity, changes in species composition resulting in shifts in ecosystem processes and function; loss of food resources and habitat for wildlife; and decreased water quality due to an increase in exposed soil surfaces. The disease has killed oaks and tanoaks over thousands of acres in southern Humboldt County to the south of the Parks and is found in small, isolated locations in Curry County, Oregon to the north of the Parks. A wide variety of host plants can harbor *P. ramorum* but not die from the disease. Some of these host plants serve as primary vectors for the pathogen including California bay laurel (*Laurus nobilis*), rhododendron (genus *Rhododendron*), and huckleberry (genus *Vaccinium*) which are commonly found in the parks.

P. ramorum spreads from tree to tree as zoospores or sporangia in water including rain splash, drip and stem flow. Local spread is facilitated by transfer of sporangia dislodged from upper crown infections in clouds and wind driven rain. Most newly infected trees are found within about 300 to 600 feet of previously infected trees, a pattern consistent with wind and rain dispersal. However, new disease sites have been detected up to three miles from nearest known infested areas. This type of longer distance or landscape scale spread is believed to be facilitated by turbulent transfer of sporangia dislodged from upper crown infections in storm driven wind events. Extremely long distance spread of *P. ramorum* occurs when infected live plant stock is moved from place to place, such as nursery plants.

SOD has been positively identified on tanoak trees in the Redwood Creek drainage several miles upstream and south of the Parks. "Leaf baiting" (i.e., testing for presence of *P. ramorum* pathogen using cloth bags filled with leaves) in Redwood Creek near Orick, approximately 15 miles downstream of the infestation site, has confirmed the presence of the SOD organism in the creek. Redwood National Park is located between the infection site and the bait station in Orick, with high visitor use areas such as the Redwood Creek trail and Tall Trees Grove on or intersecting the waters of Redwood Creek. It can thus be assumed that SOD will become established in the Parks soon.

Proposed Action

SOD can become established in any forested area within the parks and thus the exact location of any potential treatment area is unknown. A similar set of evaluation criteria and possible actions, however, are being proposed to determine the appropriate response and management to

the discovery of an initial infestation. The proposed SOD management is thus programmatic and not time or site specific.

Monitoring for SOD will be conducted throughout the Parks' forested areas. Upon discovery, the extent of the infestation will be mapped, and an inventory of the stand will be taken to determine the presence and cover of tanoaks, California bay laurel, rhododendron, and huckleberry in close proximity of the infection site. If tanoak and California bay laurel trees are absent within 300 feet of an infection, no action is contemplated. If tanoak or bay laurel trees are present, the extent of the infestation will be mapped, and a 300 foot buffer will be extended around the infected site. All tanoaks, California bay laurel, rhododendron or huckleberry, greater than 1 foot tall, will be cut down with chainsaws by hand crews within the established 300 foot buffer zone. All attempts will be made to fall target tree/shrub species away from non-target tree species. Cut materials will be bucked to get them in contact with the ground and all materials will be left on site. The goal of the treatment will be to get infected trees and shrubs, and nearby potentially infected trees and shrubs, to the ground so that they cannot facilitate the release of *P. ramorum* spores into the air during rain and wind events – thus preventing the spread of the disease into adjacent stands. Both monitoring crews and treatment crews will disinfect all gear prior to leaving an infected site.

No mechanical removal or burning of cut material is proposed on National Park Service (NPS) lands, unless those activities have been already approved as part of a separate management effort (e.g. second-growth forest restoration, watershed restoration, fire management). Small pile burning may occur on California State Parks (CSP) lands. CSP pile burning will only occur outside of the murrelet, spotted owl, and Pacific fisher breeding season restriction periods in or within 500 feet of each species' respective suitable habitats (24 March – 15 September, 1 February – 9 July, 1 January – 31 August, 1 March – 15 June, respectively) in order to minimize drifting smoke from disturbing or affecting immobile nesting/denning adults and juveniles. Stumps and cut stobs will be painted with herbicide, Roundup™ or Aquamaster™, to prevent resprouting on NPS lands, but not on CSP lands. No herbicide will be used in riparian areas (150 foot buffers zones extending from bank full width) on NPS lands. Resprouts in riparian areas will be hand cut in out years until resprouting ceases. No herbicide will be sprayed.

A single tree SOD infection will result in a 7-acre treatment area. Multiple infected trees in one location with 300ft buffer areas overlapping will be joined together to form a single treatment area (polygon). The maximum single treatment area size will be dependent on the canopy cover of the tanoak and bay laurel trees in combination. The maximum cumulative total of all treatment areas for the lifespan of this consultation (2013 through 2017) will also be dependent on the canopy cover of tanoak and bay trees in combination. Finally, the linear feet limit of treated riparian area trees that contribute to stream shading will also vary depending on the canopy cover of tanoak and bay trees in combination (Table 1).

Post treatment monitoring will occur in each treated area every year to determine SOD persistence, as indicated by symptomatic host species within or adjacent to the treated area. Any infected resprouts will be removed by non-mechanized hand tools during the noise restriction periods in or within 500 feet of suitable murrelet, spotted owl and Pacific fisher habitat (24 March – 15 September, 1 February – 9 July, 1 March – 15 June, respectively), or within 0.25

mile of known bald eagle nests (1 January to 31 August), otherwise the most efficient tool available will be used to control resprouts, including chainsaws.

The exact location(s), date(s), and amount of suitable spotted owl, murrelet and fisher habitats affected by SOD management activities would be reported in the Parks' annual incidental take report to the Service.

Table 1. Relative canopy cover of California bay and tanoak trees at infection sites in the Parks.

	Relative Canopy Cover at Infection Site		
	0 to 25% of the canopy cover	26% to 50% of the canopy cover	51% to 75% of the canopy cover ^①
Average stand canopy cover = 50 to 75 percent	50-acre total treatment polygon	25-acre total treatment polygon	13-acre total treatment polygon
Average stand canopy cover = 76 to 100 percent	100-acre total treatment polygon	40-acre total treatment polygon	25-acre total treatment polygon
Maximum Cumulative Treated Area 2012 – 2017	Unlimited	500 acres	100 acres
Maximum Length of Shading Riparian Area Treated Per Stream	Unlimited	2,000 feet	1,000 feet

Tiering

Specific SOD management projects would be tiered to this biological opinion through use of the tiering form attached in Appendix 2 of the Biological Assessment (Redwood National and State Parks 2012). Tiered projects would be reviewed by the Parks biologist to ensure consistency with the project description in this biological opinion and Redwood National and State Parks (2012).

Conservation Measures

Tree and shrub cutting could occur at any time of the year, regardless of location. However, all attempts will be made to restrict the use of chainsaws to outside of the murrelet, spotted owl, and fisher noise restriction periods in, or within 500 feet of each species respective suitable, unsurveyed and assumed occupied habitats (24 March – 15 September, 1 February – 9 July, 1 March – 15 June, respectively) in order to minimize disturbance. Adherence to the noise restrictions may not always be possible, due to staff, funding, safety, and weather restrictions. SOD treatment must occur during the first dry season post discovery to be effective, thus limiting work timing flexibility. The Parks propose to implement the following conservation measures:

1. If tree and shrub cutting must occur in or within 500 feet of suitable murrelet habitat during the murrelet noise restriction period, then chainsaw use will be restricted to the

period from 2 hours after sunrise to 2 hours before sunset to minimize noise disturbance during the key crepuscular period.

2. If tree and shrub cutting must occur within unsurveyed, suitable spotted owl nesting and roosting habitat during the spotted nesting season (1 February to 31 July) or post fledging period (9 July to 15 September), then a full spot check (spotted owl calling) and visual survey of all trees to be cut will be made to look for potential suitable nesting cavities or platforms and roosting adults or fledged juveniles.
3. Any trees that contain potentially suitable nesting cavities or platforms will not be cut until after the spotted nesting period (1 February to 31 July).
4. If any spotted owls are discovered within a treatment polygon, then no shrub or tree cutting will occur within that polygon and the Parks will re-consult with the Service.
5. If SOD treatment using chainsaws must occur during the murrelet, spotted owl and/or Pacific fisher noise restriction periods (24 March – 15 September, 1 February – 9 July, 1 March – 15 June, respectively) in unsurveyed, suitable habitat, then an absolute maximum area treated limit will be used (Table 2).

Table 2. Maximum SOD area treated using chainsaws during the murrelet, spotted owl and/or Pacific fisher noise restriction periods (24 March – 15 September, 1 February – 9 July, 1 March – 15 June, respectively) in or within 500 feet of each species respective, unsurveyed habitat.

	Area Treated per Year	Total Area Treated Over 5 Year Plan
Within 500 Feet of Unsurveyed Marbled Murrelet/Spotted Owl/Pacific Fisher Habitat (i.e., old- growth forest)	10 x 15-acre polygons totaling 150 acres	750 acres
Within 500 Feet of Unsurveyed Spotted Owl/Pacific Fisher Habitat (i.e., 40 plus year old second- growth forest)	5 x 15-acre polygons totaling 75 acres	375 acres

Recovery Measures

The Parks are not proposing to include any recovery measures as part of the proposed action.

STATUS OF THE SPECIES

Murrelet

Legal Status

The murrelet was listed as a threatened species¹ on September 28, 1992, in Washington, Oregon, and northern California (57 Federal Register (FR) 45328 [October 1, 1992]). On May 24, 1996, the Service designated 3,887,800 acres (ac) (1,573,337 hectares [ha]) of land as critical habitat for the murrelet in Washington, Oregon, and California; 693,200 ac (17.8 percent; 280,528 ha) of this land occurs in northern California (61 FR 26256). Since the species' listing, the Service has completed two 5-yr status reviews of the species: September 1, 2004 (Service 2004) and January 21, 2010 (75 FR 3424). The legal status of the murrelet remains unchanged from the original designation.

Threats to Murrelet Survival and Recovery

Murrelets are long-lived seabirds that spend most of their life in the marine environment, with breeding adult birds annually nesting in the forest canopy of mature and old-growth forests from about March 24 through September 15. Murrelets have a naturally low reproductive rate. Murrelets lay just one egg, and are thought to usually first breed at three years of age. Re-nesting in the event of nest failure appears to be uncommon, although some pairs do re-nest (Hébert et al. 2003a; Piatt et al. 2007).

Several threats to murrelets, present in both the marine and terrestrial environments, have been identified. These threats collectively comprise a suite of environmental stressors that, individually or through interaction, have significantly disrupted or impaired behaviors which are essential to the reproduction or survival of individuals. When combined with the species naturally low reproductive rate, these stressors have led to declines in murrelet abundance, distribution, and reproduction at the population scale within the listed-range.

When the murrelet was listed under the Act (57 FR 45333 [October 1, 1992]) and threats summarized in the Recovery Plan (Service 1997, pp. 43-76), several anthropogenic threats were identified as having caused the dramatic decline in the species, including:

- habitat destruction and modification in the terrestrial environment from timber harvest and human development caused a severe reduction in the amount of nesting habitat
- unnaturally high levels of predation resulting from forest "edge effects;"
- the existing regulatory mechanisms, such as land management plans (in 1992), were considered inadequate to ensure protection of the remaining nesting habitat and reestablishment of future nesting habitat; and
- manmade factors such as mortality from oil spills and entanglement in fishing nets used in gill-net fisheries.

¹ The Act defines a threatened species as a species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

There has been a decrease in the magnitude of some threats since the 1992 listing (Service 2004, pp. 11-12; Service 2009, pp. 27-67). For example, the regulatory mechanisms implemented since 1992 that affect land management in Washington, Oregon, and California (for example, the Northwest Forest Plan [NWFP]) and new gill-netting regulations in northern California and Washington have reduced the magnitude of threats to murrelets (Service 2004, pp. 11-12). The magnitude of threat for the other threats identified in 1992 listing (57 FR 45333 [October 1, 1992]), including loss of nesting habitat, predation rates, and mortality risks from oil spills and gill net fisheries (despite the regulatory changes) remained unchanged following the Service's 2004, 5-year, range-wide status review for the murrelet (Service 2004, pp. 11-12).

However, new threats were identified in the Service's 2009, 5-year review for the murrelet (Service 2009, pp. 27-67). These new stressors are due to several environmental factors affecting murrelets in the marine environment. These new stressors include:

- Habitat destruction, modification, or curtailment of the marine environmental conditions necessary to support murrelets due to:
 - elevated levels of polychlorinated biphenyls in murrelet prey species;
 - changes in prey abundance and availability;
 - changes in prey quality;
 - harmful algal blooms that produce biotoxins leading to domoic acid and paralytic shellfish poisoning that have caused murrelet mortality; and
 - climate change in the Pacific Northwest.
- Manmade factors that affect the continued existence of the species include:
 - derelict fishing gear leading to mortality from entanglement;
 - energy development projects (wave, tidal, and on-shore wind energy projects) leading to mortality; and
 - disturbance in the marine environment (from exposures to lethal and sub-lethal levels of high underwater sound pressures caused by pile-driving, underwater detonations, and potential disturbance from high vessel traffic; particularly a factor in Washington state).

Detailed discussions of the above-mentioned threats, life-history, biology, and status of the murrelet are described in the listing rule for the murrelet (57 FR 45328 [October 1, 1992]); the Recovery Plan; Ecology and Conservation of the Marbled Murrelet (Ralph et al. 1995); the final rule designating murrelet critical habitat (61 FR 26256 [May 24, 1996]); the Evaluation Report in the 5-Year Status Review of the Marbled Murrelet in Washington, Oregon, and California (McShane et al. 2004); the 2004 and 2009, 5-year reviews for the Marbled Murrelet (Service 2004; Service 2009), and the final rule revising critical habitat for the murrelet (76 FR 61599 [October 5, 2011]).

Nesting Habitat Abundance

The destruction, modification, or curtailment of nesting habitat from logging, urbanization, and land use conversion has generally been regarded as the most influential environmental stressor that led to the 1992 Federal listing of the species under the Act. The Service estimates that over 80 percent of the historic nesting habitat has been rendered unsuitable for nesting (57 FR 45328 [October 1, 1992]). Because of the important role nesting habitat plays in the survival and recovery of the species, significant attention has been given to describing the quality, quantity, and location of the remaining nesting habitat and planning for the restoration of nesting habitat in California, Oregon, and Washington.

Loss of Nesting Habitat Since 1992

The Service has determined that the rate of habitat loss has declined since listing, particularly on Federal lands due to implementation of the NWFP (Service 2004, pp. 11 and 13). Between 1992 and 2003, the estimated loss of suitable murrelet habitat totaled 22,398 acres in Washington, Oregon, and California combined, of which 5,364 acres resulted from timber harvest and 17,034 acres resulted from natural events (McShane et al. 2004, pp. 4-64). Those data primarily represented losses on Federal lands, and did not include data for most private or State lands within the murrelet's range.

More recent data on habitat losses, and from all ownerships, comes from the NWFP Effectiveness Monitoring (EM) Program. More recent data on habitat losses, and from all ownerships, comes from the NWFP Effectiveness Monitoring (EM) Program. The NWFP EM Program used spatial habitat models to estimate distribution and losses of potential suitable murrelet nesting habitat on Federal and non-Federal lands within the five Conservation Zones in the NWFP area, as follows: during the 1994-2007 time period in California, and during the 1996-2006 time period in Oregon and Washington (Raphael et al. 2011). Results indicate that losses of potential nesting habitat have been greater than previously estimated, with losses ranging from 270,000 to 490,000 acres of higher-suitability habitat in the 5-Conservation Zone area (amount of loss depends on the method of calculating losses, as discussed below and in Raphael et al. 2011). Of this habitat loss, about 72,000 to 77,000 acres (16 to 26%) occurred on Federal lands and about 200,000 to 414,000 acres (74 to 84%) on non-Federal lands. Fire was the primary cause of loss (74%) on Federal lands during this period, followed by timber harvest (20%, about 15,300 acres), although timber harvest caused most loss (95%) on nonfederal lands (Raphael et al. 2011). Most of the fire loss on Federal lands was associated with the 2002 Biscuit Fire in southwestern Oregon.

Current Amount of Nesting Habitat

McShane et al. (2004, p. 4-2), reviewed and summarized habitat estimates from 16 sources and estimated the amount of murrelet nesting habitat at 2,223,048 acres distributed throughout Washington, Oregon, and California (McShane et al. 2004, p. 4-5). Washington State contains almost half of all remaining nesting habitat with an estimated 1,022,695 acres or 48 percent of the total. Approximately 93 percent (2,000,000 acres) are reported to occur on Federal lands (McShane et al. 2004, p. 4-10).

Recently, Raphael et al. (2011) used models to predict the amount, location, and distribution of potentially suitable murrelet nesting habitat. Their habitat model used the Maximum Entropy (Maxent) methodology (Phillips and Dudik 2008) to compare vegetation and physical attributes for known murrelet occupied polygons or nest locations with conditions over the entire range of forested lands in which murrelets occurred. The resulting habitat maps ranked suitability as the nesting habitat throughout most of the listed range, relative to conditions at those known nest locations and occupied sites. Separate models and maps were developed for Washington, Oregon and California for a baseline year of 1994-1996, resulting in maps of habitat suitability broken into four classes, ranging from lowest (Class 1) to highest (Class 4) suitability nesting habitat, each with acreage estimates (Table 3; Conservation Zone 6 is not included, as it was outside the analysis area [the NWFP area]). In Washington, 2.3 million acres of habitat were classified as "higher suitability" (Classes 3 plus 4), of which 1.0 million acres were in the "highest suitability" class (Class 4). In Oregon, 1.4 million acres of habitat were classified as higher suitability, of which 0.6 million acres were Class 4. In California, about 133,000 acres of habitat were rated as higher suitability, of which about 51,000 acres of habitat were Class 4.

The above estimates are for the baseline period of 1994 (California) or 1996 (Oregon and Washington). Raphael et al. (2011) also provide more estimates of habitat, based on projecting the same Maxent habitat suitability models onto maps with vegetation conditions in 2006-2007. They also used separate "LandTrendr" spatial data on vegetation change (Kennedy et al. 2010) to refine the estimates of habitat loss as determined by the model projections. This helped identify likely causes of habitat loss, and provided estimates of suitable nesting habitat in 2006-2007. As detailed in Raphael et al. (2011), they used two methods to estimate habitat in those years, resulting in a range of estimates. The estimated amount of higher-suitability habitat (Class 3 plus Class 4) in 2006 was 2.05 to 2.1 million acres, and 1.15 to 1.31 million acres, for Washington and Oregon, respectively; and for California in 2007 was 124,000 to 130,000 acres. Of the higher-suitability habitat present in 2006/2007, the largest percentage of habitat occurred on Federal lands in Oregon and Washington (67% and 69%, respectively). In California, large blocks of habitat occurs in state and county parks, and only 24% of higher-suitability habitat occurred on Federal lands; these totals do not include Conservation Zone 6. Overall, about 66% of all higher-suitability habitat was on Federal lands, mostly (59% of the total) on lands designated as "reserved" under the NWFP, and thus being managed for late-successional forest.

The Service believes the Raphael et al. (2011) models, which use characteristics of known (occupied) murrelet nest stands to estimate habitat abundance, distribution, and quality, represent the best available information on the subject. While not necessarily the best means to describe suitable habitat at the site scale, the Service expects these models have higher reliability for state or provincial-scale analysis compared to previous efforts.

Population Status

The initial at-sea surveys for murrelets that began during the 1990s in the marine waters of Washington, Oregon, and California were generally independent and sporadic efforts to assess murrelet population status (abundance, trends, distribution, and fecundity). In 1999, researchers developed the EM Program for the NWFP (Madsen et al. 1999), which brought a unified sampling protocol to assessing murrelet population status and trend for the coastal marine waters

offshore of the five Conservation Zones within the NWFP planning area. Standardized at-sea surveys using this protocol began in 2000, as part of the EM Program (Bentivoglio et al. 2002).

Table 3. Estimated amount and distribution of potential murrelet nesting habitat in baseline and most recent years with data, and losses owing to harvest, fire, and other causes from the baseline year to 2006/07^a (adapted from Raphael et al. 2011, Tables 5, 8, 9).

Land class	Higher suitability nesting habitat						
	Baseline (1994/96)	Recent (2006/07)	Losses				
			Fire	Harvest	Other	Total	(%)
Thousand acres							
Federal reserved							
Washington	1,387.7	1340.9	0.3	4.4	3.0	7.8	0.6
Oregon	745.2	716.4	51.2	4.3	0.6	56.1	7.5
California	30.2	30.7	0.1	0.1	0.1	0.3	1.1
Total	2,163	2088	51.6	8.8	3.7	64.2	3.0
Federal nonreserved							
Washington	113.8	105.9	0.0	1.0	0.3	1.3	1.2
Oregon	144.0	154.9	5.3	5.4	0.4	11.1	7.7
California	4.8	4.9	0.0	0.0	0.1	0.1	2.0
Total	263	266	5.3	6.5	0.8	12.6	4.8
Nonfederal							
Washington	802.8	653.1	0.3	229.4	13.8	243.5	30.3
Oregon	486.2	438.9	0.4	157.6	4.4	162.5	33.4
California	97.6	94.4	0.2	7.3	0.5	7.9	8.1
Total	1,386.6	1186	0.9	394.3	18.7	413.9	29.9
All lands							
Washington	2,304.3	2,099.9	0.6	234.9	17.1	252.6	11.0
Oregon	1,375.4	1,310.2	56.9	167.4	5.4	229.7	16.7
California	132.6	130.0	0.2	7.4	0.7	8.3	6.3
Total	3,812.3	3,540	57.8	409.6	23.2	490.7	12.9

^aNumbers are thousands of acres; totals were computed prior to rounding. Higher suitability potential nesting habitat includes class 3 (moderately high suitability) plus class 4 (highest suitability).

At-sea surveys are also conducted in Conservation Zone 6, independent of the EM Program, but conducted using similar survey methods. The at-sea survey data collected prior to the EM Program are generally not suitable for statistical comparisons or trend analyses due to differences in survey methods (McShane et al. 2004).

Piatt et al. (2007) modeled population growth rates of murrelets, and assumed that breeding adults comprised approximately 75 percent of after-hatch-year murrelets observed during at-sea surveys.

Abundance and Distribution

Murrelet abundance during the early 1990s in Washington, Oregon, and California was estimated at 18,550 to 32,000 birds (Ralph et al. 1995). Based primarily on the results from the EM Program, the 2011 murrelet population for the listed range (Table 4) is estimated at about 23,000 birds (95 percent confidence interval [CI]: 17,691 – 28,364; Table 4). This number is higher than in the previous four years, when estimates were consistently below 18,000 birds (Miller et al. 2012). Based on the 2011 estimates, Conservation Zones 3 and 4 support approximately 60 percent of the murrelet population within the U.S., and consistently have the highest at-sea densities during the nesting season (Falxa et al. 2011). Murrelets occur in the lowest abundance in Conservation Zones 5 and 6.

At the time of listing, the distribution of active nests in nesting habitat was described as non-continuous (Service 1997, p. 14). The at-sea extent of the species currently encompasses an area similar in size to the species' historic distribution, but with the extremely low density of murrelets in Conservation Zone 5, and the small population in Conservation Zone 6, the southern end of the murrelet distribution is sparsely populated compared to Conservation Zones 1-4.

Table 4. Estimates of murrelet density and population size (95 percent confidence interval (CI)) in Conservation Zones 1 through 5 during the 2011 breeding season (Northwest Forest Plan Effectiveness Monitoring Program), and in Conservation Zone 6 during the 2011 breeding season (Henry et al. 2012).

Conservation Zone	Density (birds/km ²)	Coefficient of Variation (% Density)	Population Size Estimates with 95% CI			Survey Area (km ²)
			Number of Birds	Lower	Upper	
1	2.06	18.0	7,187	4,512	9,745	3,497
2	0.72	32.2	1,189	597	2,060	1,650
3	4.65	16.4	7,417	5,200	10,078	1,595
4	5.61	29.9	6,507	3,349	10,214	1,159
5	0.32	44.2	282	57	564	883
6	-	-	433	339	553	-
Zones 1-6	-	-	23,015	17,691	28,364	-

The at-sea distribution also exhibits discontinuity within Conservation Zones 1, 2, 5, and 6, where five areas of discontinuity are noted: a segment of the border region between British Columbia, Canada and Washington, southern Puget Sound, Washington, Destruction Island, Washington to Tillamook Head, Oregon, Humboldt County, CA to Half Moon Bay, CA, and the entire southern end of the breeding range in the vicinity of Santa Cruz and Monterey Counties, CA (McShane et al. 2004, p. 3-70).

Trend

There are two general approaches that researchers use to assess murrelet population trend: at-sea surveys and population modeling based on demographic data. In general, the FWS assigns

greater weight to population trend and status information derived from at-sea surveys than estimates derived from population models because survey information generally provides more reliable estimates of trend and abundance.

Marine Surveys

Researchers from the EM Program detected a statistically significant decline ($p < 0.001$) in the abundance of the population in Conservation Zones 1 through 5 combined, for the 2001-2010 sample period (Miller et al. 2012). The estimated average annual rate of decline for this period was 3.7 percent (95 percent CI: -4.8 to -2.7 percent). This rate of annual decline suggests a total population decline of about 29 percent between 2001 and 2010 (Miller et al. 2012).

At the scale of individual conservation zones for this period, the murrelet population in Conservation Zone 1 declined at an estimated average rate of 7.4 percent per year (95 percent CI: -11.2 to -3.5) (Miller et al. 2012). In that same analysis, statistically significant trends were not detected elsewhere at the single-zone scale, but evidence of a declining trend was strong in Zone 2 (6.5% annual rate of decline, $P = 0.06$). For Washington State (Conservation Zones 1 and 2 combined) there was a 7.31 percent (standard error = 1.31 percent) annual rate of decline in murrelet density for the 2001-2010 period (Pearson et al. 2011, p. 10), which equates to a loss of approximately 47 percent of the murrelet population since 2001. Subsequent to this analysis, the 2011 estimate for Conservation Zones 1 through 5 combined (Table 4) increased markedly in 2011, reflecting substantially higher estimates in Conservation Zones 1 and 4, compared to the estimates from recent prior years as reported by Miller et al. (2012). Whether the higher 2011 estimates represent a change in murrelet numbers or trend, or a sampling artifact remains to be determined, pending additional years of population monitoring.

In Conservation Zone 6, the 2008 population estimate for Conservation Zone 6 suggested a decline of about 55 percent from the 2007 estimate and a 75 percent decline from the 2003 estimate (Peery et al. 2008). However, in the most recent population estimate available, the 2011 estimate were greater than the 2007-2008 estimates, and somewhat lower than the 1999-2003 estimates (Henry et al. 2012). Henry et al. (2012) speculated that their recent results may be explained by murrelets in central California moving out of the survey area in 2007 and 2008, and then subsequently returning.

Population Models

Prior to the use of survey data to estimate trend, demographic models were more heavily relied upon to generate predictions of trends and extinction probabilities for the murrelet population (Beissinger 1995; Cam et al. 2003; McShane et al. 2004; Service 1997). However, murrelet population models remain useful because they provide insights into the demographic parameters and environmental factors that govern population stability and future extinction risk, including stochastic factors that may alter survival, reproductive, and immigration/emigration rates.

In a report developed for the 5-year Status Review of the Marbled Murrelet in Washington, Oregon, and California (McShane et al. 2004, p. 3-27 to 3-60), computer models were used to forecast 40-year murrelet population trends. A series of female-only, multi-aged, discrete-time

stochastic Leslie Matrix population models were developed for each conservation zone to forecast decadal population trends over a 40-year period with extinction probabilities beyond 40 years (to 2100). The authors incorporated available demographic parameters (Table 5) for each conservation zone to describe population trends and evaluate extinction probabilities (McShane et al. 2004, p. 3-49).

McShane et al. (2004) used mark-recapture studies conducted in British Columbia by Cam et al. (2003) and Bradley et al. (2004) to estimate annual adult survival and telemetry studies or at-sea survey data to estimate fecundity. Model outputs predicted -3.1 to -4.6 percent mean annual rates of population change (decline) per decade the first 20 years of model simulations in murrelet Conservation Zones 1 through 5 (McShane et al. 2004, p. 3-52). Simulations for all zone populations predicted declines during the 20 to 40-year forecast, with mean annual rates of -2.1 to -6.2 percent per decade (McShane et al. 2004, p. 3-52). These reported rates of decline are similar to the estimates of -4 to -7 percent per year reported in the Recovery Plan (Service 1997, p. 5).

Table 5. Rangewide murrelet demographic parameter values based on four studies all using Leslie Matrix models.

Demographic Parameter	Beissinger 1995	Beissinger and Nur 1997*	Beissinger and Peery (2007)	McShane et al. 2004
Juvenile Ratio ($\bar{R}$)	0.10367	0.124 or 0.131	0.089	0.02 - 0.09
Annual Fecundity	0.11848	0.124 or 0.131	0.06-0.12	-
Nest Success	-	-	0.16-0.43	0.38 - 0.54
Maturation	3	3	3	2 - 5
Estimated Adult Survivorship	85 % - 90%	85 % - 88 %	82 % - 90 %	83 % - 92 %

*In Service (1997).

McShane et al. (2004, pp. 3-54 to 3-60) modeled population extinction probabilities beyond 40 years under different scenarios for immigration and mortality risk from oil spills and gill nets. Modeled results forecast different times and probabilities for local extirpations, with an extinction risk² of 16 percent and mean population size of 45 individuals in 100 years in the listed range of the species (McShane et al. 2004, pp. 3-58).

Reproduction

Data on breeding phenology dates have shown that murrelets in California have the longest breeding period in North America with incubation commencing on March 24, incubation ending on August 13, and the nestling period beginning April 23 and ending September 9 (Hamer and Nelson 1995). For murrelet populations throughout North America, data show that approximately 84 percent of young have fledged from their nests by August 18 (Hamer and Nelson 1995).

² Extinction was defined by McShane et al. (2004, p. 3-58) as any murrelet conservation zone containing less than 30 birds.

Generally, estimates of murrelet fecundity are directed at measures of breeding success, either from direct assessments of nest success in the terrestrial environment, marine counts of hatch-year birds, or computer models. Telemetry estimates are typically preferred over marine counts for estimating breeding success due to fewer biases (McShane et al. 2004, p. 3-2). However, because of the challenges of conducting telemetry studies, estimating murrelet reproductive rates with an index of reproduction, referred to as the juvenile ratio ($\bar{R}$),³ continues to be important, despite the debate over use of this index (see discussion in Beissinger and Peery 2007, p. 296).

Although difficult to obtain, nest success rates⁴ are available from telemetry studies conducted in California (Hébert and Golightly 2006; Peery et al. 2004) and Washington (Bloxtton and Raphael 2006). In northwest Washington, Bloxtton and Raphael (2005, p. 5) documented a nest success rate of 0.20 (2 chicks fledging from 10 nest starts). In central California, murrelet nest success is 0.16 (Peery et al. 2004, p. 1098) and in northern California it is 0.31 to 0.56 (Hébert and Golightly 2006, p. 95). No studies or published reports from Oregon are available.

Unadjusted and adjusted values for annual estimates of murrelet juvenile ratios suggest extremely low breeding success in Conservation Zone 4 (mean ratio for 2000-2011 of 0.046, range 0.01 to 0.1, Crescent Coastal Research 2012, p. 11), northern California (0.003 to 0.029 - Long et al. 2008, pp. 18-19; Crescent Coastal Research 2012, p. 11), central California (0.035 and 0.032 - Beissinger and Peery 2007, pp. 299, 302), and in Oregon (0.0254 - 0.0598 - Crescent Coastal Research 2008, p. 13). Estimates for $\bar{R}$ (adjusted) in the San Juan Islands in Washington have been below 0.15 every year since surveys began in 1995, with three of those years below 0.05 (Raphael et al. 2007, p. 16).

These current estimates of $\bar{R}$ are assumed to be below the level necessary to maintain or increase the murrelet population. Demographic modeling suggests murrelet population stability requires a minimum reproductive rate of 0.18 to 0.28 (95 % CI) chicks per pair per year (Beissinger and Peery 2007, p. 302; Service 1997). The estimates for $\bar{R}$ discussed above from individual studies, as well as estimates for the listed range (0.02 to 0.13; Table 2) are all below the lowest estimated value (0.18) identified as required for population stability (Service 1997, Beissinger and Peery 2007, p. 302).

The current estimates for $\bar{R}$ also appear to be well below what may have occurred prior to the murrelet population decline. Beissinger and Peery (2007, p. 298) performed a comparative analysis using historic data from 29 bird species to predict the historic $\bar{R}$ for murrelets in central California, resulting in an estimate of 0.27 (95% CI: 0.15 - 0.65). Therefore, the best available scientific information of current murrelet fecundity from model predictions, and from juvenile ratios and trend analyses based on of population survey data appear to align well. Both indicate that the murrelet reproductive rate is generally insufficient to maintain stable population numbers throughout all or portions of the species' listed range.

³ The juvenile ratio ($\bar{R}$) for murrelets is derived from the relative abundance of hatch-year (HY; 0-1 yr-old) to after-hatch-year (AHY; 1+ yr-old) birds (Beissinger and Peery 2007, p. 297) and is calculated from marine survey data.

⁴ Nest success here is defined by the annual number of known hatchlings departing from the nest (fledging) divided by the number of nest starts.

Summary: Murrelet Abundance, Distribution, Trend, and Reproduction

The 2010 estimated abundance for murrelets within Conservation Zones 1-5 was the lowest recorded since inception of the EM program (Falxa et al. 2011), with the 2010 population size for the listed range of the species estimated at 17,322 birds (95 percent CI: 13,524 – 21,192). The confidence limits indicate that population estimates are not precise, however this low number is consistent with a pattern of decreasing estimates from 2001 to 2010 (Falxa et al. 2011). Although murrelets are distributed throughout their historical range, the area of occupancy within their historic range appears to be reduced from historic levels. The distribution of the species also exhibits five areas of discontinuity: the British Columbia-Washington border region; southern Puget Sound, Washington; Destruction Island, Washington to Tillamook Head, Oregon; southern Humboldt County, California to Half Moon Bay, California; and the southern end of the breeding range including Monterey County and southern Santa Cruz County, California (McShane et al. 2004, p. 3-70).

The overall population trend from the combined 2001-2010 population estimates (Conservation Zones 1 – 5 combined) indicate a significant, range-wide annual rate of decline of about 3.7 percent (95 percent CI: -4.8 to -2.7 percent; Falxa et al. 2011). In addition, at the single-zone scale, a decline was observed for the Conservation Zone 1 population, and there is strong evidence for a decline in Conservation Zone 2 for the same period (Falxa et al. 2011).

The current range of estimates for $\hat{R}$, the juvenile to adult ratio, is below the level assumed to be necessary to maintain or increase the murrelet population. Whether derived from marine surveys or from population modeling ($\hat{R} = 0.02$ to 0.13 , Table 2), the available information is in general agreement that the current reproductive success, as indicated by the ratio of hatch year birds to after-hatch year birds, is insufficient to maintain a stable murrelet population throughout the listed range. The current estimates for $\hat{R}$ also appear to be well below what may have occurred prior to the murrelet population decline (Beissinger and Peery 2007, p. 298) and model predictions forecast an extinction risk of 16 percent over a 100-year period, with a 3-state mean population size of 45 individuals in 100 years in the listed portion of the species' range (McShane et al. 2004, p. 3-58).

Thus, considering the best available data on abundance, distribution, population trend, and the low reproductive success of the species, the Service concludes the murrelet population within the portion of its listed range currently has little or no capability to self-regulate, as indicated by the significant, annual decline in abundance the species is currently undergoing throughout the listed range. The Service expects the species to continue to exhibit further reductions in the distribution and abundance into the foreseeable future, due largely to the expectation that the variety of current environmental stressors present in the marine and terrestrial environments (discussed in the *Threats to Murrelet Survival and Recovery* section) will continue into the foreseeable future.

Recovery Plan

The Marbled Murrelet Recovery Plan (Service 1997; Plan) outlines the conservation strategy with both short- and long-term objectives. The Plan places special emphasis on the terrestrial environment for habitat-based recovery actions due to nesting occurring in inland forests.

In the short-term, specific actions identified as necessary to stabilize the population include protecting occupied habitat and minimizing the loss of unoccupied but suitable habitat (Service 1997, p. 119). Specific actions include maintaining large blocks of suitable habitat, maintaining and enhancing buffer habitat, decreasing risks of nesting habitat loss due to fire and windthrow, reducing predation, and minimizing disturbance. The designation of critical habitat also contributes towards the initial objective of stabilizing the population size through the maintenance and protection of occupied habitat and minimizing the loss of unoccupied but suitable habitat.

Long-term conservation needs identified in the Plan include:

- increasing productivity (abundance, the ratio of juveniles to adults, and nest success) and population size;
- increasing the amount (stand size and number of stands), quality, and distribution of suitable nesting habitat;
- protecting and improving the quality of the marine environment; and
- reducing or eliminating threats to survivorship by reducing predation in the terrestrial environment and anthropogenic sources of mortality at sea.

Recovery Zones

The Plan identified six Conservation Zones (Figure 1) throughout the listed range of the species: Puget Sound (Conservation Zone 1), Western Washington Coast Range (Conservation Zone 2), Oregon Coast Range (Conservation Zone 3), Siskiyou Coast Range (Conservation Zone 4), Mendocino (Conservation Zone 5), and Santa Cruz Mountains (Conservation Zone 6). Recovery zones are the functional equivalent of recovery units as defined by Service policy (Service 1997, p. 115).

Recovery Zones in California

Conservation Zone 4 extends from North Bend, Oregon to the southern end of Humboldt County, California. In general, it extends inland 35 miles (56 km) from the Pacific Ocean shoreline, and includes waters within 1.2 miles of the shoreline. Conservation Zone 5 extends south from the southern boundary of Humboldt County to the mouth of San Francisco Bay. It also includes marine waters within 1.2 miles of the Pacific Ocean shoreline, and extends inland a distance of up to 25 miles (40 km) from that shoreline. Conservation Zone 6 extends south from the mouth of San Francisco Bay to Point Sur, Monterey County, California; this zone includes marine waters within 1.2 miles of the Pacific Ocean shoreline, and extends inland a distance of up to 15 miles (24 km) from that shoreline (Service 1997, pp. 128-130).

Lands considered essential for the recovery of the murrelet within Conservation Zones 4, 5 and 6 are: (1) any suitable habitat managed by the Federal government in (Late Successional Reserves (LSRs) located in the Forest Ecosystem Management Assessment Team Zone 1 (see pages IV-23 and IV-24 in U.S. Department of Agriculture et al. 1993 for a description of this Zone 1); (2) other large areas of suitable habitat on Federal lands outside of LSRs; (3) large areas of suitable habitat on state lands within 25 miles (40 km) of the coast in California and Oregon; (4) suitable habitat on county park lands within 25 miles (40 km) of the coast in San Mateo and Santa Cruz Counties, California; and (5) suitable nesting habitat on Pacific Lumber Company (now Humboldt Redwood Company) lands in Humboldt County, California (Service 1997, pp. 131-133).

Marine areas in California considered essential for recovery of the murrelet include: (1) nearshore waters (within 1.2 miles of the shore) along the Pacific Coast from the Oregon-California border south to Cape Mendocino in northern California, including Humboldt and Arcata Bays, and river mouths; and (2) nearshore waters (within 1.2 miles of shore) along the Pacific Coast in central California from San Pedro Point south to the mouth of the Pajaro River (Service 1997, p. 135).

Conservation Needs of the Species

Reestablishing an abundant supply of high quality murrelet nesting habitat is a vital conservation need given the extensive removal during the 20th century. However, there are other conservation imperatives. Foremost among the conservation needs are those in the marine and terrestrial environments to increase murrelet fecundity by increasing the number of breeding adults, improving murrelet nest success (due to low nestling survival and low fledging rates), and reducing anthropogenic stressors that reduce individual fitness⁵ or lead to mortality.

The overall reproductive success (fecundity) of murrelets is directly influenced by nest predation rates (reducing nestling survival rates) in the terrestrial environment and an abundant supply of high quality prey in the marine environment during the breeding season (improving potential nestling survival and fledging rates). Anthropogenic stressors affecting murrelet fitness and survival in the marine environment are associated with commercial and tribal gillnets, derelict fishing gear, oil spills, and high underwater sound pressure (energy) levels generated by pile-driving and underwater detonations (that can be lethal or reduce individual fitness).

General criteria for murrelet recovery (delisting) were established at the inception of the Plan and they have not been met. More specific delisting criteria are expected in the future to address population, demographic, and habitat based recovery criteria (Service 1997, p. 114-115). The general criteria include:

- documenting stable or increasing population trends in population size, density, and productivity in four of the six Conservation Zones for a 10-year period, and;
- implementing management and monitoring strategies in the marine and terrestrial environments to ensure protection of murrelets for at least 50 years.

⁵ Fitness is measure of the relative capability of individuals within a species to reproduce and pass its' genotype to the next generation.

Thus, increasing murrelet reproductive success and reducing the frequency, magnitude, or duration of any anthropogenic stressor that directly or indirectly affects murrelet fitness or survival in the marine and terrestrial environments are the priority conservation needs of the species. The Service estimates recovery of the murrelet will require at least 50 years (Service 1997).

Summary

The level of risk posed by some threats to the murrelet population may have been reduced as a result of the species' listing under the Act, such as the passage of the Oil Pollution Act and implementation of the NWFP. However, the Service is not aware that any threats have been removed since listing and in some portions of the listed range, new threats (identified above) have been identified which affect the species at the local population or listed-entity scales. Currently, the Service expects these threats to continue into the foreseeable future and those that cause direct mortality or reduce individual fitness are likely to contribute to murrelet population declines.

Considering the life history characteristics of the murrelet, the species' capability to recover from the mortality or reduced-fitness stressors is extremely low. The low observed reproductive rate causes the murrelet population to be highly sensitive to mortality and fitness-reducing stressors, particularly when they occur at a frequency which exceeds the species' loss-replacement rate. Despite the relatively long life span of murrelets and a reasonably high adult survival rate, the annual replacement rates needed for long-term population maintenance and stability is currently well below the annual rate of individuals being removed from each Conservation Zone.

Therefore, given the interactive effect of an extremely low fecundity and the current threats facing the species, it is reasonable to predict that the murrelet populations (in each Conservation Zone) throughout the listed range are likely to continue to decline. The decline is expected to continue until murrelet fecundity is significantly improved and the anthropogenic stressors affecting fitness, survivorship, and nest success are eliminated or sufficiently reduced.

Spotted Owl

Legal Status

The spotted owl was listed as threatened on June 26, 1990, due to widespread loss and adverse modification of suitable habitat across the owl's entire range and the inadequacy of existing regulatory mechanisms to conserve the subspecies (55 FR 26114). On June 28, 2011, the Service completed a Revised Recovery Plan for the spotted owl (Service 2011).

Critical habitat for the spotted owl was first designated in 1992 (57 FR 1796), and revised in 2008 (73 FR 47326). The 2008 critical habitat designation included approximately 5,312,300 acres (2,149,800 hectares) of Federal lands in California, Oregon and Washington. On March 8, 2012, the Service proposed to revise critical habitat identifying approximately 13,962,449 acres (5,650,403 hectares) that meet the definition of critical habitat in 11 units and 63 subunits in California, Oregon, and Washington (77 FR 14062).

Taxonomy and Range

The spotted owl is one of three subspecies of spotted owls currently recognized by the American Ornithologists' Union: northern subspecies, Mexican subspecies (*S. o. lucida*), and California subspecies (*S. o. occidentalis*). The current range of the spotted owl extends from southwest British Columbia through the Cascade Mountains, coastal ranges, and intervening forested lands in Washington, Oregon, and California, as far south as Marin County (55 FR 26114). The range of the spotted owl has been partitioned into 12 physiographic provinces, based on recognized landscape subdivisions exhibiting different physical and environmental features since 1990. The Revised Recovery Plan (Service 2011) adopted the physiographic provinces as recovery units with the exception of the Willamette Valley, because that area contained large amounts of non-habitat.

Biology and Ecology

The spotted owl is a medium-sized owl and is the largest of the three subspecies of spotted owl (Gutiérrez 1996). They spend virtually their entire lives beneath the forest canopy (Courtney et al. 2004) seeking 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). Spotted owls are primarily nocturnal (Forsman et al. 1984), foraging between dusk and dawn and sleeping 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). Their diet varies geographically and by forest type. Generally, flying squirrels (*Glaucomys sabrinus*) are the most prominent prey for spotted owls in Douglas-fir and western hemlock (*Tsuga heterophylla*) forests (Forsman et al. 1984) in Washington (Hamer et al. 2001) 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; 2004; Ward et al. 1998).

The spotted owl is relatively long-lived, has a long reproductive life span, invests significantly in parental care, and exhibits high adult survivorship relative to other North American owls (Gutiérrez et al. 1995). Most pairs do not nest every year, and nesting pairs are not successful every year (Forsman et al. 1984, Anthony et al. 2006). 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). Natal dispersal of spotted owls typically occurs in September and October with a few individuals dispersing in November and December (Forsman et al. 2002).

Spotted owls are territorial, actively defending their nests and young from predators (Forsman 1976; Gutiérrez et al. 1995). They will regularly confront other spotted owls with aggressive vocal displays (Forsman 1976, 1980; Forsman et al. 1984; Gutiérrez et al. 1995; Franklin et al. 1996). 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. Median annual home range size varies from 985 acres in the California Coast Redwood Region to 14,211 acres on the Olympic Peninsula. Within the home range, there is a core area of concentrated use

(approximately 20 percent of the home range) during the breeding season (Bingham and Noon 1997).

Habitat Use

Forsman et al. (1984) reported that spotted owls have been observed in many forest types, including Douglas-fir, western hemlock, grand fir (*Abies grandis*), white fir (*Abies concolor*), ponderosa pine (*Pinus ponderosa*), Shasta red fir (*Abies magnifica shastensis*), mixed evergreen, mixed conifer-hardwood, and coast redwood (*Sequoia sempervirens*), and generally rely on older forested habitats containing the structures and characteristics required for nesting, roosting, and foraging. Such features typically include moderate to high (60 to 90 percent) canopy closure; a multi-layered, multi-species canopy with large overstory trees of 30 inches or greater dbh; large trees with various deformities and decadence; large snags; large accumulations of woody debris; and open space below the canopy (Thomas et al. 1990). Foraging activity is 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. (50 cm) dbh (North et al. 1999, Irwin et al. 2000, Courtney et al. 2004), density of trees $\geq$ 31 in. (80 cm) dbh (North et al. 1999), volume of woody debris (Irwin et al. 2000), and other structural characteristics of old forests (Carey et al. 1992, Irwin et al. 2000). Dispersal habitat consists of stands with adequate tree size and canopy closure to provide protection from avian predators and opportunities to forage. A mosaic of late-successional habitat interspersed with other seral conditions may benefit spotted owls more than large, homogeneous expanses of older forests (Zabel et al. 2003; Franklin et al. 2000; Meyer et al. 1998).

Threats

The 2011 revised recovery plan for the spotted owl indicates that past and current habitat loss from timber harvest and wildfire, and competition from barred owls (*S. varia*) are the most pressing threats to spotted owl recovery. Addressing the threats associated with past and current habitat loss must be conducted simultaneously with addressing the threats from barred owls (Service 2011).

At the time of listing, there was recognition that large-scale wildfire posed a threat to spotted owl habitat (55 FR 26114). Studies indicate that the effects of wildfire vary with fire intensity, severity and size. Within fire-adapted forests, spotted owls have adapted to withstand fires of variable sizes and severities. However, fire is often considered a primary threat to spotted owls because of its potential to rapidly alter habitat (Bond et al. 2009), and is a major cause of habitat loss on Federal lands (Courtney et al. 2004). Hanson (2009) believed spotted owls suffer adverse consequences from a deficit of fire that creates habitat necessary for an abundance of their key prey species. Climate change is expected to make unpredictable changes to habitat, due to warmer temperatures increasing the probability of severe fire and length of fire season (Skinner 2007).

Barred owls may be exacerbating the spotted owl population decline by reducing spotted owl site occupancy, reproduction, and survival (Dark et al. 1998; Gutiérrez et al. 2004; Courtney et al. 2004; Olson et al. 2005; Anthony et al. 2006). Barred owls compete with spotted owls for prey

(Hamer et al. 2001, 2007; Gutiérrez et al. 2007; Livezey and Fleming 2007) and habitat (Hamer et al. 1989; Dunbar et al. 1991; Herter and Hicks 2000; Pearson and Livezey 2003; Singleton et al. 2010). Barred owl presence also affects the monitoring and management of spotted owls due to a reduction in detectability, when barred owls are present (Kelly et al. 2003; Courtney et al. 2004; Olson et al. 2005; Crozier et al. 2006).

Population Status

Two recent (January 2009) meta-analyses modeled rates of population change for up to 24 years using the re-parameterized Jolly-Seber method (λ_{RJS}) (Forsman et al. 2011). Point estimates of λ_{RJS} were all <1.0 (range 0.929 to 0.996) for 11 long-term study areas, with strong evidence that populations declined (i.e., λ_{RJS} significantly <1.0) on 7 of the 11 areas, including Rainier, Olympic, Cle Elum, Coast Range, HJ Andrews, Northwest California and Green Diamond (Forsman et al. 2011). On Tyee, Klamath, Southern Cascades, and Hoopa, populations were either stable or the precision of the estimates was not sufficient to detect declines. In the second meta-analysis, the mean λ_{RJS} of 0.972 (SE = 0.006, 95 percent CI = 0.958 to 0.985) was reported for the eight demographic monitoring areas (Cle Elum, Olympic, Coast Range, HJ Andrews, Tyee, Klamath, Southern Cascades and Northwest California) included in the effectiveness monitoring program of the Northwest Forest Plan (NWFP), an estimated decline of 2.8 percent per year. Forsman et al. (2011) indicated that the number of declining populations on study areas in Washington and northern Oregon together with their rates of decline are concerning for the long-term sustainability of spotted owl populations.

Conservation and Recovery

The 2011 revised recovery plan (Service 2011) identifies three main priorities for achieving recovery: (1) protecting the best of its remaining habitat, (2) actively managing forests to improve forest health, and (3) reducing competition from barred owls.

The NWFP continues to guide the management of Federal forest lands within the range of the spotted owl (U.S. Forest Service [USFS] and U.S. Bureau of Land Management [BLM] 1994a, 1994b), protecting large blocks of late-seral forest, and providing habitat for species, including the spotted owl, that depend on those forests.

The Service presumes that private lands will provide habitat connectivity between Federal Lands and will contribute demographic support (pair or cluster protection) to Federal lands. There are 15 current and ongoing habitat conservation plans (HCP) that have incidental take permits issued for spotted owls—eight in Washington, three in Oregon, and four in California (Service 2011). The HCPs range in size from 40 acres to more than 1.6 million acres. HCPs cover approximately 2.9 million acres (9.1 percent) of the 32 million acres of non-Federal forest lands in the range of the spotted owl, with terms ranging from 5 to 100 years.

Range-wide Habitat Baseline

The Service has used information provided by the USFS, BLM, and National Park Service to update the habitat baseline conditions on Federal lands for spotted owls on several occasions, since the spotted owl was listed in 1990. The estimate of 7.4 million acres used for the NWFP in 1994 (USFS and BLM 1994b) was believed to be representative of the general amount of spotted owl habitat on these lands. This baseline has been used to track relative changes over time in subsequent analyses, including those presented here. Reliable habitat baseline information for non-Federal lands is not available (Courtney et al. 2004); consequently, consulted-on acres can be tracked, but not evaluated in the context of change with respect to a reference condition on non-Federal lands.

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

Range-wide Analysis 1994–September 5, 2012

This section updates the information considered in Service (2001), relying particularly on information in documents the Service produced pursuant to section 7 of the Act and information provided by NWFP agencies on habitat loss resulting from natural events (*e.g.*, fires, windthrow, insect and disease). To track impacts to spotted owl habitat, the Service designed the Consultation Effects Tracking System database, which records impacts to spotted owls and their habitat at different spatial and temporal scales. In 2011, the Service replaced the Consultation Effects Tracking System with the Consulted on Effects Database. The Consulted on Effects Database corrected technical issues documented in previous consultations. 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 spotted owl habitat on Federal lands were estimated to exist on Federal lands managed under the NWFP. As of January 15, 2013, the Service had consulted on the proposed removal/downgrading of approximately 192,669 acres (Table 6) or 2.6 percent of the 7.4 million acres of spotted owl suitable habitat on Federal lands. These changes in suitable spotted owl habitat are consistent with the expectations for implementation of the NWFP (USFS and BLM 1994a).

April 13, 2004 marked the start of the second decade of the NWFP. Decade-specific baselines and summaries of effects by State, physiographic province and land use function from proposed

management activities and natural events are not provided here, but can be calculated using the Service's Consulted on Effects Database.

Habitat loss from Federal lands due to management activities has varied among the individual provinces with most of the effects concentrated within the Non-Reserve relative to the Reserve land-use allocations (Table 7). When habitat loss is evaluated as a proportion of the affected acres range-wide, of the 2.2 percent removed or downgraded as a result of timber harvest, the most pronounced losses have occurred within Oregon (72 percent), especially within its Klamath Mountains (37 percent) and Cascades (East and West) (35 percent) provinces (Table 7), followed by smaller habitat losses in Washington (9 percent), and California (18 percent; Table 7). When habitat loss is evaluated as a proportion of provincial baselines, the Oregon Klamath Mountains (20 percent), Cascades East (13 percent), and the California Klamath (7 percent) provinces all have proportional losses greater than the loss of habitat across all provinces (5.9 percent; Table 7).

Table 6. Range-wide aggregate of changes to NRF¹ habitat acres from activities subject to section 7 consultations and other causes from 1994 to January 15, 2013.

Land Ownership	Consulted On Habitat Changes ²		Other Habitat Changes ³	
	Removed/ Downgraded	Maintained/ Improved	Removed/ Downgraded	Maintained/ Improved
NWFP (FS,BLM,NPS)	192,669	520,420	246,111	39,720
Bureau of Indian Affairs / Tribes	108,210	28,372	2,398	0
Habitat Conservation Plans/Safe Harbor Agreements	295,889	14,430	N/A	N/A
Other Federal, State, County, Private Lands	68,673	5,620	279	0
Total Changes	665,441	570,842	248,788	39,720

¹Nesting, 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.

²Includes both effects reported in Service 2001 and subsequent effects reported in the Northern Spotted Owl Consultation Effects Tracking System (web application and database.)

³Includes 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.

From 1994 through January 15, 2013, habitat lost due to natural events on NWFP lands was estimated at approximately 246,111 acres range-wide (Table 7). About two-thirds of this loss was attributed to the Biscuit Fire that burned over 500,000 acres in southwest Oregon (Rogue River basin) and northern California in 2002. This fire resulted in a loss of approximately 113,451 acres of spotted owl habitat, including habitat within five LSRs. Approximately 18,630 acres of spotted owl habitat were lost due to the B&B Complex and Davis Fires in the East Cascades Province of Oregon.

Table 7. Aggregate results (as of January 15, 2013) of all adjusted, suitable habitat (NRF¹) acres affected by section 7 consultation on NWFP lands for the spotted owl; baseline and summary of effects by state, physiographic province and land use function.

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		
			Reserves ⁵	Non-Reserves ⁶	Total				
WA	Eastern Cascades	706,849	4,557	6,392	10,949	14,307	25,256	3.57	5.76
	Olympic Peninsula	560,217	869	1,711	2,580	299	2,879	0.51	0.66
	Western Cascades	1,112,480	760	11,579	12,339	3	12,342	1.13	2.81
OR	Cascades East	443,659	2,589	14,368	16,957	40,884	57,841	13.04	13.18
	Cascades West	2,046,472	3,872	66,274	70,146	24,583	94,729	4.63	21.59
	Coast Range	516,577	447	3,994	4,441	66	4,507	0.87	1.03
	Klamath Mountains	785,589	2,631	56,269	58,900	101,676	160,576	20.44	36.59
	Willamette Valley	5,658	0	0	0	0	0	0	0
CA	Cascades	88,237	10	4,820	4,830	329	5,159	5.85	1.18
	Coast	51,494	464	79	543	275	818	1.59	0.19
	Klamath	1,079,866	1,546	9,428	10,984	63,689	74,673	6.92	17.02
Total		7,397,098	17,745	174,924	192,669	246,111	438,780	5.93	100

¹Nesting, 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.

²Defined by the Northwest Forest Plan as the twelve physiographic provinces, as presented in Figure 3&4-1 on page 3&4-16 of the FSEIS. The WA Western Lowlands and OR Willamette Valley provinces are not listed as they are not expected to contribute to recovery.

³1994 FSEIS baseline (USFS and BLM 1994).

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

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

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

⁷Acres 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.

Because there is no comprehensive spotted owl habitat baseline for non-NWFP Federal lands and non-Federal lands, there is little available information regarding spotted owl habitat trends on these lands. Yet, we do know that internal Service consultations conducted since 1992, have documented the eventual loss of 472,772 acres of habitat on non-Federal lands. Most of these losses have yet to be realized because they are part of large-scale, long-term HCPs. Combining effects on Federal and non-Federal lands, the Service had consulted on the proposed removal of approximately 665,559 acres, of spotted owl habitat range-wide, resulting from all management activities, as of January 15, 2013.

Fisher

Legal Status

On April 8, 2004, the Service concluded a 12-month finding (69 FR 18770) for a petition to list the West Coast (Washington, Oregon, and California) population of the fisher. 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.

Life History

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).

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 (69 FR 18770). Fishers also exhibit regional variation in body mass. Fishers in western North America typically weigh less than those in the eastern United States (69 FR 18770). 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).

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). The range of the West Coast population of fishers included the Hozomeen, 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).

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 (Service 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).

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 Patterns

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).

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 (69 FR 18770). 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 three 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).

Denning and Resting Sites

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; 69 FR 18770; Lofroth et al. 2010). Fishers typically use three 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 (69 FR 18770). 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). Live-trees are the primary resting structures used, secondarily in snags (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 (69 FR 18770, 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 (69 FR 18770, 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).

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).

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 *al.*

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).

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).

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 concern is how the widespread use of anticoagulant rodenticides may be affecting fishers. Prevalence to exposure of fishers to these rodenticides is quite high (79% of 58 samples), but it is unknown what effects to individuals or populations they may have (Gabriel et al. 2012). Four California fishers have been determined to have died from anticoagulant rodenticides, but the potential sublethal cumulative, or chronic effects are not well understood (Gabriel et al. 2012). Whether fishers are consuming directly anticoagulant rodenticide baits or secondarily by consuming rodents that have consumed the bait is unknown (Gabriel et al. 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.

Threats

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 (69 FR 18770). 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 subsequent to the 12-month finding but their status is still being determined (Lewis et al. 2010; Washington Department of Fish and Wildlife 2011; California Department of Fish and Game [CDFG] 2011).

Climate Change

The terms "climate" and "climate change" are defined by the Intergovernmental Panel on Climate Change (IPCC). "Climate" refers to the mean and variability of different types of weather conditions over time, with 30 years being a typical period for such measurements, although shorter or longer periods also may be used (International Panel on Climate Change 2007, p. 78). The term "climate change" thus refers to a change in the mean or variability of one or more measures of climate (e.g., temperature or precipitation) that persists for an extended period, typically decades or longer, whether the change is due to natural variability, human activity, or both (International Panel on Climate Change 2007, p. 78). Various types of changes in climate can have direct or indirect effects on species. These effects may be positive, neutral, or negative and they may change over time, depending on the species and other relevant considerations, such as the effects of interactions of climate with other variables (e.g., habitat fragmentation) (International Panel on Climate Change 2007, pp. 8–14, 18–19).

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.

Anticoagulant Rodenticides

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 fishers' sampled 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 anticoagulant rodenticides exposed prey or carrion (Gabriel 2012).

Conservation Needs of the Fisher

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

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.

Conservation Strategy

Region 8 of the Service completed an action plan for the West Coast DPS of the fisher (Service 2009). 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.

Federal Contribution to Recovery

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 (USFS and BLM 1994a, b). The NWFP represents a 100-year strategy for conservation of the spotted owl 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 (USFS 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 USFS's Sensitive Species Policy and the 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 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).

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., spotted owls, 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 a translocation of fishers to the northern Sierra Nevada in December 2009. Three years of planned translocations (Callas and Figura 2008) were complete December 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.

Current Condition of the West Coast DPS of the Fisher

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 (69 FR 18770). 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).

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 mile² (Weir 2003). Estimated densities on an industrial forest in the province ranged between 0.8 and 1.3 fishers per 38.6 mile² (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 mile² 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 mile² 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 but the rebounding population appears to be stable or increasing based on lambda estimates and age structure shifts (Higley and Matthews 2009). The density of fishers on Green Diamond Resource Company lands was estimated to be between 7 and 11 fishers (male and female) per 38.6 mile² 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 mile²) 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 mile²) (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).

ENVIRONMENTAL BASELINE

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

The action area is defined at 50 CFR 402.02 to mean "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action." For the purposes of this consultation, the Service recognizes the action area to include all lands under the management of the Parks. This analysis area enables the Parks and the Service to more fully understand the cumulative, interrelated, and interdependent effects of the action within a more appropriate landscape context.

Murrelet

Conservation Strategy

The Parks are located in murrelet Conservation Zone 4. The primary conservation needs of the murrelet in the Parks, as identified in the Recovery Plan, are to implement short-term actions to stabilize the population and longer-term actions to increase population growth and distribution (Service 1997). Short-term actions applicable to the Parks include: (1) maintaining occupied habitat; (2) maintaining and enhancing buffer habitat; (3) decreasing risks of loss of nesting habitat due to fire and windthrow; (4) minimizing disturbance and reducing predation at nest sites; (5) increasing recruitment; and (6) initiating research to determine impacts of disturbance in terrestrial environments. Long-term actions include: (1) increasing the amount, quality, and distribution of nesting habitat; and (2) decreasing fragmentation. The Recovery Plan

recommends that recovery actions in Conservation Zone 4 should focus on preventing the loss of occupied nesting habitat, the loss of unoccupied but suitable habitat, and decreasing the time for development of new suitable habitat (Service 1997). The Recovery Plan also recommends considering the need to maintain high quality murrelet habitat when planning recreational projects in the Parks. Recreational facilities may present threats to murrelets through loss of habitat, nest disturbance, and/or increased predation from corvids (Service 1997).

The Parks' conservation strategy identifies the following management goals for murrelets (Parks 2003a): (1) minimize, reduce, or eliminate the potential for incidental take due to noise disturbance, habitat loss, habitat degradation, and corvid predation of nests; and (2) provide, enhance, and protect nesting habitat. The strategy also identifies the following murrelet recovery goals (Parks 2003a): (1) implement short-term actions that protect and restore habitat; (2) coordinate research to increase knowledge of murrelets; and (3) treat the Parks' greater than 50,000 ac (20,234 ha) of second-growth forest to increase the amount, quality, and distribution of nesting habitat.

Current Condition

Habitat: Amount, Distribution, and Quality

The Parks contain approximately 41,400 ac (16,754 ha) of suitable murrelet nesting habitat. This includes 41,100 ac (16,633 ha) of old-growth forest occurring in stands greater than 0.5 ac (0.20 ha) in size and 362 ac (146 ha) of residual old-growth stands (isolated old-growth trees surrounded by mature tree buffers). The Parks represent approximately 62 percent (41,400 ac) (16,754 ha) of the occupied murrelet habitat in the California portion of Conservation Zone 4 (67,618 ac) (27,364 ha).

The old-growth forests in the Parks are fragmented with only three stands containing more than 5,000 ac (2,023 ha). The majority (83 percent) of the old-growth stands are 100 ac (40 ha) or smaller in size with 31 percent of the stands less than 5 ac in size. The Parks also contain over 50,000 ac (20,234 ha) of second-growth coniferous forest that are currently unsuitable nesting habitat. Over 90 percent of these stands were clearcut after 1940; therefore, it is unlikely even under the most optimistic scenario that these stands will provide additional nesting habitat for more than a century.

Population: Numbers, Distribution, and Reproduction in Conservation Zone 4

Since 2000, at-sea monitoring to determine murrelet population trend has occurred annually in Conservation Zone 4 as part of the effectiveness monitoring for the NWFP (Huff et al. 2003). For sampling purposes, Conservation Zone 4 was divided into two strata. The northern strata includes the area from Coos Bay, Oregon to Big Lagoon, California; and the southern strata, the area from Big Lagoon south to Shelter Cove, California. The northern strata occurs offshore of National Forest lands in Oregon and the Parks in California. At-sea locations of radio-marked murrelets captured offshore from the Parks ranged from Punta Gorda, Mendocino County, north to Newport, Oregon; however, most of the detections occurred in the northern strata (Hébert et al. 2003b). Murrelet population point estimates for the northern strata of Conservation Zone 4

have been estimated for years 2000 through 2011 (Table 8); Population estimates for Conservation Zone 4 in 2012 are currently not available.

In lieu of nest site data, murrelet at-sea observations of juvenile-to-adult ratios are used as an indirect index of breeding success (McShane et al. 2004). Beissinger (1995) estimated that a juvenile-to-adult ratio of 0.18 to 0.28 is needed to result in a stable population, given an annual survivorship of 0.85 to 0.90. From 2000 through 2003, Miller et al. (2003) reported juvenile-to-adult ratios from 0.0 to 0.094 offshore of Del Norte Coast Redwoods State Park and from 0.003 to 0.021 offshore of Redwood National Park. Strong (2013) reported 2.8% and 2.0% of the murrelet population to be fledglings in 2011 and 2012, respectively, based on surveys conducted along the northern California coast in Del Norte and Humboldt counties, in nearshore waters approximately adjacent to the Parks. He reported that these values were similar to or lower than earlier surveys in the study area and in the larger region from Coos Bay to Cape Mendocino, and no effect of improved nesting success due to management activities in the Parks could be discerned.

In 2003, the rate of population change was estimated for Conservation Zone 4 with a stage-based Leslie Matrix model (Beissinger and Peery 2003). The rate of population decline for Conservation Zone 4 ranged from 2.5 to 13.2 percent per year, depending on the values used for adult and juvenile survival. All combinations of adult and juvenile survival, even the most optimistic, produced a negative rate of population change indicative of a declining population (Beissinger and Peery 2003).

Table 8. Murrelet population point estimates for the northern strata of Conservation Zone 4 have been estimated for years 2000 through 2011.

Year	Point Estimate	Population Size Estimates with 95% CI	
		Lower	Upper
2000	4,400	3,000	8,700
2001	3,400	2,400	5,900
2002	3,800	2,600	5,000
2003	3,700	2,600	5,700
2004	3,200	2,000	7,800
2005	3,300	2,200	5,400
2006	3,600	2,700	4,900
2007	3,511	2,401	7,026
2008	4,306	3,115	6,600
2009	4,581	3,575	7,153
2010	3,368	2,196	6,140
2011	6,507	3,349	10,214

Population: Numbers, Distribution, and Reproduction in Conservation Zone 4, within the Parks

Most of nesting habitat (i.e., old-growth forests) available to murrelets in northern Humboldt and southern Del Norte counties occurs in the Parks. In addition, densities of murrelets in nearshore waters tend to correlate with amount of available nesting habitat in adjacent inland forests, and offshore surveys indicate that the old-growth coast redwood forests associated with the Parks support the highest densities of murrelets in California (Ralph and Miller 1995). Based on information in our files from at-sea surveys conducted within Conservation Zone 4 (specifically, from "Primary Sampling Unit" (PSU) 4-1-8 (approximately, as far north as Saddle Rock, Oregon) south to PSU 4-2-15 (approximately, as far south as Trinidad, California) in 2000-2010, we estimate that 2,638 murrelets occur from PSU 4-1-8 to 4-2-15, and could potentially breed in the Parks (Table 9).

For the purposes of this consultation, we recognize the following assumptions: (1) not all murrelets observed during at-sea surveys are breeding in the same year; (2) some murrelets may not be detected during at-sea surveys; (3) not all murrelets observed at-sea off the northern California coast breed in the Parks; and (4) equal distribution of murrelet nest sites in the old-growth habitat in the Parks. Nevertheless, we assume that all of the birds from at-sea detections have the potential to breed; thus, 2,638 birds would represent 1,319 potential breeding pairs of murrelets in the Parks. Equating this estimate to the amount of old-growth habitat estimated to occur in the Parks (41,400 ac [16,754 ha]), we estimate that there is approximately 31.4 ac (12.7 ha) of old-growth habitat per potential breeding pair of murrelets in the Parks. An alternative way to describe this would be to say that we estimate 0.03 breeding pairs of murrelets per acre of old-growth habitat in the Parks.

Table 9. Average of Primary Sampling Unit (PSU) density of murrelets (birds/km²), PSU area (km²), and average estimated number of murrelets (birds/PSU) in PSUs 4-1-8 through 4-2-15, in Conservation Zone 4 (southern Oregon and northern California), in 2000-10.

PSU ^a	Average of PSU		PSU area (km ²)	(birds/PSU)
	Density (birds/km ²)			
4-1-8	0.91		53.8	48.9
4-2-9	4.23		52.6	222.4
4-2-10	5.74		53.0	304.4
4-2-11	7.11		52.1	370.6
4-2-12	3.73		47.1	175.9
4-2-13	12.98		53.4	693.6
4-2-14	11.52		52.4	603.2
4-2-15	3.8		57.5	218.6
Total	50.0		422.0	2,637.7

^a Dashed PSU numbers comprise, in order: conservation zone-stratum-PSU (e.g., 4-1-8), from Marbled Murrelet Effectiveness Monitoring Module (2011).

Project-specific surveys have not been conducted in the action area. However, in 2001 and 2002, 25 murrelet nests were located in the Parks (based on murrelets captured at-sea and fitted with radio transmitters), within contiguous stands of old-growth (Hébert et al. 2003a). In addition, inland audio/visual surveys were conducted at three sites in or near the Parks from 1989 through

2002 (Miller et al. 2003). Based on these surveys there was a “generally decreasing trend from inland forest morning surveys over the past thirteen years” with the mean numbers of detections in 2002 at “. . . the lowest levels observed in any year for Lost Man Creek and James Irvine Trail” (Miller et al. 2003). For example, in 1989 the mean number of detections at the James Irvine Trail was 74.5 (± 36.18); by 2002 the mean number of detections was 38.5 (± 25.5). Similarly, at Lost Man Creek, in 1989 the mean number of detections was 128.4 (± 74.5); by 2002 the mean number was 39.4 (± 19.9).

Breeding success of murrelets in the Parks has been estimated using radio telemetry (Hébert and Golightly 2006). From 2001 to 2003, Hébert and Golightly (2006) reported breeding success (fledglings that depart from the nest site per egg-laying per year) values of 6.6 to 20 percent, for nests not exposed to noise disturbance. Reduced reproductive success in their study was influenced primarily by failures during incubation, and predation by corvids (*i.e.*, Steller’s jays, common ravens) was implicated as a major source of nest failure.

From 2001 through 2003, the average proportion of breeding murrelets in the Parks ranged from 33 percent (including only detected nests) to 66 percent (including detected nests and adults with incubation patches present at capture) (Hébert and Golightly 2006). For comparison, the average proportion of breeders in the Santa Cruz population was 31 percent (Peery et al. 2004) and 65 percent in Desolation Sound, British Columbia (Bradley et al. 2004).

The indirect measures of nesting success in the Parks, juvenile-to-adult ratios, proportion of breeders, and nest failure rates, indicate that the level of reproductive success in the Parks is insufficient to maintain current population levels.

Previous Federal Actions in the Action Area

From 1995 through 2012, the Service issued 21 non-jeopardy biological opinions, not including amendments (exception: consultation #8-14-1998-0134, which changed from formal to informal consultation for spotted owl), to the Parks, which evaluated the effects upon the murrelet of various activities in the action area (Table 10). The Service is not aware that any murrelets were harmed as a result of these projects.

Spotted Owl

Conservation Needs

The Parks are in the California Coast Physiographic Province (or Recovery Unit) as delineated in the Revised Recovery Plan for the spotted owl (Service 2011). The Parks are recognized as being important for providing demographic support of owl populations in the northern California Coast Range and also for providing connectivity with interior populations on national forest lands.

Table 10. Twenty-one discrete formal consultations (excludes biological opinion amendments^a) between the Service and the Parks that evaluated effects upon the murrelet, spotted owl or critical habitat for the murrelet, regarding various activities in the Parks, from 1995 through 2011.

	Date Issued	Consultation #	Species/ CH ^b	Subject
1)	06/26/1995	1-1-95-F-78	1, 2	Howland Hill Road Annual Maintenance Project, Jedediah Smith Redwoods State Park.
2)	02/07/1996	1-1-95-F-147	1	"Jammin' at Jed" Jazz Concert, Jedediah Smith Redwoods State Park.
3)	05/09/1997	1-14-97-F-7	1, 2	Repair of the Mill Creek Road and Campground
4)	06/06/1997	1-14-97-F-8	1	Repair of the Tall Trees Access Road (C-line east side)
5)	07/07/1997	1-14-97-F-10	1	Repair of the A-9 and B-5 Roads and the 6-Hour Loop Horse and Tall Trees Trails
6)	06/18/1998	1-14-98-133	1	Redwood National and State Parks' Trail Maintenance Projects
7)	06/24/1998	1-14-98-24	1, 2	Redwood National and State Parks' Annual Maintenance Activities
8)	07/20/1998	1-14-98-134	1, 2	Redwood National and State Parks' Watershed Restoration Program
9)	07/21/1998	1-14-98-145	1, 2	Construction of the Skunk Cabbage Memorial Groves Trail
10)	03/23/1999	1-14-98-208	1, 2, 3	Emergency Formal Consultation on Redwood National and State Parks' Rescue of a Front-end Loader on Howland Hill Road, April 13, 1998.
11)	06/10/1999	1-14-99-76	1, 3	Hazard Tree Removal in Jedediah Smith Redwoods State Park
12)	07/01/1999	1-14-99-133	1	Stream Restoration and Trailhead Development Project at the Old B-Mill Deck Site in Redwood National Park
13)	04/02/2001	1-14-2001-888	1	Helicopter Use in Redwood National and State Parks
14)	08/02/2001	1-14-2001-1010	1	Watershed Restoration Program in Portions of Lost Man Creek Watershed
15)	07/11/2005	8-14-2005-2558	1	Formal Consultation on the Mill Creek and Lost Man Creek Trails Culvert Replacement Projects
16)	10/17/2005	8-14-1998-0134 (1-14-98-134)	1	Three Year Extension Watershed Restoration Program
17)	03/24/2006	8-14-2006-2836	1	Lost Man Creek Erosion Control and Disturbed Land Restoration Plan
18)	01/29/2007	8-14-2003-1517	1, 2	Trail and Backcountry Management Plan, Redwood National and State Parks
19)	10/25/2007	8-14-2004-2133	1	South Fork of Lost Man Creek Second Growth Forest Management Plan
20)	06/18/2009	81331-2008-F-0130	1, 2	Maintenance Program in Redwood National and State Parks
21)	05/13/2011	11B0077-11F0076	1	Formal Consultation on Helicopter Use in Redwood National and State Parks (2011-2020), Humboldt and Del Norte Counties, California

Footnotes for Table 10 -

^a Exception: Formal consultation #8-14-1998-0134, which did not include northern spotted owl in amended biological opinion.

^b Species or critical habitat to which formal consultation pertained, as follows: 1 = marbled murrelet, 2 = northern spotted owl, 3 = marbled murrelet critical habitat.

Current Conditions

Habitat Trends and Distribution

The Parks define suitable nesting and roosting habitat in their General Management Plan as old-growth forest with canopy closures of greater than or equal to 70 percent, with at least 40 percent of the canopy contributed by trees greater than or equal to 21 inches dbh. Second-growth stands greater than 40 years of age are considered suitable habitat, especially if large residual trees occur in the stand. Within the Parks, there are an estimated 41,000 ac (16,600 ha) of old-growth forest, all of which is considered suitable nesting, roosting, and foraging habitat. An additional 35,000 ac (14,164 ha) of second-growth forest is now ≥ 40 yrs old and may be suitable nesting, roosting, and foraging habitat. Two hundred and seventy acres (109 ha) of second-growth forest contain residual old-growth trees in patches between 1 and 5 ac. Some proportion of these stands qualify as suitable nesting, roosting, and foraging habitat. Some proportion of the remaining 30,000 ac (12,140 ha) of second-growth < 40 yrs of age may be suitable for spotted owl foraging (Parks 2012). Therefore, there are approximately 72,270 ac (29,247 ha) of habitat in the Action Area suitable for nesting, roosting, and foraging by spotted owls, and an additional approximately 30,000 ac (12,140 ha) of habitat in the Action Area suitable for foraging only by spotted owls.

The first parks-wide inventory of suitable habitat was conducted between 1993 and 1995 (Tanner 1999). After 1995, park staff continued to survey some proportion of the suitable habitat in the parks annually. In each year 2001- 2004 approximately 50% of all suitable spotted owl habitat within the parks was surveyed, with approximately 65% of those acres in old-growth and 35% in second-growth forests. The amount of suitable habitat surveyed declined beginning in 2005 and in 2007 only 10% of the suitable habitat acres in the parks were surveyed. The reasons for the decline in survey coverage include indications from previous surveys that many of the historic owl territories are probably no longer occupied by spotted owls, or we are no longer able to detect them in their territories, and many of the historic spotted owl territories are now occupied by one or more barred owl pairs or resident singles.

Spotted Owl Population Numbers, Distribution, and Reproduction

Up to 40 spotted owl territories were identified in the Parks during the Parks-wide inventory conducted between 1993 and 1995 (Tanner 1999). The Parks currently tracks 39 territories (including three that were not part of the original inventory) in their spotted owl database. Surveys for spotted owls in suitable habitat in the vicinity of annual maintenance projects have been conducted annually since 1998. These surveys have detected a few "floater" spotted owls, individuals that could not be relocated during daytime follow up visits.

In 2002, territory-wide inventories of "inactive" sites (activity centers where no owls were detected in greater than 3 consecutive years) were begun. Inventories include a thorough survey of all suitable habitat within a 1 mi radius of the historic activity center following the standards in the two-year survey protocol (Evans Mack 2003; Parks 2003b). As of 2010, 20 of 39 territories were inventoried. Spotted owls were relocated in 5 of these historic sites, although since then spotted owls have again gone undetected in at least 2 of these territories (Parks 2012).

Therefore, an estimated three active spotted owl territories were documented in the Parks, as of 2012.

Biologists with the Parks have documented high levels of barred owl activity. Barred owls have been documented in the Parks since at least 1993. As of 2009, barred owls have been observed in 31 (79%) of the known spotted owl territories within the Parks. An additional 20 barred owl sites have been located apart from any known historic spotted owl activity centers. Barred owls routinely out-reproduce spotted owls, with numerous sites producing two to three fledglings each year compared to zero, one, or two spotted owl sites producing one fledgling in recent years (Schmidt 2010).

Previous Federal Actions in the Action Area

From 1995 through 2012, the Service issued eight non-jeopardy biological opinions, not including amendments (exception: consultation #8-14-1998-0134, which changed from formal to informal consultation for spotted owl), to the Parks, which evaluated the effects upon the spotted owl of various activities in the action area (Table 10). The Service is not aware that any spotted owls were harmed as a result of these projects.

Fisher

To date, there have been five separate surveys for forest mesocarnivores in the Parks. Fishers were detected in all five of these surveys. Two of these surveys were conducted by USFS in areas of proposed highway construction at Cushing Creek (Gellman et al. 1993) and Wilson Creek (McKenzie et al. 1994), Del Norte County, within a few of miles of the coast. In a state-sponsored distribution study, habitats were surveyed within 50 km (31 mi) of the coast between the Oregon border and southern Humboldt County (Beyer and Golightly 1996). A park-sponsored survey took place in 2002 with the main objective of determining presence of the Humboldt marten (*M. americana* ssp. *humboldtensis*) in the Parks (Slauson et al. 2003). In 2010, a study was conducted throughout the Parks by USFS researchers in partnership with the Parks. Beyer and Golightly (1996) reported a "...high detection ratio...in an area of...[Redwood] National Park...". Slauson et al. (2003) detected fishers in old-growth, older second-growth, and along the edges of these two types. Sample units with detections were distributed throughout the park, from Jedediah Smith State Park in the north to Devil's Creek (a tributary of Redwood Creek) in the south. Data from the 2010 study have yet to be analyzed, but preliminary information indicates fishers were detected at many different track plate locations. There are a modest number of fisher observations in the Parks' wildlife observations database; reliable observations were recorded in Lost Man Creek and Prairie Creek watersheds, near the Wolf Creek Education Center, and along Newton B. Drury parkway as well as from the A-9 Road, C-9 Road, Bald Hills Road, and Maneze Prairie. The survey results coupled with the reliable database records indicate that fishers are probably well-distributed throughout the Parks. There are no records of fishers breeding within the Parks, although they are known to reproduce on private managed timberlands adjacent to the Parks (Klug 1997), and it is likely that the Parks harbors a breeding population (Parks 2012). However, the Service is not aware of any population estimates of fisher in the Parks.

EFFECTS OF THE ACTION

This section presents an analysis of the direct and indirect effects of the proposed action on the murrelet, spotted owl and fisher, together with the effects of other activities that are interrelated or interdependent with the proposed action. Interrelated actions are those that are part of the larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration. These effects are evaluated along with the environmental baseline and the predicted cumulative effects to determine the overall effects to the species.

Murrelet

Effects to Habitat

No murrelet nesting habitat will be removed or degraded by the proposed action. None of the trees proposed to be removed (i.e., bay laurel and tanoak) are potential nest trees. Furthermore, the majority of the trees proposed to be removed, if they occurred near suitable murrelet nesting habitat (i.e., old-growth redwood), would not be of sufficient height, nor would their canopies extend high enough, to provide cover for potential nesting platforms. Since all potential nest trees, potential nesting platforms, and trees providing protective cover around nesting platforms will be retained, degradation of nesting habitat for murrelets is not expected. In addition, no known murrelet nests have occurred in locations where large tanoaks or bay laurels provided direct visual cover in the Parks (Golightly and Gabriel 2009; Parks 2012).

Disturbance to Breeding Murrelets

Scientific Basis for Disturbance

Management activities that require use of chainsaws introduce noise, visual, and air disturbances into the environment. The effects of noise on birds are extremely difficult to determine (Knight and Skagen 1988). Confounding factors include the tolerance level of individual birds, type and frequency of human activity, ambient sound levels, how sound reacts with topography and vegetation, and differences in how species perceive noise. Regardless of these difficulties, research conducted on a variety of bird species does suggest that disturbance can have a negative impact on their reproductive success (Tremblay and Ellison 1979; Belanger and Bedard 1989; Piatt et al. 1990; Henson and Grant 1991). For example, disturbance can affect productivity by interfering with courtship (Bednarz and Hayden 1988), and can cause nest abandonment (White and Thurow 1985), egg and hatchling mortality, and exposure to predation (Drent 1972; Swensen 1979), and altered parental care (Fyfe and Olendorff 1976; Bortolotti et al. 1984). However, in a study of the influence of human disturbance on the nesting success of murrelets in the Parks, Hébert et al. (2005) observed behaviors of 16 murrelets (12 adults and 4 chicks) at nests using video surveillance, while simultaneously running a chainsaw at ground level at a distance of approximately 82 ft (25 m) from each respective nest. No chicks or adults flushed from the nests while the chainsaws were operating.

Based on the Service's "Noise Guidance" document, *Estimating the Effects of Auditory and Visual Disturbance to Northern Spotted Owls and Marbled Murrelets in Northwestern California*, dated July 31, 2006, disturbance is generally defined as noise in excess of ambient levels in or near (generally within 0.25 mi [0.40 km] or less) suitable nesting habitat, or as the reaction of nesting birds to human presence or activity, resulting in disruption of essential breeding behaviors or predation. Disturbance during the breeding season (defined as March 24 through September 15 for murrelets) may potentially disrupt the species' essential breeding behaviors by: (1) causing abandonment of the breeding effort by failure to initiate nesting or to complete incubation; (2) disrupting nesting activity such as feeding young; and (3) causing premature dispersal of juveniles. In addition, disturbance may result in increased predation of young or adults.

Breeding adult alcids in general are sensitive to nest site disturbance during the incubation period and the first few days of chick rearing. Disturbances near nest sites that "flush" (i.e., cause birds to leave nest) incubating or brooding adults may expose adults and young to increased predation or accidental loss of eggs or nestlings by falling or being knocked out of nests (Service 1997). Murrelets have no defense against predators at their nests other than the ability of adults and nestlings to remain hidden on the nest, and the ability of adults to access and depart from the nest without being detected by visual predators. Research on murrelets has shown that adults tend to concentrate their nest visits during twilight hours after eggs hatch, and nestlings are left unattended during daylight. However, adults increase daytime visits to nests as chicks develop. Because low productivity or breeding success appears to be a substantial problem, minimizing disturbance and reducing predation at nest sites is an important first step in the recovery process (Service 1997). Disturbance of murrelet reproductive activity in the Parks is of particular concern due to the importance of the Parks' population to the survival and recovery of the species.

Effects of the Action - Disturbance

To minimize disturbance to breeding murrelets and their young, the Parks would not treat SOD infected areas with chainsaws that are in or within 500 feet of suitable murrelet nesting habitat during the breeding season (24 March to 15 September), to the extent possible. However, there may be years when this is not possible, because SOD-infected areas need to be treated during the first available dry weather after discovery of the infection. Given the limits proposed (Table 1), the maximum area of suitable habitat that could be exposed to noise above ambient noise levels would be 660 acres (10 x 15-acre individual polygons in old-growth – each surrounded by a 500-foot noise buffer zone) per year. If this were to occur every year for the 5 years of the program, up to 3,300 ac (660 ac per year) of suitable murrelet nesting habitat could be exposed to noise (e.g., chainsaw noise) above ambient noise levels.

In the Environmental Baseline section, we estimated that 0.03 breeding pairs of murrelets per acre could utilize old-growth habitat in the Parks. Accordingly, as many as 20 breeding pairs of murrelets per year could be exposed to noises above ambient background noise levels, assuming that all murrelets observed at sea were potential breeders and bred in the Parks. However, all birds observed at-sea are not breeding in each year. Based on assumptions in Piatt et al. (2007), 75 percent of birds observed at-sea are breeders. Therefore, as many as 15 murrelet breeding

pairs per year could be subjected to noise above ambient background noise levels. This amounts to approximately 1.1 percent of potential murrelet breeding pairs (not observed as pairs at-sea; rather, murrelet at-sea total divided by two) from the northern California at-sea surveys. However, as stated above, in a video surveillance study of nesting murrelets in the Parks, Hébert and Golightly (2006) did not observe adult murrelets ($n = 12$ observations) to flush while a chainsaw simultaneously operated for a 15-minute period (each chainsaw), at a distance of 82 ft (25 m) away. In addition, it cannot be predicted where or when SOD treatment activities may occur in the Parks. And, as stated in the Description of the Proposed Action section, the Parks would make every attempt to conduct SOD treatment activities outside the breeding season of the murrelet. For these reasons, we think that, while a maximum of 15 breeding pairs could potentially be subjected to noises above ambient noise levels per year, it is unlikely that this many breeding attempts per year would be disrupted by noise generated by SOD treatment activities.

The effects of noise on birds are extremely difficult to determine (Knight and Skagen 1988). While we cannot accurately gauge the effects of the proposed action on murrelets in the Parks, for this consultation we will assume that, while we expect that the majority of murrelets exposed to noise above ambient noise levels will not leave the nest in response to chainsaw noise, either or both adult murrelets of 15 breeding pairs (per year) could leave their nest during the incubation period as a result of noises generated by SOD treatment activities. If this were to occur, an unincubated egg could be vulnerable to predation (e.g., by corvids) or abandonment by the adult(s). Conducting SOD treatment activities (that occur within 500 feet of suitable murrelet habitat) outside the murrelet breeding season, to the extent practicable, would minimize this effect.

Injury or Mortality

No nesting murrelets will be injured or killed by the proposed action because no nesting habitat for murrelets will be removed, and no felled trees will be allowed to strike suitable nest platforms, limbs, or trees.

Summary of Effects

Habitat

Habitat suitable for nesting by murrelets will not be removed.

Disturbance to Marbled Murrelets

The proposed activity could result in disturbance (by noises associated with SOD management activities) of murrelets that occur within as much as 3,300 ac (1,214 ha) of suitable nesting habitat (660 ac [243 ha] per year). As many as 16 murrelet breeding attempts per year could be subjected to noises above ambient background noise levels. This amounts to approximately 1.2 percent of potential murrelet breeding pairs (not observed as pairs at-sea; rather, murrelet at-sea total divided by two) from the northern California at-sea surveys. However, it is unlikely that as many as 16 murrelet breeding attempts would be disrupted per year, and we estimate that one

murrelet breeding attempt per year could be disrupted by SOD treatment activities. The impacts on nesting murrelets from noise disturbance are expected to be insignificant, because most infected areas would be treated outside the breeding season of the murrelet (after September 15th and before March 24th).

Over the long-term, the conservation needs of the murrelet focus on the retention or development of suitable habitat to stop population decline and increase population growth. The proposed action does not contribute or hinder this conservation need, because no habitat will be degraded or improved.

Spotted Owl

Habitat Modification

Scientific Basis for Habitat Modification

Vegetation management practices associated with the proposed SOD Management Program have the potential to reduce the quantity and quality of spotted owl nest and roost sites. Spotted owls depend upon existing structures, such as cavities and broken treetops, for nest sites.

Management activities which result in the removal of the oldest, most decadent trees or require removal of hazard trees and snags are likely to remove potential spotted owl nest sites (Blakesley et al. 1992). Further, activities designed to reduce ladder fuels or release the growth of co-dominant trees often simplify vertical structure in the understory, where spotted owls perch for hunting or roosting (Forsman et al. 1984).

Removing trees, snags, and downed wood can affect spotted owl prey composition and/or availability by altering characteristics of the habitat upon which prey species depend. Because the amount of snags and down material on the forest floor is positively correlated with densities of some prey species, a reduction in the abundance of these components may contribute to localized, short-term declines in prey (Williams et al. 1992). Reductions in populations of these prey species could lower spotted owl recruitment.

For the purposes of the following discussion, there are three categories of possible changes to spotted owl habitat: removal of habitat, downgrading of habitat, and maintaining of habitat. Removal represents a complete loss of habitat function following an action. For example, an area functioned as nesting/roosting habitat; after habitat modification, the area does not provide function as nesting/roosting habitat. Downgrade is a subset of the term removal and refers to a loss of habitat function and change from one habitat function to another. For example, an area functioned as nesting/roosting habitat; after habitat modification, the area is capable only of providing foraging habitat. This term could also be used to signify a change in function from foraging to dispersal habitat as well. Maintain, to be distinguished from downgrade, indicates a reduction in habitat quality, but not habitat function. For example, an area that functioned as foraging habitat prior to an action still provides foraging habitat after the effect, but prey abundance may be reduced due to a reduction in some structural components or vegetation.

Removal or downgrading of habitat within the home range of a spotted owl, especially when located close to the nest site, can reasonably be expected to negatively affect spotted owls. A linear reduction in spotted owl productivity and survivorship occurs as the amount of suitable habitat within a spotted owl home range declines (Bart 1995). In northwestern California, survivorship of adult spotted owls was greater where greater amounts of older forest were present around the activity center, but reproductive success increased where the amount of edge between older and younger forest was relatively high (Franklin et al. 2000).

The Service defines a spotted owl "activity center" as, "the area of concentrated activity of either a pair of spotted owls or a single territorial spotted owl, represented by a mapped location (e.g., usually a nest tree) that occurs within, but not necessary at the exact center of, the "core area." The Service defines a "core area" as, "100 ac of nesting/roosting habitat retained within a 0.7-mile radius contiguous with the activity center.

Research indicates that spotted owls in northern California focus their activities in heavily-used "core areas" that ranged in size from about 167 to 454 acres, with a mean of about 409 acres (Bingham and Noon 1997). 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 home range area. Therefore, habitat removal within core areas could have disproportionate effects on owls. Spotted owl abundance and productivity significantly decrease when the proportion of suitable habitat within 0.7 mile of an activity center falls below 500 ac, which represents 50 percent of the total 1,000 ac within 0.7 mile (O'Halloran 1989; Simon-Jackson 1989; Thomas et al. 1990). For the purpose of consultation, the Service uses the following guidelines for the amount of suitable spotted owl habitat needed to maintain essential behaviors, such as breeding, within the home range area: 500 ac (200 ac nesting/roosting habitat and 300 ac foraging habitat) within 0.7 mile of the activity center.

Effects of the Proposed Action – Habitat Modification

It is likely that treatment of SOD-infected areas within old-growth and older second-growth (for the latter, greater than 40 years old) will not remove or downgrade nesting/roosting habitat for spotted owls, because only tanoak trees, bay laurel trees and rhododendron shrubs will be removed, and spotted owls typically nest in conifers in the Parks. The canopy of all old-growth areas within the Parks are comprised of conifers that will not be felled; thus, there will be no reduction in canopy cover and no reduction of conifer nesting/roosting habitat. Furthermore, all logs and snags will be retained, providing owl nesting (snags) and abundant prey habitat (snags and logs).

The quality of spotted owl nesting/roosting habitat could be affected as a result of SOD management activities, if large tanoaks and bay laurel trees that contain potential suitable nesting cavities or platforms are removed. However, any reduction in availability of nesting/roosting habitat as a result of the removal of these hardwood tree species would be minimal, due to the abundant large tanoaks and bay laurels in untreated areas immediately adjacent to treated areas, as well as large cavity- and platform-forming conifers and other large untreated hardwoods within treated areas. In addition, in the Parks, the spotted owls typically have used old-growth

coniferous forests for nesting purposes, and would likely use cavities or deformities that occur in conifers, rather than these features that may occur in hardwood tree species.

As stated in the Description of the Proposed Action section, upon discovery of SOD infestation in the Parks, the area of infestation will be mapped, and an inventory of the stand will be taken to determine the presence and cover of tanoaks, California bay laurel, rhododendron, and huckleberry in close proximity of the infection site. If tanoak and California bay laurel are absent within 300 feet of an infection, no action is contemplated. If tanoak or bay laurel are present, the extent of the infestation will be mapped, and a 300-foot buffer will be extended around the infected site. A single tree SOD infection would result in a 7-ac treatment area, but the Parks estimates that SOD management activities could occur on as many as 15 treatment areas per year, on as much as 1,125 ac (225 ac/year) of unsurveyed (for spotted owls) forested lands in the Parks over the 5-year period (2013-2017).

Disturbance to Spotted Owls

Scientific Basis for Disturbance

The effects of noise on birds are extremely difficult to determine (Knight and Skagen 1988). Confounding factors include the tolerance level of individual birds, type and frequency of human activity, ambient sound levels, how sound reacts with topography and vegetation, and differences in how species perceive noise. Regardless of these difficulties, research conducted on a variety of bird species does suggest that disturbance can have a negative impact on their reproductive success (Tremblay and Ellison 1979; Belanger and Bedard 1989; Piatt et al. 1990; Henson and Grant 1991). For example, disturbance can affect productivity by interfering with courtship (Bednarz and Hayden 1988), and can cause nest abandonment (White and Thurow 1985), egg and hatchling mortality, exposure and predation (Drent 1972; Swensen 1979), and altered parental care (Fyfe and Olendorff 1976; Bortolotti et al. 1984).

The few studies which examined responses of northern and Mexican spotted owls (*Strix occidentalis lucida*) to several disturbance sources, such as helicopters, small chainsaw, hikers, indicate that noise can disrupt owl behaviors, such as flushing from roosts and prey delivery rates (Delaney et al. 1999; Delaney and Grubb 2001; Swarthout and Steidl 2001). However, owl sensitivity varies with stimulus distance, location (i.e., aerial or ground), type, and timing, as well as individual tolerance (Delaney et al. 1999; Delaney and Grubb 2001; Swarthout and Steidl 2001).

Effects of the Action – Disturbance

During the spotted owl noise restriction period (1 February to 9 July), the Parks will generally attempt to avoid using chainsaws to treat SOD-infected areas in unsurveyed, suitable spotted owl habitat. However, depending on occurrences of SOD infection, this may be unavoidable. We estimate that a maximum of 930 ac (10 x 15-ac individual polygons in old-growth plus 5 x 15-ac individual polygons in 40+ year old second-growth, each surrounded by a 500-foot noise buffer zone) could contain spotted owls that could be disturbed by above-ambient noise per year. If this occurred every year during the 5 years of the program (2013-2017), then spotted owls associated

with 4,650 ac of suitable, unsurveyed spotted owl nesting habitat could be disturbed by noise. However, we think it is unlikely that this scenario will occur every year, because we anticipate that SOD infection treatment areas would be clustered, thus shrinking their noise footprint, and that only some infected areas would have to be treated during the noise restriction period (February 1 through July 9) while most infected areas would be treated after July 9 and before February 1. Cutting shrubs or trees with spotted owls present could disrupt incubating spotted owls. Not cutting shrubs or trees if a spotted owl is detected within a SOD treatment polygon would minimize this effect.

Injury or Mortality

Scientific Basis for Injury or Mortality

In extreme cases, management activities could result in direct injury or mortality of adults, eggs, or young. The potential for 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. Individual adult spotted owls can reasonably be expected to move from the area of disturbance and avoid injury or death. However, adult spotted owls which are incubating eggs or brooding young may be reluctant to leave the area (Delaney et al. 1999) and be vulnerable to injury or death. Young spotted owls are poor fliers immediately after leaving the nest; they develop their flight skills during their first several months after leaving the nest. Thus, they are most vulnerable to being struck by falling trees during this timeframe. Young are also susceptible to smoke inhalation. They may disperse prematurely in response to disturbance such as tree falling or smoke, thus increasing the likelihood of predation or starvation outside of the nest grove. Adults may abandon eggs in response to tree felling near the nest (Drent 1972; Swensen 1979; White and Thurow 1985). The risk of injury to eggs and young can be avoided by implementing an operating restriction for all SOD management activities in occupied and unsurveyed suitable nesting and roosting habitat from February 1 through September 15.

Effects of the Action – Injury or Mortality

The only potential for injury or harm from the proposed action is from the felling of a tanoak or bay laurel large enough to contain a suitable, and occupied, nesting cavity or platform within unsurveyed, suitable spotted owl nesting habitat during the nesting and post-fledging period. The scenario would have to occur in the unlikely event that a brooding adult and/or an unfledged owlet were still in an unknown nest in a tree that was felled, or a fledged owlet was roosting in tree that was then felled. The scenario is unlikely because we estimate there are only three territorial spotted owl pairs left in the Parks, due to the multi-decadal invasion of barred owls (Parks 2011).

Despite the few known active spotted owl territories left in the parks, minimization measures will be taken to prevent mortality or injury to spotted owls. As stated in the proposed action, a spot check (spotted owl calling) and visual survey of all trees to be cut will be conducted prior to SOD treatment to look for potential suitable nesting cavities or platforms, roosting adults, or fledged juveniles in unsurveyed suitable habitat. Any trees that contain potentially suitable

nesting cavities or platforms will not be cut until after the spotted nesting period (1 February to 31 July). If any spotted owls are discovered within a treatment polygon, then no shrub or tree cutting will occur within that polygon and the Parks will contact the Service to determine how to proceed.

Summary of Project Effects on the Northern Spotted Owl Numbers, Distribution, and Reproduction

SOD management activities over the 5-year period (2013-2017) could occur on as much as 1,125 ac of suitable spotted owl nesting, roosting, or foraging habitat. The amount of habitat affected is likely to be less than this amount. The impacts on spotted owls from habitat modification are expected to be insignificant because of the large amount (as much as 76,000 ac of suitable nesting/roosting habitat) of post-project suitable habitat remaining in the project areas and because no residual old-growth trees will be removed.

Spotted owls associated with approximately 4,650 acres of suitable, unsurveyed spotted owl nesting habitat could be disturbed by noise from SOD management activities over the 5-year period (2013-2017). The impacts on nesting spotted owls from noise disturbance are expected to be insignificant because most infected areas would be treated outside the incubation period of the spotted owl (after July 9th and before February 1st).

Fisher

Habitat Modification

Scientific Basis for Habitat Modification

Vegetation management practices associated with the proposed SOD Management Program have the potential to reduce the quantity and quality of fisher denning sites. Fishers depend upon existing structures, such as cavities and broken treetops, for denning sites (Powell 1993; Lofroth et al. 2010). Management activities which result in the removal of the oldest, most decadent trees or require removal of hazard trees and snags are likely to remove potential denning sites. In some landscapes, large proportions of suitable denning and resting structures and habitat may be located in riparian areas (Lofroth et al. 2010). Fishers in northern California are 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).

Effects of the Proposed Action – Habitat Modification

SOD infected areas treated within old-growth will not be rendered unsuitable habitat for fishers post treatment because only subcanopy tanoak and bay laurel trees and rhododendron shrubs will be removed. The canopy of all old growth areas within the parks are made up of conifers that will not be felled, thus, there will be no reduction in canopy cover. All logs and snags will be retained, providing fisher denning and prey habitat. However, fisher denning habitat quality will be reduced due to the removal of some potentially suitable denning cavities formed by large tanoaks and bay laurel trees that may be felled. The reduction in habitat quality diminution will

be minimal, however, due to the abundant large tanoaks and bay laurels in untreated areas immediately adjacent to treated areas. Prey habitat, in the form of denning cavities and platforms, will be affected similarly as fisher denning habitat.

SOD infected areas treated within suitable second growth forest (defined broadly as >40 year old stands in the Parks) will not be rendered unsuitable habitat for fishers post treatment because only tanoak and bay laurel trees and rhododendron shrubs will be removed. In order for a stand of second growth to be rendered unsuitable for fishers, canopy cover would have to be lowered below 60 percent (commensurate with spotted owl nesting/roosting habitat definition). The vast majority of second growth stands in the Parks that greater than 40 years old are not made up of canopies where tanoak and bay laurel make up more than 40% of the canopy. Only very limited areas (less than 100 acre polygons) within the Coyote Creek, Copper Creek and Rock Creek drainages that are suitable fisher habitat have canopies dominated by tanoak and bay laurel. These polygons are surrounded by conifer dominated and/or other hardwood dominated canopies (Parks 2012). It is difficult to model exactly where SOD treatment areas are likely to occur, but it is unlikely that a substantial amount of habitat would be rendered unsuitable for use by fishers as a result of implementation of the SOD management program. Because fisher inhabit similar forested habitats as spotted owls, for the purposes of this biological/conference opinion, we assume that SOD management activities could occur on and affect as many as 1,125 ac (225 ac/year) of suitable fisher habitat in the Parks over the 5-year period (2013-2017).

Disturbance

Scientific Basis for Disturbance

Management activities that require use of chainsaws introduce noise, visual, and air disturbances into the environment. However, fishers appear to be tolerant of moderate degrees of human activity, including low-density housing, farm roads, and small-scale logging (Heinemeyer and Jones 1994). For example, in New Hampshire, the presence of human activity and domestic animals appeared to have little effect on fisher movement (Heinemeyer and Jones 1994). Furthermore, fishers in Maine tolerated a marked degree of human activity (Heinemeyer and Jones 1994). Females with kits, however, may be more sensitive to disturbance and may move their kits periodically to new dens (Heinemeyer and Jones 1994). Fishers are secretive, usually avoid humans, and seldom linger when they become aware of the presence of humans. The females use one to three dens and are more likely to move if disturbed. Indirectly, human activities may lead to negative impacts on fishers through increased human access to fisher populations (USFS 1991, Heinemeyer and Jones 1994; Ruggiero et al. 1994).

Effects of the Action – Disturbance

During the fisher noise restriction period (1 March to 15 June), the Parks will generally attempt to avoid using chainsaws to treat SOD-infected areas in unsurveyed, suitable fisher habitat. However, depending on occurrences of SOD infection, this may be unavoidable. The Parks estimate that a maximum of 930 ac (ten 15-ac individual polygons in old-growth plus five 15-ac individual polygons in 40+ year old second-growth, each surrounded by a 500-foot noise buffer zone) could contain fishers that could be disturbed by above-ambient noise per year. If this

occurred every year during the five years of the program (2013-2017), then fishers associated with 4,650 acres of suitable, unsurveyed fisher habitat could be disturbed by noise. However, we think it is unlikely that this scenario will occur every year, because we anticipate that SOD infection treatment areas would be clustered, thus shrinking the potential areas affected by noises. In addition, only some infected areas would have to be treated during the noise restriction period (1 March to 15 June), while most infected areas would be treated after June 15th and before March 1st.

Injury or Mortality

Scientific Basis for Injury or Mortality

Fishers depend upon existing structures, such as cavities and broken treetops, for denning sites (Powell 1993; Lofroth et al. 2010), and 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). Thus, fishers could be at risk of injury or mortality if they den or rest in cavities that occur in large hardwood trees (i.e., bay laurel, tanoak) proposed for removal during SOD management activities.

Effects of the Action – Injury or Mortality

The only potential for injury or mortality from the proposed action is from the felling of a tanoak or bay laurel large enough to contain a suitable and occupied denning cavity or platform within unsurveyed, suitable fisher denning habitat during the denning period. These types of trees almost exclusively exist in old growth stands. Almost all hardwoods were removed in cut over areas of the Parks, very few residual large old hardwoods remain in second growth forest (Parks 2012). Injury or mortality to fishers could occur in the unlikely event that a den tree was felled while occupied by an adult female and kits. The large cavity protection measures described also for spotted owls will prevent the felling of most suitable denning trees. In addition, there will likely be few occasions that SOD treatment will occur during the fisher denning season (1 March to 15 June), because of the wet working conditions present during that time of the year (L. Arguello pers. comm., in Parks 2012). However, fishers can den in relatively small, hard to detect cavities. Thus, there is the potential that an unknown, but minimal, number of occupied fisher den trees could be felled during that time period. All attempts will be made to avoid or minimize this possibility.

Summary of Project Effects on Fisher Numbers, Distribution, and Reproduction

Similar to what is estimated for the spotted owl in the Action Area, as much as 1,125 ac of forested lands in the Parks suitable for denning or resting by fishers could be degraded over the 5-year period (2013-2017). The amount of degraded habitat is likely to be less than this amount, as 1,125 ac is the maximum amount of fisher denning and resting habitat that could be affected. The impacts on fishers from habitat modification are expected to be insignificant because of the large amount of post-project suitable habitat remaining in the project areas.

Fishers associated with approximately 4,650 acres of suitable resting or denning habitat could be disturbed by noises from SOD management activities over the 5-year period (2013-2017). The impacts on fishers from noise disturbance are expected to be insignificant because most infected areas would be treated outside the denning period of the fisher (after June 15 and before March 1).

Interrelated and Interdependent Activities

Regulations implementing the Act require the Service to consider the effect of activities which are interrelated and interdependent to the proposed action (50 CFR 402.02). The Act defines interrelated activities as those which are part of a larger action and depend upon the larger action for their justification, and interdependent activities as those projects which have no independent utility apart from the action that is under consideration. There are no interrelated or interdependent activities associated with this project.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act. The Service is not aware of any future actions that may result in cumulative effects to the murrelet, spotted owl, or fisher in the action area of this project.

CONCLUSION

Murrelet and Spotted Owl

After reviewing the current status of the murrelet, spotted owl, and fisher, the environmental baseline for the action area, the effects of the proposed SOD management program and the cumulative effects, it is the Service's biological opinion that implementation of the SOD management program in the Parks, Humboldt and Del Norte counties, California, as proposed, is not likely to jeopardize the continued existence of the murrelet, spotted owl, or fisher.

We have reached this conclusion for the following reasons:

Murrelet

1. From 2013 through 2017, murrelets associated with a maximum of 3,300 acres (660 ac per year) of habitat (maximum of 15 murrelet breeding attempts per year) could be exposed to noise from SOD management activities; however, in each year, most SOD management activities would likely occur outside the murrelet breeding season.
2. If all 15 murrelet breeding attempts per year exposed to elevated noises noise were disrupted (which we think is unlikely), this would represent only an estimated 1.1 percent of estimated potential breeding pairs in the Parks.

3. Murrelet nesting habitat in the Parks would not be removed or physically affected.

Northern Spotted Owl

1. From 2013 through 2017, SOD management activities could occur on as many as 15 treatment areas per year, on as much as 1,125 ac (225 ac/year) of unsurveyed (for spotted owls) forested lands in the Parks. However, this is a maximum estimate of potentially affected habitat, and in each year, most SOD management activities would likely occur outside the spotted owl breeding season. In addition, any trees that contain potentially suitable nesting cavities or platforms will not be cut until after the spotted owl nesting season for that year.
2. Spotted owls associated with a maximum of 4,650 ac (930 ac/year) of suitable, unsurveyed spotted owl nesting habitat could be exposed to noise from SOD management activities; however, in each year, most SOD management activities would likely occur outside the spotted owl breeding season.
3. If any spotted owls are detected within a SOD treatment polygon, no shrub or tree cutting will occur.

Fisher

1. From 2013 through 2017, SOD management activities could occur on and affect as many as 1,125 ac (225 ac/year) of suitable fisher habitat in the Parks. However, this is a maximum estimate of potentially affected habitat, and in each year, most SOD management activities would likely occur outside the fisher breeding season.
2. Fishers associated with a maximum of 4,650 ac (930 ac/year) of suitable fisher habitat could be exposed to noise from SOD management activities; however, in each year, most SOD management activities would likely occur outside the fisher breeding season.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act, prohibit the take of endangered and threatened species, respectively, without a special exemption. Take is defined as harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions 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 that Act provided that such taking is in compliance with this Incidental Take Statement.

The measure described below is non-discretionary, and must be undertaken by the Parks so that it becomes a binding condition of any grant or permit issued to the applicant, as appropriate, for the exemption in section 7(o)(2) to apply. The Parks have a continuing duty to regulate the activity covered by this incidental take statement. If the Parks (1) fail to assume and implement the terms and conditions or (2) fail to require the applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the Parks must report the progress of the action and its impact on the species to the Service as specified in the Incidental Take Statement [50 CFR §402.12(I)(3)].

AMOUNT OR EXTENT OF INCIDENTAL TAKE

Murrelet

The Service anticipates that a maximum of 15 murrelet pairs per year could be exposed to noise above ambient noise levels, as a result of this proposed action. Although we think it is unlikely that all of the 15 murrelet pairs per year potentially exposed to noise above ambient levels will experience a disruption in breeding activities (i.e., egg -incubation or chick-rearing and survival), we cannot infer from this estimate a minimum number of murrelet breeding pairs per year for which breeding activities could be disrupted. Therefore, the Service anticipates that 15 murrelet breeding attempts per year could be disrupted as a result of elevated noise levels. Incidental take is expected to occur in the form of disturbance to an incubating adult(s) and subsequent harm to eggs or chicks from project-related noise, due to implementation of SOD management activities within 500 feet of suitable nesting habitat during the murrelet breeding seasons, from 2013 through 2017.

In previous formal consultations with the Parks regarding murrelets, we have characterized take in the form number of acres of suitable habitat disturbed as a result of proposed actions in the parks. Therefore, commensurate with previous consultations, anticipated take in this consultation will also be measured in terms of the number of acres of suitable habitat that are disturbed as a result of the proposed action. Thus, the Service authorizes incidental take in the form of: (1) reduction of murrelet reproduction associated with 660 ac of suitable nesting habitat from March 24 through September 15 annually for five breeding seasons during the period from 2013 through 2017, resulting in a total of 3,300 acres; or (2) reduction of murrelet reproduction associated with one breeding pair per year, from 2013 through 2017. Incidental take is expected to be in the form of disturbance to adults and subsequent harm to eggs or chicks, due to noise generated by chainsaws during implementation of SOD management activities.

Spotted Owl

The Service anticipates that zero northern spotted owls will be taken as a result of this proposed action.

Fisher

The Service does not anticipate the proposed implementation of SOD management activities in the Parks (from 2013 through 2017) will incidentally take any fisher.

EFFECT OF THE TAKE

Murrelet and Spotted Owl

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the murrelet, and is not likely to result in jeopardy to the spotted owl.

Fisher

In the accompanying conference opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the fisher.

REASONABLE AND PRUDENT MEASURE

We have not identified any additional measures necessary to further reduce impacts to murrelets, spotted owls, or fishers beyond those described in the Description of the Proposed Action.

REPORTING REQUIREMENTS

The Parks will submit a report to the Arcata Fish and Wildlife Office, by 31 December of each year, from 2013 through 2017. For that year's activities, the report will detail the following for all SOD management activities:

1. exact locations of detected SOD infection areas in the Parks;
2. exact dates of SOD treatment activities at each infection site;
3. extent of infection and amount (acreage) of treated habitat at each infection site;
4. the types and estimated numbers of tree and shrub species treated at each infection site;
5. numbers of felled trees with observed cavities or platforms suitable for nesting by spotted owls;
6. for any felled tree with an observed (prior to felling) cavity or platform suitable for nesting by spotted owls, a description of contents (i.e., presence or absence of whitewash or spotted owl feathers), after felling, of all cavities or platforms, if practicable;

7. number of acres of the suitable murrelet, spotted owl and fisher habitats within 0.25 mi of SOD treatment areas; and
8. any observations of murrelets, spotted owls or fisher, detected during implementation of SOD treatment activities.

DISPOSITION OF DEAD OR INJURED SPECIMENS

Any dead or injured listed species must be reported to the Service's Law Enforcement Division (916-414-6660) or the Arcata Fish and Wildlife Office as soon as possible, and turned over to the Law Enforcement Division or a game warden or biologist of the California Department of Fish and Wildlife (formerly, CDFG) for care or analysis. The Service is to be notified in writing within three working days of the accidental death of, or injury to a listed species during implementation of the proposed action. Notification must include the date, time, and location of the incident or discovery of the dead or injured animal, as well as any pertinent information on the circumstances surrounding the incident or discovery. The Service contact for this written information is the Field Supervisor for the Arcata Field Office at (707) 822-7201.

CONSERVATION RECOMMENDATIONS

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

Marbled Murrelet

1. Coordinate with the Service and others to survey for and locate murrelet nests in the Parks.
2. Subsequent to finding murrelet nests in the Parks, coordinate with the Service and others to regularly monitor nesting activities of murrelets, using remote video or camera technology.
3. Subsequent to finding murrelet nests in the Parks, coordinate with the Service and others to deploy and operate a discreetly deployed video camera, a "Marbled Murrelet Nest Cam," which could show live or archived video activities at a murrelet nest; this live video would be available for viewing at a visitor center in the Parks, as a tool for public outreach and education.
4. Coordinate with the Service and others to participate in annual at-sea surveys for marbled murrelets off Del Norte and Humboldt counties, California.

5. Plan future trail construction and expansion of recreation programs to occur outside of old-growth redwood forests in the Parks.

Northern Spotted Owl

1. Coordinate with the Service to conduct limited research on removal of barred owls from spotted owl activity centers in the Park, to evaluate subsequent responses by spotted owls and interactions between these species as a result of barred owl removal efforts.
2. Coordinate with the Service and others to test the efficacy of the use of artificial nest boxes for use by spotted owls. It is likely that some spotted owls that formerly nested in the Parks are still present, but are utilizing second-growth habitat that generally does not provide suitable nesting habitat. It is possible that the deployment of artificial nest boxes could supplement habitat currently suitable only as foraging habitat, and enable nesting by spotted owls; nesting that otherwise would likely be suppressed or prevented by barred owls.

Fisher

1. Coordinate with the Service and others to document breeding locations of fisher in the Parks.
2. Coordinate with the Service and others to conduct habitat-use studies of fisher in the Parks through the use of live-trapping (and release) and tracking with radio-telemetry.

To keep the Service informed of actions that minimize or avoid adverse effects or benefit listed, proposed, or candidate species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

REINITIATION NOTICE

Formal Consultation

This concludes formal consultation on the action outlined in your October 17, 2012, request. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this opinion; or (4) a new species is listed or critical habitat is 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.

Formal Conference

In addition, this concludes formal conference for the proposed action. The Parks may ask the Service to confirm the conference opinion as a biological opinion issued through formal consultation, if the fisher is listed as threatened or endangered under the Act at any time during the 2013-17 time period. The request must be in writing. If the Service reviews the proposed action and finds that there have been no significant changes in the action as planned or in the information used during the conference, the Service will confirm the conference opinion as the biological opinion on the project and no further section 7 consultation will be necessary. The incidental take statement provided in this conference opinion does not become effective until the species is listed and the conference opinion is adopted as the biological opinion issued through formal consultation. At that time, the project will be reviewed to determine whether any take of the fisher has occurred. Modifications of the opinion and incidental take statement may be appropriate to reflect that take. No take of the fisher may occur between the listing of the species and the adoption of the conference opinion through formal consultation, or the completion of a subsequent formal consultation.

If you have any questions regarding this consultation or conference, please contact Bill McIver of my staff at (707) 822-7201.

cc:

California Department of Parks and Recreation, Eureka (Attn: Jay Harris)

California Department of Fish and Wildlife, Eureka (Attn: Tony LaBanca)

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