

**A Biological Assessment of Impacts To
Terrestrial And Non Anadromous Federal and State
Threatened, Endangered and Candidate Species
From Maintenance Programs At
Redwood National and State Parks (RNSP)**

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Table of Contents

Introduction	2
Consultation To Date	2
Current Management Direction	5
Description Of Proposed Action	5
Measures to Minimize Impacts on Listed Species	10
Status And Distribution Of Listed Species	11
Impacts To Threatened, Endangered And Candidate Species	21
Determination	23
Management Recommendations	24
Literature Cited	25
Appendix I – Maintenance Work Schedules and Effects To Threatened, Endangered and Candidate Species For Each Individual Park Development	29
Appendix II - Maps	100
Appendix III – Maintenance Program Project Tiering Form	101
Appendix IV – CDPR Tree Hazard Habitat Suitability Assessment Form	102

I. INTRODUCTION

The purpose of this biological assessment (BA) is to review the proposed Redwood National and State Parks' (RNSP or "parks") maintenance program, in sufficient detail to determine if the proposed actions may affect any federal and/or state threatened, endangered or candidate species and/or their designated 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 (FWS). This consultation is a renewal and combination of two programmatic consultations originally completed in 1998 (USFWS ref. #'s 1-14-98-24 and 1-14-98-F-134 and amendment 8-14-1998-0134). The expected life span of this consultation is ten years, or until February 2019.

II. CONSULTATION TO DATE

Redwood National and State Parks obtained a list from the Arcata Fish and Wildlife Service Office website, identifying the federally endangered, threatened, and candidate species that may be present or may be affected by park activities, dated January 23, 2009 (Document Number 307330548-155241). This list included 23 species currently listed as federally threatened or endangered and four species that are candidates for listing in Humboldt and Del Norte Counties.

Endangered

Western Lily (*Lilium occidentale*)
Beach Layia (*Layia carnosa*)
Black Abalone (*Haliotis cracherodii*)
Tidewater Goby (*Eucyclobius newberryi*)
Leatherback Turtle (*Dermochelys coriacea*)
California Brown Pelican (*Pelecanus occidentalis californicus*)
Short-tailed Albatross (*Phoebastris 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*)
California Coastal Chinook Salmon (*Oncorhynchus tshawytscha*)
Northern California Steelhead (*Oncorhynchus mykiss*)
Southern Oregon/ Northern California Coho Salmon (*Oncorhynchus kisutch*)
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 alexandrinus nivosus*)
Steller Sea Lion (*Eumetopias jubatus*)

Candidate

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

Critical habitat was designated for nine species on the list. Of these, four designated critical habitat areas occur within the parks. These species are chinook salmon, coho salmon, steelhead, and the marbled murrelet. 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. Critical habitats for the tidewater goby, leatherback turtle, northern spotted owl, western snowy plover, and Steller's sea lion are not designated within the parks.

RNSP contains two species still listed and protected under the California Endangered Species Act (CDFG 2008) but that were recently federally delisted.

California State Endangered

Bald Eagle (*Haliaeetus leucocephalus*)
American Peregrine Falcon (*Falco peregrinus anatum*)

Anadromous Fish Species

Effects to federal and California state listed anadromous fish from RNSP's maintenance program were previously consulted upon with the National Marine Fisheries Service. These species will not be considered further in this document.

Species Not Affected By Proposed Action and Not Considered Further in This Document

The following non anadromous species will have no proposed actions occurring in or immediately adjacent to their respective suitable habitats and so there is no possibility for effects, positive or negative. These species will not be considered further in this document: western lily, beach layia, tidewater goby, leatherback turtle, California brown pelican, short-tailed albatross, sperm whale, blue whale, humpback whale, fin whale, sei whale, green turtle, olive Ridley sea turtle, loggerhead turtle, western snowy plover, Steller's sea lion. Xantu's murrelet, black abalone and western yellow-billed cuckoo do not occur within RNSP.

History of Current Consultation

An overview of the RNSP maintenance program was presented at an Interagency Consultation Team on 28 February 2008 at the South Operations Center – Redwood National and State Parks, Orick, California. RNSP was represented by Jay Harris, Valerie Gizinski, Charlie Shay, Jeff Bomke (all of the CDPR) and Dick Mayle, Chris Heppe, Aida Parkinson, Dave Anderson, Greg Holm, Baker Holden (all of the NPS). The USFWS was represented by Robin Hamlin; NOAA Fisheries was represented by Wendy Cole and California State Fish and Game by Mike van Hatten and Bill Condon. All annual, non-annual routine and non-routine maintenance activities and their proximity to suitable listed species habitat were described as well as preliminary determinations of effects.

A draft biological assessment was sent to the USFWS for preliminary review on 2 September 2008. Comments on the draft biological assessment were received on 8 January 2009.

III. CURRENT MANAGEMENT DIRECTION

Please refer to *A Conservation Strategy for Managing Threatened and Endangered Species in Redwood National and State Parks* (Sakai 2003) for a detailed summary of laws and policies that influence management direction in RNSP.

Maintenance standards of built facilities within RNSP (i.e. campgrounds, buildings, roads, trails, historic structures and associated facilities) are generally described in the RNSP General Plan/General Management Plan (USDI/CDPR 1999). In addition, a wide variety of federal and state laws, policies and agency rules stipulate specific state and national park facility maintenance techniques, schedules and materials in order to meet safety, environmental, access, aesthetic and cultural preservation standards.

Previous Pertinent and Active Consultations

As stated previously, this is a renewal of two previous maintenance programmatic consultations completed in 1998 (USFWS ref. #'s 1-14-98-24 and 1-14-98-F-134 and amendment 8-14-1998-0134). The RNSP Trail and Backcountry Management Plan consultation (USFWS ref # 8-14-2003-1517) also contains an assessment of impacts from maintenance activities that will occur after new developments that are described in that plan have been constructed. Other future developments may be proposed and built by the parks that require future maintenance but are not in the RNSP Trail and Backcountry Management Plan. Those future developments will be assessed when they are proposed. Only park developments that are already operational at the date of this document's writing will be assessed within this document.

IV. DESCRIPTION OF THE PROPOSED ACTION

The following actions are expected to take place over the next ten years, or until March 2019.

The maintenance program at RNSP can roughly be broken up into three major categories based on the type of development being maintained: trails – any route where motorized vehicles are prohibited; building/built areas – defined as stand alone historic and non historic structures, campgrounds, trailheads and picnic areas; and roads – paved or unpaved routes where motorized traffic is allowed. Note, some RNSP roads are used as trails by the public, but these trail/roads are maintained in the same manner as other park roads and so are lumped under the roads category for this assessment. General descriptions of the types of work that occur under each category are below. Detailed descriptions of the types of work that occur at any given development, as well as its proximity to suitable listed and candidate species habitat, are presented in tabular form in Appendix I. Information in the tables includes whether individual roads are accessible to the public or are used only for park management. Locations for each development are shown on maps in Appendix II.

In support of the maintenance program, RNSP conducts regular northern spotted owl protocol surveys around certain park developments within suitable spotted owl habitat. RNSP will be altering the areas to be regularly surveyed due to the negative data collected over the past decade and the establishment of known barred owl (*Strix varia*) territories.

1) Trails

a) Trail Tread and Corridor

Please see Appendix I, Table 1 for work associated with each particular trail, equipment used, work timing and work periodicity and Appendix II, Maps, for locations.

Annual trail maintenance involves clearing vegetation which has overgrown or fallen on the trail route or drainage structures. Overgrown or fallen vegetation is cleared to 6 feet wide by 8 feet tall on foot trails and 8 feet by 10 feet on horse trails. Hazard trees are not removed from trail corridors until they have fallen to the ground. Trail treads require cyclic reshaping (once every five years to remove sluff and berm material and regain an out sloped surface). Tools typically used include non-powered hand tools such as shovels, rakes, ax/trenchers, “miserly whip” handsaws, prybars and hand powered cable winches. Motorized equipment typically used includes chainsaws, line trimmers, walk-behind trail tractors, brush mowers, ATV quads and generators.

Three temporary footbridges are installed every year in RNSP. Two cross Redwood Creek along the Redwood Creek Trail and another is placed across the Smith River from the Jedediah Smith Redwoods State Park campground and Stout Grove Trail. All work is done using non motorized hand tools or battery powered hand tools. The temporary footbridges are installed in June and removed in late September, depending on stream flow levels.

b) Trail Footbridge Repair

Permanent trail footbridges are scattered along almost every trail in RNSP and vary in length

from a few feet (puncheons) to over 100 feet long. The exact number and location of footbridges that may need repair over the lifespan of this consultation are unknown and so will be identified as their repair needs become known; therefore, bridges are not included in Appendix I, Table 1. All of the longer bridges have concrete or wood abutments and sills that the bridge stringers (the support structures under the deck boards) attach to. Longer bridges are made of either wood or metal and plastic. Trail bridge repair is conducted on an as needed basis, but it is usually more than five to ten years between major repairs for any given bridge. The most common minor repair is replacing broken handrails and deck boards. Major repairs sometimes require the replacement of whole stringers, abutments and/or sills.

All trail footbridge maintenance activities with power tools that produce noise above ambient levels in or within 500 feet (or 0.25 miles if back up warning beepers will be utilized) of marbled murrelet, spotted owl, and/or Pacific fisher habitat or within 500 feet (or 0.25 miles if back up warning beepers will be utilized) of known bald eagle nests will occur outside of each species' respective seasonal noise restriction period (bald eagle – 1 January through 31 August, northern spotted owl – 1 February through 9 July, marbled murrelet – 24 March through 15 September, Pacific fisher – 24 March through 15 June) unless the area has been shown to be unoccupied through protocol surveys. Only hand tools or below ambient noise producing electric tools will be used to maintain bridges in or within 500 feet of suitable habitat (or known bald eagle nests) during the seasonal noise restriction period of any of these four species if not otherwise cleared by surveys. For example, when larger bridge elements are to be replaced during noise restriction periods, they are precut and predrilled and assembled at the bridge site using non impact, electric powered hand tools.

2) Buildings* and Built Areas

**Please note that any maintenance that occurs entirely within an enclosed building is not described here because there is no possibility for listed or candidate species to be affected by such activities.*

Please see Appendix I, Table 2 for work associated with each particular development, equipment used, work timing and work periodicity.

The maintenance work that occurs at these developments is wide ranging and a variety of noise producing tools are utilized. Examples of typical work includes grass and shrub mowing and tree branch trimming with power mowers, tractor pulled mowers, riding mowers, line trimmers and chainsaws. Only low hanging tree branches below 20 feet tall are trimmed. Hazard trees are removed with chain saws, front end loaders, and hydraulic log splitters. Hazard tree removal only occurs at CDPR owned developments – see hazard tree habitat assessment guidelines below. Buildings are maintained with a variety of powered and non powered hand tools that include, but are not restricted to drills, saws, power washers, power painters, power sanders, hammers, welding units, power paint sprayers and pumps. Picnic areas, trailheads, campgrounds and their associated infrastructure (e.g. picnic tables, trashcans, food lockers, kiosks, signs,

power lines, plumbing) have all of the above maintenance activities occurring plus, but not restricted to: repairs to pipelines and underground wiring using backhoes and dump trucks, garbage collection with garbage trucks, and pavement and sidewalk repair with mixers, pavers, rollers and generators. Some of the larger vehicles may use back up warning beepers as a safety precaution. All maintenance activities utilize pickup trucks for access and hauling.

CDPR Hazard Tree Management Program and Habitat Assessment Guidelines.

The CDPR has a policy and formal procedure for assessing potentially hazardous trees, i.e. trees within or immediately adjacent to high use visitor developments (e.g. campgrounds, picnic areas, major trailheads) which, if they fell, would cause property damage, injury or death to visitors and/or park staff. Trees that are deemed to be potentially dangerous are assessed for their threatened and endangered species habitat suitability – particularly for marbled murrelets (see Appendix IV, form). CDPR clearly state that:

“p. 15 Tree Hazard Handbook for the California Department of Parks and Recreation – June 2008.

The removal of trees or tree parts can have significant detrimental effect on the surrounding natural, cultural, and aesthetic values. The mitigation of an identified hazard must be conducted in a manner least detrimental to other associated objectives.

Some tree hazard mitigations may affect sensitive species, particularly nesting birds (e.g., marbled murrelet). In the absence of regulatory-approved guidelines to avoid impact to sensitive species from tree work, California Department of Fish and Game and the U.S. Fish and Wildlife Service should be contacted before conducting any tree work in areas known to be frequented by sensitive species which utilize trees for a portion of their life cycle.”

No hazardous trees that have been felled or altered (i.e. limbed) within RNSP have been classified as suitable marbled murrelet habitat. This is primarily due to the fact that all the hazardous trees that have been felled were already dead and thus did not provide suitable nesting habitat for murrelets or provide cover for adjacent suitable nest trees. If a hazardous tree that is targeted for removal is determined to be contributing to suitable marbled murrelet habitat (i.e. the tree is located within 0.5 miles of suitable nest trees and is one half the site potential in height or greater) then RNSP will contact the USFWS and CDFG for guidance and recommendations.

All hazardous trees are also assessed for their habitat value to spotted owls. All visitor development areas where hazardous trees have been/could be felled have been/will be cleared of spotted owl presence through protocol surveys. No spotted owls have ever been found within any of the visitor development areas where hazardous trees have been felled in the past, most likely because of the amount of disturbance within campgrounds, picnic areas and major trailheads. Any tree that has the potential to provide a contribution to habitat suitability (e.g. trees greater than 18” DBH, trees with large cavities, trees with noticeable deformities) and is within or adjacent to suitable spotted owl habitat stand will be preserved whenever possible.

3) Roads

a) Annual and Periodic Routine Road Maintenance

Please see Appendix I, Tables 3 (annual road maintenance) and 4 (periodic road maintenance) for work associated with each particular road, equipment used, work timing and work periodicity (annual maintenance occurs every year, periodic maintenance work occurs once every four or more years). The volume of daily traffic is also noted for each road in Appendix I, Tables 3 and 4, in order to determine the ambient noise produced by vehicles on each road; low use roads are defined as less than five vehicles per day and high use roads as more than five vehicles per day.

Typical annual and periodic routine road maintenance involves brushing with line trimmers, chainsaws and articulated “brush hog” mowers attached to tractors. Only grasses, shrubs and tree branches which have grown into or over the road prism are targeted for trimming. Only low hanging tree branches below 20 feet tall are trimmed. No trees are cut during road brushing. Ditch and culvert inlet cleaning utilizes backhoes to clear these structures of fallen leaves, branches and debris. Down tree removal involves the use of chainsaws and backhoes. Hazard trees are not felled along park roads. Only fallen trees are cut and removed. Road surface grading utilizes graders and sometimes backhoes and dump trucks. Larger vehicles may use back up warning beepers as a safety precaution. No vegetation is cut during road grading.

b) Non Routine Road Maintenance

Please see Appendix I, Table 5 for work associated with each particular road, equipment used and work timing. All work described here and in the table in the appendix will occur only once in any given location during the life of this consultation and so there is no periodicity to report for this type of maintenance work.

The three types of non-routine road maintenance are rolling dip installation, culvert replacement and road bridge repair. Rolling dip installation work utilizes primarily bulldozers, graders and backhoes. Culvert replacement involves the use of excavators, backhoes, bulldozers, front loaders, graders, compactors, dump trucks and chainsaws. Larger vehicles may use back up warning signals as a safety precaution. Bridge repair can potentially involve most of the equipment listed above as well as cranes, concrete mixers, concrete pumps and various powered hand tools and generators.

All non routine road maintenance work that produces noise above ambient levels in or within 500 feet (or 0.25 miles if back up warning beepers will be utilized) of marbled murrelet, spotted owl, and/or Pacific fisher habitat or within 500 feet (or 0.25 miles if back up warning beepers will be utilized) of known bald eagle nests will occur outside of each species’ respective seasonal noise restriction period (bald eagle – 1 January through 31 August, northern spotted owl – 1 February through 9 July, marbled murrelet – 24 March through 15 September, Pacific fisher – 24 March through 15 June) unless the area has been shown to be unoccupied through protocol surveys.

No vegetation is cut or removed during rolling dip installation or road bridge repair. A small

number of trees may be cut and removed during culvert replacement work that are growing in road fill directly above culverts to be replaced. Some of these trees may be of sufficient size to provide suitable spotted owl foraging habitat but not nesting habitat. No more than 0.10 acre of trees will be removed at any one given culvert replacement site. Usually less than a dozen trees are removed. Some of these trees are located within suitable nesting, roosting and foraging habitat, or only in foraging habitat, or in unsuitable habitat. The maximum nesting, roosting and foraging habitat that would be cumulatively degraded would be 50 acres over ten years, spread across a significant portion of the park. The same amount may be cumulatively degraded within foraging only habitat. No suitable marbled murrelet habitat constituent elements (i.e. trees that are one half the site potential tree height or that provide cover for suitable nest platforms on adjacent suitable nesting trees) will be removed during culvert replacement work.

4) Alteration of Northern Spotted Owl Survey Areas

RNSP has been annually or semiannually surveying approximately 100 spotted owl call points since 1998 in support of the parks' maintenance program. No spotted owl activity centers have ever been discovered during any of these surveys. A majority of the areas that these call points survey are now occupied by barred owls (*Strix varia*) (Schmidt 2008, unpub. data). Some of the areas surveyed are located adjacent to areas with higher ambient noise levels (e.g. highways, high traffic suburban roads along the parks' boundary, campgrounds) which overwhelm any noise generated by park maintenance activities. Finally, some areas surveyed are located in unsuitable habitat. Therefore, RNSP will be eliminating a number of survey areas and reducing the survey intensity to three survey rounds once every four years in the remaining survey areas. The areas to be eliminated include:

- Wolf Creek Outdoor School
- Big Tree Parking Lot
- Prairie Creek Campground
- Camp Lincoln
- Howland Hill Outdoor School
- Jedediah Smith Campground
- Mill Creek Campground
- Newton B Drury Scenic Parkway
- Prairie Creek Campground
- A-9-7 Road
- Aubell Maintenance Complex
- Demartin Backcountry Campground
- Pacomo Residence
- Templeman Meadow Picnic Area
- Rellim Ridge Trail

The areas to be surveyed every four years include:

- A-9 Road
- A-9-9 Road
- Holter Ridge Road
- Skunk Cabbage Trail
- Elam Horse Camp
- Coastal Trail
- Flint Ridge Trail
- Howland Hill Road
- Mill Creek Campground Access Road

Measures to Minimize Impacts on Listed Species

Oregon silverspot-

No silverspots have been recorded in suitable habitat areas where maintenance activities will occur and so there are no specific minimization measures.

Spotted owl-

Above ambient noise producing work that will occur within 500 feet (or 0.25 miles if back up warning signals will be utilized) of suitable habitat will be limited to times outside the noise restriction period (1 February through 9 July) or potentially occupied suitable habitat areas may be surveyed to protocol and cleared of occupancy before work commences.

Marbled murrelet -

No suitable marbled murrelet nesting habitat will be removed or altered. Above ambient noise producing work will be limited to times outside the noise restriction period (24 March through 15 September) for most work types and areas within 500 feet (or 0.25 miles if back up warning beepers will be utilized) of suitable habitat except for a few areas noted in Appendix I. Work will be restricted to two hours after sunrise to two hours before sunset to minimize the potential for disturbance to nesting murrelets within these areas.

All park maintenance workers and contractors will be instructed to not leave any food scraps in or near suitable marbled murrelet habitat and to not feed any wildlife.

Bald eagle-

No suitable bald eagle nesting habitat will be removed or altered. Above ambient noise producing work will be limited to times outside the noise restriction period (1 January through 31 August) within 500 feet (or 0.25 miles if back up warning beepers will be utilized) of any known, active bald eagle nests.

Mardon skipper-

Any trail maintenance work along the Little Bald Hills Trail (the only maintained park development located within suitable mardon skipper habitat) (see map in Appendix II for location) within suitable mardon skipper habitat will occur in June when skippers are in the most mobile adult life phase (RNSP unpublished data) and thus least vulnerable to harm.

Peregrine falcon-

No maintenance activities would be allowed along a section of the central portion of the Coastal Trail near Gold Bluffs Beach within 0.5 mi north and south of known eyries between 1 March and 1 July or when young are known to have fledged, whichever is later. There would be no restrictions around unoccupied eyries, where falcons have not been observed during regular monitoring visits, or are presumed non-nesting based on observations by a CDPR staff resource ecologist or NPS wildlife biologist.

Tiering

All non routine maintenance projects would be tiered to this biological assessment through use of the tiering form attached at the end of this document (Appendix III). Tiered projects would be reviewed by a CDPR staff resource ecologist or NPS staff biologist to ensure consistency with the project description in this biological assessment.

V. STATUS AND DISTRIBUTION OF LISTED SPECIES

Please refer to *A Conservation Strategy for Managing Threatened and Endangered Species in Redwood National and State Parks* (Sakai 2003, as amended) for detailed species account, habitat status, and literature summaries for the all non-salmonid species discussed below.

1. Oregon Silverspot (*Speyeria zerene hippolyta*), Federal Threatened

A. Species Account

The nearest known population of the Oregon silverspot is near Lake Earl and the adjacent Tolowa Dunes State Park, where it is associated with dune habitat and coastal grasslands containing the larval host plant, early blue violet (*Viola adunca*), nectar sources, and adult courtship areas. Meadow habitats must have sufficient numbers of early blue violets to provide adequate food for the caterpillars. Such habitats tend to be relatively open and low-growing grasslands. Microclimate conditions at Lake Earl north to Brookings, Oregon create an environment that is oftentimes warmer than the surrounding area. It was hypothesized that these warmer conditions may render the habitat more ideally suitable for this butterfly in the vicinity of

Lake Earl (S. Mattoon pers. comm.).

Habitat with the greatest likelihood of supporting Oregon silverspots in RNSP, the coastal grasslands adjacent to Crescent Beach, Endert's Beach Road and Endert's Beach, was surveyed by researchers working under a NPS scientific research permit at various times in the early 1990s and as recently as 2004 but this species was not detected (S. Mattoon pers. comm.). This area contains substantial amounts of tansy ragwort, a preferred nectar plant of the silverspot.

B. Habitat Status

The spread of non-native plants has degraded or eliminated habitat for the Oregon silverspot butterfly at numerous sites. Those exotic plants that change the structure of the habitat including Scotch broom (*Cytisus scoparius*) and European beachgrass (*Ammophila arenoides*) are particularly noteworthy (Hammond 1994). Occurrence of early blue violets was inversely correlated with vegetation height and thatch depth (Singleton 1989, McIver et al. 1991, Pickering et al. 1992); removal of shrubs, bracken fern, grass thatch and trees resulted in vigorous violet growth (Hammond 1986).

In Del Norte County, early blue violets are known to occur in sand dune habitat with low wet areas sustained by subsurface water. Also, at Lake Earl early blue violets grow in association with European beachgrass (USFWS 2001a). Potentially suitable habitat in RNSP occurs in the Crescent Beach/Endert's Beach area south of Crescent City. At this location there are 240 ac (113 ha) of coastal prairie containing a wetland. Early blue violets occur in this area, as do many of the adult nectar sources (L. Arguello pers. comm.).

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

A. Species Account

Each year since 1993 some proportion of the 36 known spotted owl activity centers have been monitored. In 2007 there were fourteen active sites (territories with one or more spotted owls present in the previous three years) (Schmidt 2008). Currently, all but one of these territories are located in the Redwood Creek watershed, however during the original park-wide inventory spotted owls were detected in Prairie Creek Redwoods, Del Norte Coast Redwoods, and Jedediah Smith Redwoods State Parks. Survey results from completed home range inventories (all suitable habitat surveyed in a 1.0 mi radius centered on the historic activity center) at sites with no spotted owls detected in ≥ 3 yrs indicate that spotted owls no longer occur within the majority of territories with persistently unoccupied activity centers.

We have documented high levels of barred owl (*Strix varia*) activity in many spotted owl territories, in some cases barred owls have taken up residence at spotted owl nest sites; barred owls are known to be reproducing with regularity within the park. Barred owl records in the park 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 original

spotted owl activity centers (Tanner unpub. data). As of 2005 barred owls have been observed in 21 of the known spotted owl territories within the parks; at least 12 of these territories appear to be no longer occupied by spotted owls and are now occupied by barred owls exclusively (Schmidt 2008). As of 2005 it was estimated that there were as many as 42 independent barred owl sites within all of RNSP.

B. Habitat Status

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. As of 2005, there were 23,231 ac (9,401 ha) of second growth forest ≥ 40 years old that possibly may be suitable for nesting, roosting, and foraging. There are an estimated 331 ac (134 ha) with residual old growth that are assumed to be suitable for spotted owls. 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.

Twenty (55%) of the original 36 RNSP owl territories have > 1336 ac and > 500 ac (the minimum or “threshold” number of 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. However, as was noted above, much of this suitable habitat is now occupied by barred owls, and most likely unavailable for use by spotted owls.

3. Bald Eagle (*Haliaeetus leucocephalus*), California State Endangered

A. Species Account

Field surveys to identify potential bald eagle nesting activities during the breeding season were begun in 1997 and have continued to the present. In 2008 there were two known active bald eagle nest sites in RNSP, on the main branch of Mill Creek and on a ridge above Orick which both produced two fledglings each (unpublished data). The Mill Creek nest site was first suspected in 2003 due to eagle activity observed in this area during the breeding season. The nest was finally located in 2005, and produced one eaglet that year and in 2006 and 2007. The nest discovered in 1997 on the ridge above Orick has produced one or two eaglets every year

since 1997 except for 2007. Bald eagles in all age classes have been observed with regularity along coastal areas, however, there are many fewer observations of eagles inland, e.g., up Redwood Creek (Bensen 2007).

B. Habitat Status

Redwood National and State Parks were identified primarily as winter habitat in the *Recovery Plan for the Pacific Bald Eagle* (USFWS 1986), which forms the basis for management direction and provides recovery goals. Approximately 12,900 ac (5,220 ha) of potential habitat is located within 200 m of streams, lagoons and the ocean. Large trees providing suitable nest sites are located throughout many areas of RNSP.

4. Marbled Murrelet (*Brachyramphus marmoratus*), Federal Threatened

A. Species Account

Beginning 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. Twenty-seven nests were initiated by radio-marked birds in the first three years of this study (Hebert and Golightly 2003, R. Golightly pers. comm. 2005). Preliminary results from trials with noise (from chainsaws) and people walking and talking in the vicinity of an occupied nest indicate 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 (2003) 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 contrast, Hamer and Nelson (1998) 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).

In 1999-2001, 2003-2004, and 2006 the park contracted surveys of all suitable habitat within 0.25 mi of roads proposed for removal throughout the Lost Man Creek watershed. This habitat included 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.

Because of these and other studies within the park, we assume that all stands with trees providing

nesting opportunities for marbled murrelets have the potential to be occupied.

A significant threat to the marbled murrelet, and one that may explain the observed low recruitment rates, is the high level of predation on murrelet eggs and chicks. Of the fourteen known or suspected nest predators, eight 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, Hebert and Golightly 2003). Corvids are extremely intelligent and efficient predators, using a highly refined search image for locating prey. Corvid numbers have increased significantly throughout the west in the last century in response to habitat change and human development (Marzluff et al. 1994). The densities of many corvid species, have been found to be higher in landscapes fragmented by agriculture and human development than in forested landscapes. 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.

The recovery actions for the Siskiyou Coast Range Zone (including RNSP) 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).

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.

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.

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).

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.

5. Mardon Skipper (*Polites mardon*), Federal Candidate

A. Species Account

The mardon skipper is a small sedentary butterfly that inhabits low growing grassland plant communities. Up until recently the species was known from four widely separated locations. Prior to 2004 the only known California population occurred in northwestern Del Norte County, on Low Divide ridge on US Forest Service land. In May of 2004, a fifth population was discovered in the Little Bald Hills area of the park. This is now the southernmost known population of this species. Both California populations occur in rocky serpentine meadows containing Idaho fescue (*Festuca idahoensis*). The two California sites are separated by approximately seven air miles, and the Smith River valley.

Mardon skipper larvae feed on *Festuca* spp. for approximately three months (Dornfeld 1980) before pupating in cocoons in the bunch grass (Newcomer 1966). Adults feed on a variety of nectar sources depending on the locale. At one site *Viola adunca* was the preferred nectar source; other preferred sources include *Vicia* spp., *Penstemon* spp., and *Calochortus* spp.

The Little Bald Hills population in RNSP was originally located in a mesic fescue-dominated meadow and a tall-grass horse pasture. Additional searches for mardon skippers subsequent to the initial detections have resulted in a number of individuals being detected in Little Bald Hills ridge top areas, approximately 0.5 mi southeast of the original location. It is possible that

mardon skippers may occur extensively throughout the Little Bald Hills. Based on surveys by park staff in 2005 and 2006, it appears that numbers and locations of mardon skippers vary among years, and probably depend upon environmental factors that influence the emergence of adults.

Threats to the species include recreational activities including walking, horseback riding, and off-road vehicle use that may kill skippers directly and degrade habitat. The Low Divide population is currently threatened by these activities (USFWS 1999). Grassland habitats required by this species have been severely reduced by development, fire suppression, and invasion by exotic or other plants not used by the species (Potter et al. 1999). Scotch broom has been identified as a particular threat due to its ability to form dense stands and exclude native grassland species. Parker et al. (1997) found an inverse relationship between Scotch broom and Idaho fescue, a larval host species. Horseback riding and hiking could pose threats to the Little Bald Hills population but perhaps more importantly, the open grassland is threatened by encroachment grassland by conifers including Jeffrey pine and Douglas-fir that has occurred due to the absence of fire.

Controlled burning, mowing, and exotic plant management are necessary to maintain suitable mardon skipper habitat, but methods must be implemented in such a way as to not prove lethal to a population. Restoration activities should involve small-scale, site-specific treatments focused on augmenting food and nectar plants. Care must be taken to select exotic plant control methods, and time activities in such a way, that would minimize impacts to butterfly larvae and pupae (Potter et al. 1999).

B. Habitat Status

It is likely that the only suitable mardon skipper habitat in the park occurs in the Little Bald Hills in the Jeffrey pine and fescue grasslands as the serpentine soils that create this type of habitat are absent elsewhere in RNSP. The Jeffrey pine grassland in the Little Bald Hills covers approximately 346 ac (138 ha).

6. Fisher (*Martes pennanti*), Federal Candidate

A. Species Account

Fishers are known to occur in RNSP. There have been four separate surveys for forest carnivores in the park (Gellman et al. 1993, McKenzie et al. 1994, Beyer and Golightly 1995, and Slauson et al. 2003); fishers were detected in all of these surveys. Beyer and Golightly (1995) 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. There are relatively few fisher observations in the park's wildlife observations database, however, reliable sightings have occurred in the Lost Man Creek, Prairie Creek, Wolf Creek Education Center, Requa maintenance yard, and Newton B. Drury parkway areas, along the A-9, C-9, and Bald

Hills Roads, and at Maneze Prairie. The survey results coupled with the reliable database records indicate that fishers are probably well-distributed throughout the park.

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 west indicate fishers give birth in mid-March to early April, and breed shortly after. On managed forests in the redwood and redwood/ Douglas-fir transition zone it appeared that parturition was occurring during the latter part of 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. One study (Seglund 1995) showed that fisher rest sites occurred >100 m (328 ft) from roads, homes, and campgrounds. However, fishers are somewhat frequently observed near roads in the park (RNSP unpub. data). Slauson et al. (2003) detected fishers at road-side track plate stations, including those placed near Newton B. Drury parkway, and near Alder Camp, Howland Hill and Bald Hills roads. Conversely, Beyer and Golightly (1995) attributed low and high detection ratios at certain sites to proximity of a major highway and limited human access, respectively. From a park 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. Increased movements during the day may increase mortality from predators or automobiles (Paragi et al. 1994). The presence of humans on foot in the vicinity of a den or rest site, e.g., on a nearby trail, under most circumstances would probably not result in significant disturbance (B. Zielinski pers. comm.).

B. Habitat Status

Fishers have generally been associated with large unfragmented blocks of late successional conifer forest. 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).

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. in press b). 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 24,364 ac (9,860 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.

7. American Peregrine Falcon (*Falco peregrinus anatum*), California State Endangered

The peregrine falcon has an almost worldwide distribution, with three subspecies recognized in North America. The American peregrine falcon occurs throughout much of North America, from the subarctic boreal forests of Alaska and Canada south through Mexico. In the west, the subspecies nests from central Alaska and south throughout western Canada and the United States to Baja California and the highlands of central Mexico (USDI 1999).

Peregrine falcons declined precipitously in North America following World War II due to the increase in use of organochlorine pesticides, mainly DDT and its metabolites, that occurred during that period. Organochlorines affected peregrines by causing direct mortality, reproductive failures, and egg shell thinning and breakage. Because of the vast reduction in numbers throughout the range, and complete extirpation in some places, the peregrine falcon was listed as an endangered species upon adoption of the Endangered Species Act in 1973.

Following the ban on organochlorine pesticides peregrine falcons began to recover. Active management including reintroduction of captive bred peregrines and relocation of wild hatchlings also contributed to the species' recovery. On August 25, 1999 a final rule removing the subspecies from the list of threatened and endangered species was published, along with rules for recovery (USDI 1999). However, the species is still considered endangered by the State of California.

The recovery plan for the Pacific Coast population of the American peregrine falcon called for 185 wild self-sustaining pairs (i.e., producing 1.5 young per pair) throughout California, Oregon, Washington, and Nevada. Of those 185, there were to be 120 pairs in California (USFWS 1982).

Based on data from a 1998 census there were 270 pairs meeting the productivity goal of 1.5 young per pair (USDI 1999) throughout the four-state area. The nationwide 2003 census indicated that there were approximately 1,500 pairs in the conterminous United States (USFWS website).

There are many threats to this species including transmission lines, shooting, falconry, and human disturbance. In early spring disturbance during courtship may result in the abandonment of nest sites. If human activities occur throughout the nesting area, the entire territory may be abandoned (Fyfe and Olendorf 1976). Aerial disturbance from low-flying helicopters and airplanes also may be responsible for nest abandonment (USFWS 1982). Known predators include Great Horned Owls, Red-tailed Hawks, Common Ravens, Coyotes, Bobcats, Raccoons, and Skunks.

Areas in RNSP with potential peregrine falcon nesting habitat have been surveyed by boat and on land since 1993. Although peregrines were observed at a number of locations within the park (e.g., Split Rock (Falvey 1998) and False Klamath Rock (K. Schmidt pers. obs.)), the first documented eyrie and reproduction occurred in 1998 on the bluffs above Gold Bluffs Beach (Falvey 1998). Currently there are two confirmed peregrine falcon territories and one additional suspected territory within RNSP, with four nest sites. One territory is centered north of Requa, and the two other (most likely alternate nest sites) are along Gold Bluffs Beach. The Requa site is difficult to observe due to its location, and reproduction there has been confirmed by observations of fledglings, with one seen in 1999 and 2004 and two seen in 2005. However, the annual presence of adult birds during the breeding season from 1993 through 2005 indicates a high probability of regular nesting and productivity at this site (Holm 2006). The pair at Gold Bluffs Beach is very productive, and has produced at least one young in 2000 and 2002. Two young were confirmed fledged in 1998, 1999, 2001 and 2003. Fledglings were not confirmed, but were suspected, in 2004 and 2005 (Holm 2006). The third territory is suspected to be in the top of a very large redwood tree along lower Redwood Creek. It was found in 2008 when adult birds and one young bird were seen perched and flying around the suspected nest tree (Bensen 2008).

Peregrine Falcons are regularly observed during all times of year at a wide variety of locations throughout RNSP, particularly along the coast (RNSP unpub. data).

B. Habitat Status

American peregrine falcons nest almost exclusively on cliffs, usually near water. Tree-nesting and nesting on man-made structures are rare for this subspecies. Most often nests are on sheer cliffs 150 ft (43 m) or more in height. The cliff usually has a small cave or overhung ledge large enough to contain three or four full-grown nestlings. Several different ledges are used in alternate years. Peregrines have been known to nest from sea level to over 11,000 ft (3,350 m). Wooded areas, marshes, open grasslands, coastal strands, and lagoons, especially in proximity to a nest site, provide suitable foraging habitat (USFWS 1982). The discovery of a suspected tree nest in 2008, however, opens the possibility that falcons will nest in very large redwoods in RNSP.

In RNSP suitable habitat occurs in many areas of the park. Sea cliffs, beach bluffs, sea stacks, and large bedrock outcrops, e.g., in the Bald Hills all may provide potentially suitable nesting habitat for Peregrines. However, the only confirmed cliff territories in the park occur along the coast. If very large redwoods are suitable falcon nesting habitat, then the amount of suitable nesting habitat within RNSP will increase dramatically.

VI. IMPACTS TO THREATENED, ENDANGERED AND CANDIDATE SPECIES

Oregon Silverspot

Surveys in the area of Enderts Beach Road indicate that Oregon silverspots do not occur in the park. If Oregon silverspots were to occur in the potentially suitable habitat areas at Enderts Beach Road/CBEC then early blue violets and tansy ragwort would be clearly marked so that trampling of butterfly larvae or pupae would be minimized or avoided. Both food plants may occur in small patches in areas that are mowed along the immediate edges of the Enderts Beach Road and CBEC Road (the only maintenance action that could affect these plants). Mowing does not kill these plants at the few times per year rate that these areas are currently maintained (L. Arguello pers. comm.). Therefore, Oregon silverspot habitat is only minimally degraded by maintenance activities.

Northern Spotted Owl

A maximum of 50 cumulative acres (broken up into 0.1 acres pieces) of suitable nesting, roosting and foraging spotted owl habitat and an additional 50 acres of foraging suitable spotted owl habitat scattered across a large portion of the park may be degraded during non routine road maintenance (culvert replacement). The total acreage degraded will most likely be lower. This habitat degradation is expected to be insignificant due to the dispersed nature of the various work locations and the large amounts of remaining suitable habitat available throughout the park.

Spotted owls may be disturbed by above ambient noise produced during backcountry trail maintenance. A maximum of 801 acres of suitable habitat may be disturbed in any given year. It is unlikely that all the estimated acres will be disturbed in any given year, however, based on past maintenance program disturbance patterns. Not all the suitable acres of habitat will be disturbed during any given year because much of the maintenance will occur on an as needed basis and/or periodic basis. This has been demonstrated by the highly variable past maintenance schedules. For example, the percentage of the total noise disturbance incidental take authorized actually affected varied widely between years; in 2007 – 4%, 2006 – 4%, 2005 – 25%, 2004 – 10%, 2003 – 21%, 2002 – 9%, 2001 – 13% of the take acres authorized were actually disturbed by above ambient noise due to annual and periodic maintenance work. These disturbance patterns are expected to continue over the next ten years. All other above ambient noise producing work that will occur within 500 feet (or 0.25 miles if back up warning signals are to be utilized) of suitable habitat will be limited to times outside the noise restriction period (1 February through 9 July) or suitable habitat areas will be surveyed to protocol and cleared of occupancy before work

commences.

Bald Eagle

No bald eagle nesting or roosting habitat would be removed or degraded by any maintenance activities.

The bald eagle nest tree located near Mill Creek is within approximately 100 yards of the Mill Creek Horse Loop Trail. Visitors and park staff are not allowed within a quarter mile of the nest tree from 15 October to 31 March due to trail ford closures on Mill Creek instituted to protect salmonid spawning grounds from trampling. This trail closure period effectively prevents any disturbance to the nest during the first half of the eagle nesting season. No brush clearing with motorized tools is allowed within a 500 feet of the nest tree between 31 January and 15 September due to noise restrictions imposed to protect spotted owls and marbled murrelets. Thus the only time regular trail maintenance with motorized tools would occur within 500 feet of the nest tree would be from 16 September to 14 October when bald eagles would not be present at the nest. Large trees which fall across the trail during the eagle noise restriction period (1 January to 31 August) will be removed with hand tools or the trail will be closed until after the noise restriction period so that the tree(s) can then be removed with chainsaws. Annual maintenance activities along the Mill Creek Horse Loop Trail will not affect bald eagles at this territory.

Disturbance of the occupied eagle territory located within a quarter mile of the McArthur Creek Horse trail (but outside of 500 feet) is not expected. The nest tree is located over a ridge from the trail and is partially shielded from activity occurring along the trail. In addition, this territory has successfully produced young every year (except one, when the nest was blown out during a winter storm) (Bensen 2008) despite regular maintenance occurring along the trail early in the noise restriction period.

Marbled Murrelet and Marbled Murrelet Critical Habitat

No marbled murrelet nesting habitat or primary constituent elements of critical habitat will be removed or degraded by any maintenance activities. No trees that are one half the site potential tree height and located within 0.5 miles of a suitable nest tree will be removed.

Above ambient noise producing work will be limited to times outside the noise restriction period (24 March through 15 September) for most work types and areas within 500 feet (or 0.25 miles if back up warning beepers are to be utilized) of suitable habitat except for some areas noted in the tables in Appendix I. Within the areas where above ambient noise producing work does occur during the noise restriction period, marbled murrelets may be adversely affected by noise disturbance across a total of 2,364 acres of suitable habitat. Not all the suitable acres of habitat will be disturbed during any given year because much of the maintenance will occur on an as needed basis and/or periodic basis. This has been demonstrated by the highly variable past maintenance schedules. For example, the percentage of the total noise disturbance incidental take authorized actually affected varied widely between years; in 2007 – 14%, 2006 – 57%, 2005

– 58%, 2004 – 31%, 2003 – 24%, 2002 – 34%, 2001 – 75% of the take acres authorized were actually disturbed by above ambient noise due to annual and periodic maintenance work. These disturbance patterns are expected to continue over the next ten years.

Mardon Skipper

Any trail maintenance work along the Little Bald Hills Trail (the only maintained park development located within suitable mardon skipper habitat) (see map in Appendix II for location) within suitable mardon skipper habitat will occur in June when skippers are in the most mobile adult life phase (RNSP unpublished data) and least vulnerable to harm.

Pacific Fisher

No suitable fisher denning or resting habitat will be removed or altered. No disturbance is expected throughout most of the suitable fisher habitat in RNSP because above ambient noise producing maintenance work that will occur within 500 feet (or 0.25 miles if back up warning beepers are utilized) of suitable habitat will be limited to times outside the noise restriction period (24 March to 15 June). Some suitable habitat within 500 feet (or 0.25 miles if back up warning beepers are utilized) of annual maintenance areas will be affected by above ambient maintenance activity caused noise because work will be allowed there due to clearance of spotted owl presence through surveys. Fisher presence will not be ascertained through surveys in these suitable habitat areas and so the habitat is assumed to be occupied. The total maximum amount (out to 0.25 miles) of suitable habitat that may be disturbed is 2,450 acres near the A-9, A-9-9, Holter Ridge and Mill Creek Campground Access Roads. Not all these acres are expected to be disturbed based on past maintenance schedules as mentioned above in the marbled murrelet section.

American Peregrine Falcon

No suitable falcon nesting habitat will be removed or altered. No known eyries will be disturbed by maintenance activities due to timing restrictions described in the proposed action. Any future eyries are also not expected to be disturbed by maintenance activities because the birds establishing the nest site will presumably be habituated to any ongoing noise.

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 park. Private timberland, ranch and home owners, county and state road and building maintenance crews will be operating in and around the parks throughout the year along their respective jurisdictions. Each land owner maintains their roads according to differing schedules which may or may not add additional noise disturbance to park listed species habitat, depending on when and where they occur and the conservation measures they operate under.

VII. DETERMINATION

Based on the nature and timing of the proposed actions, it is my determination that the maintenance program in RNSP will have the following effects on the threatened and endangered species addressed in this document:

There will be no effects to Oregon silverspot butterflies.

Due to a small amount of potentially suitable nesting, roosting and foraging trees being removed at culvert replacement work sites and thus degrading the suitable habitat, spotted owls may be affected but will not be adversely affected. Due to above ambient noise producing work occurring along some developments within suitable habitat during the noise restriction period, spotted owls may be affected and are likely to be adversely affected across 801 acres of habitat. Not all acres of disturbance are expected to occur in any given year and will most likely vary between 4% and 25% of 801 acres, based on past maintenance work disturbance patterns.

Due to some above ambient noise producing maintenance work occurring along the Macarthur Creek Horse Trail that is in the vicinity, but outside of 500 feet, of an active nest, bald eagles maybe affected but will not be adversely affected.

Due to above ambient noise producing work occurring along some developments within suitable habitat during the noise restriction period, marbled murrelets may be affected and are likely to be adversely affected across 2,364 acres of habitat. Not all acres of disturbance are expected to occur in any given year and will most likely vary between 14% and 75% of 2,364 acres, based on past maintenance work disturbance patterns.

Due some vegetation clearing occurring within suitable habitat during June, mardon skippers are not expected to be substantially negatively affected by trail maintenance work.

Due to above ambient noise producing work occurring along some developments within suitable habitat during the noise restriction period, Pacific fishers may be substantially negatively affected across 2,450 acres of habitat.

There will be no effects to peregrine falcons.

VIII. MANAGEMENT RECOMMENDATIONS

There are no management recommendations.

VIX. CONTRIBUTORS

Judy Wartella – GIS analysis and map production.

LITERATURE CITED

- Bensen, K.B. 2008a. 2008 bald eagle inventory and monitoring, Redwood National and State Parks annual progress report. Unpublished report on file at South Operations Center, Redwood National and State Parks, Orick, CA. 5 pp.
- Bensen, K.B. 2008b. Redwood National and State Parks, 2007 Annual Incidental Take Summary Report. Unpub. Rep. to US Fish and Wildlife Service. 7 pp.
- Beyer, K.M. and R.T. Golightly. 1996. Distribution of Pacific fisher and other forest carnivores in coastal northwest California. Unpub. Rep. to California Dept. of Fish and Game. Contract # FG-3156-WM. 28 pp.
- Buskirk, S.W., and R.A. Powell. 1994. Habitat ecology of fishers and American martens. In Buskirk, S.W., A.S. Harestad, M.G. Raphael, and R.A. Powell (Eds.). Martens, sables, and fishers: biology and conservation. Cornell Univ. Press, Ithaca, New York. Pages 283-296.
- [CDFG]. California Department of Fish and Game. 2008. Special Animals, California Natural Biodiversity Database. <http://www.dfg.ca.gov/biogeodata/cnddb/pdfs/SPAnimals.pdf> 60 pp.
- Dornfield, E.J. 1980. The butterflies of Oregon. Timber Press, Forest Grove, OR. 276 pp.
- Falvey, B. 1998. Peregrine Falcon inventory and monitoring- 1998, Redwood National and State Parks (RNSP). Unpub. Rep. on file at Redwood National and State Parks, Orick, CA. 10 pp.
- Fyfe, R.w. and R.e. Olendorff. 1976. Minimizing the dangers of nesting studies to raptors and other sensitive species. Canadian Wildlife Service, Occ. Paper No. 23. 12 pp.
- Gellman, S.T., D.L. Walters, and C.J. Ralph. 1993. Biological assessment of the Cushing Creek realignment project route 101, Del Norte County, California. USDA Forest Service, Redwood Sciences Laboratory, Arcata, CA. 66 pp.
- Hamer, T.E. and S.K. Nelson. 1995. Nesting chronology of the marbled murrelet. Pages 49-56 in C.J. Ralph, G.L. Hunt, M.G. Raphael, and J.F. Piatt (Tech. eds.). Ecology and conservation of the marbled murrelet. Gen. Tech. Rept. PSW-GTR-152. U.S. Dept. of Agriculture, Forest Service, Albany, California.
- Hammond, P.C. 1986. Ecological investigation of *Viola adunca* 1986 supplement. U.S. Department of Agriculture, Forest Service, Siuslaw National Forest. 25 pp.
- Hammond, P.C. 1994. 1994 report of silverspot butterfly use of native meadow habitat on the Siuslaw National Forest. U.S. Department of Agriculture, Siuslaw National Forest. 16 pp.

- Hebert, P.N. and R.T. Golightly. 2003. Breeding biology and human-caused disturbance to nesting of marbled murrelets (*Brachyramphus marmoratus*) in northern California. Unpub. Prog. Rept, Humboldt State University, Dept of Wildlife, Arcata, CA.
- Holm, G. 2006. 2005 Peregrine Falcon inventory and monitoring annual progress report. Unpub. Rep. on file at Redwood National and State Parks, Orick, CA. 12 pp.
- LeValley, R. 2001. Redwood National Park, Humboldt County California, marbled murrelet surveys in residual stands, interim report- Summer 2000 surveys. RNSP Work Order Number P8480000019. Unpub. Rep. on file at RNSP, Orick, CA
- Marzluff, J.M., J.M. Luginbuhl, M.G. Raphael, D.M. Evans, D.E. Varland, L.S. Young, S.P. Horton, S.P. Courtney. 1996. The influence of stand structure, proximity to human activity, and forest fragmentation on the risk of predation to nests of marbled murrelets on the Olympic Peninsula. Unpublished Report submitted to the USFWS. January 31, 1996. 63 pp.
- Marzluff, J.M., R.B. Boone, and G.W. Cox. 1994. Historical changes in populations and perceptions of native pest bird species in the west. *Studies in Avian Biology* 15:202-220.
- McIver, J., S. Muttillinja, D. Pickering, and R. VanBuskirk. 1991. Population dynamics and habitat selection of the Oregon silverspot butterfly (*Speyeria zerene hippolyta*): a comparative study at four primary sites in Oregon. Report to the U.S. Department of Agriculture, Forest Service, Siuslaw National Forest, Corvallis OR. 61 pp.
- McKenzie, M., S.T. Gellman, and W.J. Zielinski. 1994. Interim biological assessment of the proposed Wilson Creek realignment project route 101, Del Norte County, California. USDA Forest Service, Redwood Sciences Laboratory, Arcata, CA. 30 pp.
- McShane, C., T. Hamer, H. Carter, G. Swartzman, V. Friesen, D. Ainley, R. Tressler, K. Nelson, A. Burger, L. Spear, T. Mohagen, R. Martin, L. Henkel, K. Prindle, C. Strong, and J. Keany. 2004. Evaluation report for the 5-year status review of the marbled murrelet in Washington, Oregon, and California. Unpub. Rept. EDAW, Inc. Seattle, WA. Prepared for the U.S. Fish and Wildlife Service, Region1, Portland, OR.
- Nelson, S.K. and T.E. Hamer. 1995. Nest success and the effects of predation on marbled murrelets. In *Ecology and Conservation of the Marbled Murrelet in North America* (C.J. Ralph, G.L. Hunt, M.G. Raphael, and J.F. Piatt, eds.) Gen. Tech. Report PSW-GTR-152. USFS, Albany, California.
- Newcomer, E.J. 1966. Life histories of three western species of *Polites*. *J. Res. Lepid.* 5: 243-247.
- Paragi, T.F., S.M. Arthur, and W.B. Krohn. 1994. Seasonal and circadian activity patterns of female fishers, *Martes pennanti*, with kits. *Can. Field. Nat.* 108:52-57.

- Parker, I., W. Harpole, and D. Dionne. 1997. Changes in the south Puget prairies landscape. Pages 149-161 in Ecology and conservation of the south Puget Sound prairie landscape (P.V. Dunn, and K. Ewing, eds.) The Nature Conservancy. Seattle, WA.
- Pickering, D., D. Salzer, and C.A. Macdonald. 1992. Population dynamics and habitat selection of the Oregon silverspot butterfly (*Speyeria zerene hippolyta*). Report to the Siuslaw National Forest. The Nature Conservancy, Portland, OR. 100 pp.
- Potter, A., J. Fleckenstein, S. Richardson, and D. Hays. 1999. Washington state status report for the mardon skipper. Washington Department of Fish and Game, Olympia. 39 pp.
- Raphael, M.G., D. Evans Mack, J. M. Marzluff, and J.M. Luginbuhl. 2002. Effects of fragmentation on populations of the marbled murrelet. Studies in Avian Biol. 25:221-235.
- Powell, R.A. and W.J. Zielinski. 1994. Fisher. In Ruggiero, L.F., K.B. Aubry, S.W. Buskirk, L.J. Lyon, W.J. Zielinski (Tech. Eds.). The scientific basis for conserving forest carnivores, American marten, fisher, lynx, and wolverine, in the western United States. USDA Forest Service, General Technical Report RM-254. Pages 38-73.
- Raley, C. 2002. Ecological characteristics of fishers in the southern Oregon Cascade range. Final Progress Report. USDA Forest Service, Pacific Northwest Research Station, Olympia, WA. 16 pp.
- Sakai, H. 2003. A conservation strategy for managing threatened and endangered species in Redwood National and State Parks. Unpub. Rep. on file at South Operations Center, Orick, CA
- Seglund, A.E. 1995. The use of resting sites by the Pacific fisher. M.S. Thesis. Humboldt State University, Arcata, CA. 66 pp.
- Singleton, T.A. 1989. Population dynamics and habitat selection of the Oregon silverspot butterfly (*Speyeria zerene hippolyta*) at Cascade Head Preserve. The Nature Conservancy, Portland, OR. 9 pp.
- Slauson, K.M., W.J. Zielinski, G.W. Holm. 2003. Distribution and habitat associations of the Humboldt marten (*Martes americana*), and the Pacific fisher (*Martes pennanti pacifica*) in Redwood National and State Parks. Unpub. Rep. on file at South Operations Center, Orick, CA. 29 pp.
- Stauffer, J. and R. LeValley. 2004. Redwood National Park, Humboldt County, California, northern spotted owl and marbled murrelet surveys in residual stands. Final Rept. on file at South Operations Center, Orick, CA. 15 pp.
- Tanner, R.G. 1999. Habitat use by northern spotted owls in coastal redwood forests of northwestern California. M.S. Thesis, Humboldt State University, Arcata, CA
- USDI [United States Department of the Interior]. 1999. Endangered and threatened wildlife and plants; final rule to remove the American peregrine falcon from the federal list of endangered and threatened wildlife, and to remove the similarity of

appearance provision for free-flying peregrines in the conterminous United States; final rule. Fed. Reg. Vol 64(164): 46541-46558.

[USDI] U.S. Department of the Interior and [CDPR] California Department of Parks and Recreation. 1999. Redwood National and State Parks, Humboldt and Del Norte Counties; final general management plan/ general plan; environmental impact statement/ environmental impact report. Vol. 1. Crescent City, CA: USDI National Park Service and California Department of Parks and Recreation.

USFWS [United States Fish and Wildlife Service]. 1982. The Pacific coast American peregrine falcon recovery plan. 87 pp.

[USFWS] United States Fish and Wildlife Service. 1999. Candidate and listing priority assignment form, *Polites mardon*. US Fish and Wildlife Office, Region 1, Western Washington Office, Lacey, WA. 8 pp.

[USFWS] United States Fish and Wildlife Service. 2001a. Oregon silverspot butterfly (*Speyeria zerene hippolyta*) revised recovery plan. US Fish and Wildlife Service, Portland, OR. 111 pp.

USFWS website. 2006. http://www.fws.gov/endangered/recovery/peregrine/QandA_re.html#na.

Zielinski, W.J., R.L. Truex, G.A. Schmidt, F.V. Schlexer, K.N. Schmidt, and R.H. Barrett. 2004a. Resting habitat selection by fishers in California. J. Wildl. Mgmt. 68(3):475-492.

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Appendix I

Annual and Periodic Maintenance Work Schedules And Effects to Threatened, Endangered and Candidate Species For Each Individual Park Development

Table 1. Annual trails maintenance activities in Redwood National and State Parks.

Note: The majority of down tree removal is performed Oct-Apr. Periodic reroutes of trails and replacement of bridges that wash out in winter cannot be associated with individual trails ahead of time. Brushing will be performed using power tools only in Redwood National Park (RNP). Hand tools will be used exclusively in the state parks during spotted owl and marbled murrelet noise restriction periods (*state parks are marked with * after the trail name in the location column*). MALAA= May affect and is likely to adversely affect. MANLAA = May affect, not likely to adversely affect. Location column contains number of miles of trail in old growth (**OG**), second growth (**CUT**), prairie (**PR**), spruce (**SP**) and coastal scrub (**CS**). Federal and state listed threatened, endangered and candidate species considered in this analysis include: marbled murrelet (MAMU), northern spotted owl (SPOW), bald eagle (BAEA), peregrine falcon (PEFA), western snowy plover (SNPL), Pacific fisher (PFISH) and mardon skipper (MASK). Northern spotted owl activity centers = AC. This table evaluates noise disturbance only. If RNSP identifies habitat loss due to trail maintenance work, the consultation will be reinitiated. If spotted owls are found within 500 feet of trails during protocol surveys, then work will occur outside of the noise restriction period (1 Feb – 9 Jul). Actions causing adverse effects are **highlighted in bold**.

Location No. miles for each veg. type	Proposed Activity	Type of Equipment used to accomplish activity	Duration (hours to accomplish proposed activity)	Periodicity (i.e. times per month activity would occur)	Season in which activity is planned	Would activity generate noise > ambient level during noise restriction period? (Yes/No)	Is this location within 500 feet of suitable habitat? (List species)	Acres of habitat adversely affected within 500 feet of trails.	Is location within 0.25 miles of a SPOW activity center? (Yes/No)	Determination	Notes about start dates, species surveys, determinations and acres of affect.
Ellsworth Loop Trail* OG=0.43	Brushing Trail Corridors in old growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	½ mile per hour	Once per year	Apr-Jul	No	MAMU SPOW PFISH		No	No Effect for all species	
	Down tree removal in old growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	Up to 2 weeks per tree	When necessary	All Year	No					
Leiffer Loop* OG=1.32	Brushing Trail Corridors in old growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	½ mile per hour	Once per year	Apr-Jul	No	BAEA MAMU SPOW		No	No Effect for all species	

Location No. miles for each veg. type	Proposed Activity	Type of Equipment used to accomplish activity	Duration (hours to accomplish proposed activity)	Periodicity (i.e. times per month activity would occur)	Season in which activity is planned	Would activity generate noise > ambient level during noise restriction period? (Yes/No)	Is this location within 500 feet of suitable habitat? (List species)	Acres of habitat adversely affected within 500 feet of trails.	Is location within 0.25 miles of a SPOW activity center? (Yes/No)	Determination	Notes about start dates, species surveys, determinations and acres of affect.
	Down tree removal in old growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	Up to 2 weeks per tree	When necessary	All Year	No	PFISH				
Hiouchi Trail* OG=1.35	Brushing Trail Corridors in old growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	½ mile per hour	Once per year	Apr-Jul	No	BAEA MAMU SPOW PFISH		No	No Effect for all species	
	Down tree removal in old growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	Up to 2 weeks per tree	When necessary	All Year	No					
Peterson Trail* OG=0.27	Brushing Trail Corridors in old growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	½ mile per hour	Once per year	Apr-Jul	No	BAEA MAMU SPOW PFISH		No	No Effect for all species	
	Down tree removal in old growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	Up to 2 weeks per tree	When necessary	All Year	No					
Simpson Reed Trail* OG=0.51	Brushing Trail Corridors in old growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	½ mile per hour	Once per year	Apr-Jul	No	MAMU SPOW PFISH		No	No Effect for all species	

Location No. miles for each veg. type	Proposed Activity	Type of Equipment used to accomplish activity	Duration (hours to accomplish proposed activity)	Periodicity (i.e. times per month activity would occur)	Season in which activity is planned	Would activity generate noise > ambient level during noise restriction period? (Yes/No)	Is this location within 500 feet of suitable habitat? (List species)	Acres of habitat adversely affected within 500 feet of trails.	Is location within 0.25 miles of a SPOW activity center? (Yes/No)	Determination	Notes about start dates, species surveys, determinations and acres of affect.
	Down tree removal in old growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	Up to 2 weeks per tree	When necessary	All Year	No					
Jed Smith Camp-ground trail* OG/PR=0.11	Brushing Trail Corridors in old growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	½ mile per hour	Once per year	Apr-Jul	No	BAEA MAMU SPOW PFISH		No	No Effect for all species	
	Temporary footbridge installation	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	Up to 3 days	Twice per year	Jun & Sept	No					
	Down tree removal in old growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	Up to 2 weeks per tree	When necessary	All Year	No					
Hatton Trail* OG=2.16	Brushing Trail Corridors in old growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	½ mile per hour	Once per year	Apr-Jul	No	BAEA MAMU SPOW PFISH		No	No Effect for all species	
	Down tree removal in old growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	Up to 2 weeks per tree	When necessary	All Year	No					

Location No. miles for each veg. type	Proposed Activity	Type of Equipment used to accomplish activity	Duration (hours to accomplish proposed activity)	Periodicity (i.e. times per month activity would occur)	Season in which activity is planned	Would activity generate noise > ambient level during noise restriction period? (Yes/No)	Is this location within 500 feet of suitable habitat? (List species)	Acres of habitat adversely affected within 500 feet of trails.	Is location within 0.25 miles of a SPOW activity center? (Yes/No)	Determination	Notes about start dates, species surveys, determinations and acres of affect.
Wellman Trail* OG=0.62 CUT=0.3 2	Brushing Trail Corridors in old growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	½ mile per hour in old growth	Once per year	Apr-Jul	No	BAEA MAMU SPOW PFISH		No	No Effect for all species	
	Brushing Trail Corridors in 2 nd growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	1/4 mile per hour in 2 nd growth	Once per year	Apr-Jul	No					
	Down tree removal in old growth and 2 nd growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	Up to 2 weeks per tree	When necessary	All Year	No					
Stout Grove Trail* OG=0.60	Brushing Trail Corridors in old growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	½ mile per hour	Once per year	Apr-Jul	No	BAEA MAMU SPOW PFISH		No	No Effect for all species	
	Down tree removal in old growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	Up to 2 weeks per tree	When necessary	All Year	No					

Location No. miles for each veg. type	Proposed Activity	Type of Equipment used to accomplish activity	Duration (hours to accomplish proposed activity)	Periodicity (i.e. times per month activity would occur)	Season in which activity is planned	Would activity generate noise > ambient level during noise restriction period? (Yes/No)	Is this location within 500 feet of suitable habitat? (List species)	Acres of habitat adversely affected within 500 feet of trails.	Is location within 0.25 miles of a SPOW activity center? (Yes/No)	Determination	Notes about start dates, species surveys, determinations and acres of affect.
	Down tree removal in old growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	Up to 2 weeks per tree	When necessary	All Year	No					
Mill Creek Trail * (JSSP) OG=3.33 CUT=0.30	Brushing Trail Corridors in old growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	½ mile per hour	Once per year	Apr-Jul	No	BAEA MAMU SPOW PFISH		No	No Effect for all species	
	Brushing Trail Corridors in 2nd growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	1/4 mile per hour	Once per year	Apr-Jul	No					
	Down tree removal in 2 nd growth and old growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	Up to 2 weeks per tree	When necessary	All Year	No					
Little Bald Hills Trail OG=1.23	Brushing Trail Corridors in JSSP (old-growth)	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	½ mile per hour	Once per year	Apr-Jul	No	MAMU SPOW PFISH BAEA		No	No Effect to MAMU BAEA	

Location No. miles for each veg. type	Proposed Activity	Type of Equipment used to accomplish activity	Duration (hours to accomplish proposed activity)	Periodicity (i.e. times per month activity would occur)	Season in which activity is planned	Would activity generate noise > ambient level during noise restriction period? (Yes/No)	Is this location within 500 feet of suitable habitat? (List species)	Acres of habitat adversely affected within 500 feet of trails.	Is location within 0.25 miles of a SPOW activity center? (Yes/No)	Determination	Notes about start dates, species surveys, determinations and acres of affect.
* (JSSP) CUT=3.3 7 (RNP)	Down tree removal in JSSP (old-growth)	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	Up to 2 weeks per tree	When necessary	All Year	No	MASK				
	Brushing Trail Corridors in 2 nd growth	Power Tools (weed-eaters)	1 mile per hour	Once per year	10 Jul – 31 Jan	Yes				MANLAA SPOW PFISH	RNP - Use hand tools only along sections of second growth forest within 500 feet of old-growth forest from 24 Mar to 15 Sep SPOW surveys
	Down tree removal in 2 nd growth	Power Tools (chainsaws)	Up to 2 weeks per tree	When necessary	10 Jul – 31 Jan	Yes				Mowing vegetation may disturb or harm mardon skipper larvae and adults	
Boy Scout Tree Trail* OG=2.15	Brushing Trail Corridors in old growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	½ mile per hour	Once per year	Apr-Jul	No	MAMU SPOW PFISH		No	No Effect for all species	
	Down tree removal in old growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	Up to 2 weeks per tree	When necessary	All Year	No					

Location No. miles for each veg. type	Proposed Activity	Type of Equipment used to accomplish activity	Duration (hours to accomplish proposed activity)	Periodicity (i.e. times per month activity would occur)	Season in which activity is planned	Would activity generate noise > ambient level during noise restriction period? (Yes/No)	Is this location within 500 feet of suitable habitat? (List species)	Acres of habitat adversely affected within 500 feet of trails.	Is location within 0.25 miles of a SPOW activity center? (Yes/No)	Determination	Notes about start dates, species surveys, determinations and acres of affect.
Old Stage Trail* OG=0.52	Brushing Trail Corridors in old growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	½ mile per hour	Once per year	Apr-Jul	No	MAMU SPOW PFISH		No	No Effect for all species	
	Down tree removal in old growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	Up to 2 weeks per tree	When necessary	All Year	No					
Nickerson Ranch* OG=0.52	Brushing Trail Corridors old-growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	½ mile per hour	Once per year	Apr-Jul	No	MAMU SPOW PFISH		No	No Effect for all species	
	Brushing Trail Corridors in 2nd growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	1/4 mile per hour	Once per year	Apr-Jul	No					
	Down tree removal in old growth and 2 nd growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	Up to 2 weeks per tree	When necessary	All Year	No					

Location No. miles for each veg. type	Proposed Activity	Type of Equipment used to accomplish activity	Duration (hours to accomplish proposed activity)	Periodicity (i.e. times per month activity would occur)	Season in which activity is planned	Would activity generate noise > ambient level during noise restriction period? (Yes/No)	Is this location within 500 feet of suitable habitat? (List species)	Acres of habitat adversely affected within 500 feet of trails.	Is location within 0.25 miles of a SPOW activity center? (Yes/No)	Determination	Notes about start dates, species surveys, determinations and acres of affect.
Mill Creek Horse Trail OG=0.54 CUT=2.7 9	Brushing Trail Corridors in old growth	Power Tools (weed-eaters)	1 mile per hour	Once every 2 years	16 Sep to 31 Jan	Yes	MAMU SPOW BAEA PFISH		No	No effect for all species	
	Brushing Trail Corridors in 2nd growth	Power Tools (tractor pulling mower)	1 mile per hour	Once per year	Jun	Yes		20 MAMU 140 SPOW		MALAA SPOW MAMU PFISH	
	Down tree removal in 2 nd growth and old growth	(Hand tools from 1 Feb to 15 Sep)	Up to 2 weeks per tree	When necessary	All year	Yes				No effect for all species	Close trail if large tree (> 4 feet diameter) can not be cut with hand tools.
Rellim Ridge Trail OG=0.13 CUT=4.0 5 (~5 acre prairie near south end)	Brushing Trail Corridors in old growth	Power Tools (weed-eaters)	1 mile per hour	Once every 2 years	16 Sep to 31 Jan	Yes	MAMU SPOW PFISH		No	No Effect for all species	
	Brushing Trail Corridors in prairie and second growth	Power Tools (Tractor pulling mower)	2 mile per hour	Once per year	Jun	Yes				No Effect for all species	Use hand tools only in prairie and second growth forest areas within 500 feet of old-growth forest from 24 Mar to 15 Sep. SPOW surveys

Location No. miles for each veg. type	Proposed Activity	Type of Equipment used to accomplish activity	Duration (hours to accomplish proposed activity)	Periodicity (i.e. times per month activity would occur)	Season in which activity is planned	Would activity generate noise > ambient level during noise restriction period? (Yes/No)	Is this location within 500 feet of suitable habitat? (List species)	Acres of habitat adversely affected within 500 feet of trails.	Is location within 0.25 miles of a SPOW activity center? (Yes/No)	Determination	Notes about start dates, species surveys, determinations and acres of affect.
	Down tree removal in old growth and 2 nd growth	Power Tools (chainsaws)	Up to 2 weeks per tree	When necessary	All year	Yes				No Effect for all species	Use hand tools only in old and second growth areas in/within 500 feet of old-growth forest from 24 Mar to 15 Sep. SPOW surveys
Crescent Beach Trail CS=0.62 PR=1.54	Brushing Trail Corridors in Prairie	tractor pulling mower and weed-eaters	1/2 mile per hour	4 times per year in prairie	Apr-Jun	Yes	No		No	No Effect for all species	
	Brushing Trail Corridors in Coastal Scrub	tractor pulling mower and weed-eaters	1/2 mile per hour	2 times per year in Coastal Scrub	Apr-Jun	Yes					
	Down tree removal in Prairie and Coastal Scrub	Power Tools (chainsaws)	Up to 4 hours per tree	When necessary	All year	Yes					
Endert's Beach Trail PR=0.45	Brushing Trail Corridors in prairie	Power Tools (weed-eaters)	1/2mile per hour	4 times per year	Apr-Jun	Yes	No		No	No Effect for all species	

Location No. miles for each veg. type	Proposed Activity	Type of Equipment used to accomplish activity	Duration (hours to accomplish proposed activity)	Periodicity (i.e. times per month activity would occur)	Season in which activity is planned	Would activity generate noise > ambient level during noise restriction period? (Yes/No)	Is this location within 500 feet of suitable habitat? (List species)	Acres of habitat adversely affected within 500 feet of trails.	Is location within 0.25 miles of a SPOW activity center? (Yes/No)	Determination	Notes about start dates, species surveys, determinations and acres of affect.
	Down tree removal near prairie	Power Tools (chainsaws)	Up to 4 hours per tree	When necessary	All year	Yes					
Skid Road Trail* CUT=0.84	Brushing Trail Corridors in 2 nd growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	1/4 mile per hour	Once per year	Apr-Jul	No	MAMU SPOW PFISH		No	No Effect for all species	
	Down tree removal in 2 nd growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	Up to 2 days per tree	When necessary	All Year	No					
Mill Creek Trail * DNCSP OG=3.43 CUT=0.75 PR=0.03 (Camp-ground trail =0.45mi in CUT)	Brushing Trail Corridors in 2 nd growth	Hand Tools (1Feb-9Jul) Power Tools (10Jul-31Jan)	1/4 mile per hour	Once per year	Apr-Jul	No	SPOW PFISH		No	MANLAA SPOW PFISH	
	Down tree removal in 2 nd growth	Hand Tools (1Feb-9Jul) Power Tools (10Jul-31Jan)	Up to 2 days per tree	When necessary	All Year	No					

Location No. miles for each veg. type	Proposed Activity	Type of Equipment used to accomplish activity	Duration (hours to accomplish proposed activity)	Periodicity (i.e. times per month activity would occur)	Season in which activity is planned	Would activity generate noise > ambient level during noise restriction period? (Yes/No)	Is this location within 500 feet of suitable habitat? (List species)	Acres of habitat adversely affected within 500 feet of trails.	Is location within 0.25 miles of a SPOW activity center? (Yes/No)	Determination	Notes about start dates, species surveys, determinations and acres of affect.
Alder Basin Trail* Cut=0.73	Brushing Trail Corridors in 2 nd growth	Hand Tools (1Feb-9Jul) Power Tools (10Jul-31Jan)	1/4 mile per hour	Once per year	Apr-Jul	No	SPOW PFISH		No	MANLAA SPOW PFISH	
	Down tree removal in 2 nd growth		Up to 2 days per tree	When necessary	All Year	No					
Nature Loop Trail* Cut=0.29	Brushing Trail Corridors in 2 nd growth	Hand Tools (1Feb-9Jul) Power Tools (10Jul-31Jan)	1/4 mile per hour	Once per year	Apr-Jul	No	SPOW PFISH		No	MANLAA SPOW PFISH	
	Down tree removal in 2 nd growth	Hand Tools (1Feb-9Jul) Power Tools (10Jul-31Jan)	Up to 2 days per tree	When necessary	All Year	No					
Hobbs Wall Trail* CUT=2.76	Brushing Trail Corridors in 2 nd growth	Hand Tools (1Feb-9Jul) Power Tools (10Jul-31Jan)	1/4 mile per hour	Once per year	Apr-Jul	No	SPOW PFISH		No	MANLAA SPOW PFISH	
	Down tree removal in 2 nd growth	Hand Tools (1Feb-9Jul) Power Tools (10Jul-31Jan)	Up to 2 days per tree	When necessary	All Year	No					

Location No. miles for each veg. type	Proposed Activity	Type of Equipment used to accomplish activity	Duration (hours to accomplish proposed activity)	Periodicity (i.e. times per month activity would occur)	Season in which activity is planned	Would activity generate noise > ambient level during noise restriction period? (Yes/No)	Is this location within 500 feet of suitable habitat? (List species)	Acres of habitat adversely affected within 500 feet of trails.	Is location within 0.25 miles of a SPOW activity center? (Yes/No)	Determination	Notes about start dates, species surveys, determinations and acres of affect.
Trestle Loop Trail* CUT=0.87	Brushing Trail Corridors in 2 nd growth	Hand Tools (1Feb-9 Jul) Power Tools (10 Jul-31Jan)	1/4 mile per hour	Once per year	Apr-Jul	No	SPOW PFISH		Yes	MANLAA SPOW PFISH	
	Down tree removal in 2 nd growth	Hand Tools (1Feb-9 Jul) Power Tools (10 Jul-31Jan)	Up to 2 days per tree	When necessary	All Year	No					
Saddler Skyline Trail* CUT=0.40	Brushing Trail Corridors in 2 nd growth	Hand Tools (1Feb-9 Jul) Power Tools (10 Jul-31Jan)	1/4 mile per hour	Once per year	Apr-Jul	No	SPOW PFISH		No	MANLAA SPOW PFISH	
	Down tree removal in 2 nd growth	Hand Tools (1Feb-9 Jul) Power Tools (10 Jul - 31Jan)	Up to 2 days per tree	When necessary	All Year	No					
Coastal	Brushing Trail Corridors in old growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	1 mile per hour in old growth	Once per year	Apr-Jul	No	SPOW MAMU		No	No Effect for all species	Use hand tools only second growth, coastal scrub and prairie within 500 feet of old-growth forest from 24 Mar to 15 Sep.

Location No. miles for each veg. type	Proposed Activity	Type of Equipment used to accomplish activity	Duration (hours to accomplish proposed activity)	Periodicity (i.e. times per month activity would occur)	Season in which activity is planned	Would activity generate noise > ambient level during noise restriction period? (Yes/No)	Is this location within 500 feet of suitable habitat? (List species)	Acres of habitat adversely affected within 500 feet of trails.	Is location within 0.25 miles of a SPOW activity center? (Yes/No)	Determination	Notes about start dates, species surveys, determinations and acres of affect.
Trail (Last Chance)** OG =5.18* Cut=0.51 CS=1.12 PR=0.03	Brushing (Trailhead to Nickel Ck. Camp)	Power Tools (weed-eaters)	1/2 mile per hour in Coastal Scrub	2 time per year in Coastal Scrub	Apr-Jun	No Noise from surf is high	PFISH				SPOW and MAMU habitat
	Down tree removal in coastal scrub, second growth prairie	Power Tools (chainsaws)	Up to 4 hours per tree	When necessary	All Year	Yes					Use hand tools only in coastal scrub, second growth and prairie from 1Feb - 15 Sep within 500 feet of old-growth forest
	Down tree removal in old growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	Up to 2 days per tree	When necessary	All Year	No					
Damn-ation Creek * OG=1.39 CS=0.09	Brushing trails in old growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	1 mile per hour in old growth	Once every 2 years	Apr-Jul	No	SPOW MAMU BAEA PFISH		No	No effect for all species	
	Down tree removal in old growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	Up to 2 weeks per tree	When necessary	All Year	No					

Location No. miles for each veg. type	Proposed Activity	Type of Equipment used to accomplish activity	Duration (hours to accomplish proposed activity)	Periodicity (i.e. times per month activity would occur)	Season in which activity is planned	Would activity generate noise > ambient level during noise restriction period? (Yes/No)	Is this location within 500 feet of suitable habitat? (List species)	Acres of habitat adversely affected within 500 feet of trails.	Is location within 0.25 miles of a SPOW activity center? (Yes/No)	Determination	Notes about start dates, species surveys, determinations and acres of affect.
Coastal (Middle) OG=3.85 Cut=0.39 CS=3.19 PR=0.63	Brushing Trail Corridors in old growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	1 mile per hour in old growth	Once per year	Apr-Jul	No	BAEA PEFA MAMU SPOW PFISH		No	No effect for all species	
	Brushing Trail Corridors in 2 nd growth	Power Tools (weed-eaters)	1 mile per hour in 2 nd growth	Once per year	Jun	Yes					SPOW surveys No MAMU habitat within 500 feet of this section of trail.
	Brushing Trail Corridors in Coastal Scrub	Power Tools (weed-eaters)	1/2 mile per hour in prairie and Coastal Scrub	2 time per year in Coastal Scrub	Apr-Jun	Yes				BAEA, PEFA, SNPL,MAMU = No effect SPOW = MANLAA	SPOW surveys) Hand tools within 500 feet of old-growth forest from 24 Mar to 15 Sep.
	Brushing Trail Corridors in prairies	Power Tools (weed-eaters)	1/2 mile per hour in prairie	4 time per year in Coastal Scrub	Apr-Jun	Yes					No SPOW or MAMU habitat within feet of this section of trail.
	Down tree removal in old growth (DNCSP)	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	Up to 2 days per tree	When necessary	All Year	No-breeding Yes-non breeding				No affect for all species	

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	Down tree removal in 2 nd growth	Power Tools (chainsaws)	Up to 2 weeks per tree	When necessary	All Year	Yes					SPOW surveys - No MAMU habitat within 500 feet of this section of trail.
	Down tree removal in coastal scrub and prairie	Power Tools (chainsaws)	Up to 4 hours per tree	When necessary	All Year	Yes					SPOW surveys - Hand tools within 500 feet mile of old-growth forest from 24 Mar to 15 Sep.
Yurok Loop Trail SP=0.26 CS=0.14 PR=0.34	Brushing trails in spruce	Power Tools (weed-eaters)	1 mile per hour in 2 nd growth	Once per year	Jun	Yes	BAEA PEFA PFISH		No	No Effect for all species	
	Brushing trails in coastal scrub	Power Tools (weed-eaters)	0.5 mile per hour in coastal scrub	2 times per year	Apr-Jun	Yes					
	Brushing trails in prairie	Power Tools (weed-eaters)	1/2 mile per hour in prairie	4 times per year	Apr-Jun	Yes					

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	Down tree removal in coastal prairie and coastal scrub	Power Tools (chainsaws)	Up to 4 hours per tree	When necessary	All Year	Yes					
	Down tree removal in spruce	Power Tools (chainsaws)	Up to 2 weeks per tree	When necessary	All Year	Yes					
Hostel Beach/ Hidden Beach Trails SP=1.11 CUT=0.54 CS=1.02	Brushing trails in spruce forest	Power Tools (weed-eaters)	1 mile per hour	Once every other year	anytime	Yes	BAEA PEFA PFISH		No	No Effect for all species	
	Brushing trails in 2 nd growth	Power Tools (weed-eaters)	1 mile per hour in 2 nd growth	Once per year	Jun	Yes					
	Down tree removal in 2 nd growth and old growth	Power Tools (chainsaws)	Up to 2 weeks per tree	When necessary	All Year	Yes					

Location No. miles for each veg. type	Proposed Activity	Type of Equipment used to accomplish activity	Duration (hours to accomplish proposed activity)	Periodicity (i.e. times per month activity would occur)	Season in which activity is planned	Would activity generate noise > ambient level during noise restriction period? (Yes/No)	Is this location within 500 feet of suitable habitat? (List species)	Acres of habitat adversely affected within 500 feet of trails.	Is location within 0.25 miles of a SPOW activity center? (Yes/No)	Determination	Notes about start dates, species surveys, determinations and acres of affect.
	Brushing trails in coastal scrub	Power Tools (weed-eaters)	1/2 mile per hour in coastal scrub	Once per year	Apr-Jun	Yes					
	Down tree removal in coastal scrub	Power Tools (chainsaws)	Up to 4 hours per tree	When necessary	All Year	Yes					
Flint Ridge Trail OG=1.39 CUT=0.85 CS=0.65 PR=0.18	Brushing trails (From campground to 2 nd – growth forest)	Power Tools (weed-eaters)	0.5 mile per hour in coastal scrub	2 times per year	Apr-Jun	Yes	BAEA SPOW MAMU PFISH		No	No Effect for all species	SPOW surveys No MAMU habitat within 1/4 mile of this section.
	Down tree removal in coastal scrub	Power Tools (chainsaws)	Up to 4 hours per tree	When necessary	All Year	Yes					SPOW surveys No MAMU habitat within 1/4 mile of this section.
	Brushing in old-growth forest	Power Tools (weed-eaters)	1 mile per hour in old growth	Once every other year	16 Sep to 31 Jan	Yes					

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	Down tree removal in forest	Power Tools (chainsaws)	Up to 2 weeks per tree	When necessary	All Year	Yes		17	No	SPOW MAMU PFISH MALAA	Estimate need to cut one large tree per year during the MAMU, SPOW and PFISH breeding season. Use hand tools for the rest of the down trees from 24 Mar - 15Sep
Carruth- er's Cove Trail SP=0.66	Brushing	Power Tools (weed-eaters)	0.5 mile per hour in coastal scrub	2 times per year	Apr-Jul	Yes	PFISH		No	No effect for all species	Hand tools within 500 feet of old-growth forest (1Feb to 15 Sep).
	Down tree removal	Power Tools (chainsaws)	Up to 4 hours per tree	When necessary	All Year	Yes					
Little Creek Trail* OG=0.26	Brushing Trail Corridors in old growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	½ mile per hour	Once per year	Apr-Jul	No	BAEA MAMU SPOW PFISH		No	No effect for all species	
	Down tree removal in old growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	Up to 2 days per tree	When necessary	All Year	No					
Hope Creek	Brushing Trail Corridors in old growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	½ mile per hour	Once per year	Apr-Jul	No	BAEA MAMU		No	No effect for all species	

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Trail* OG=1.13	Down tree removal in old growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	Up to 2 days per tree	When necessary	All Year	No	SPOW PFISH				
Cathedral Trees Trail* OG=1.07 PR=0.23	Brushing Trail Corridors in old growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	½ mile per hour	Once per year	Apr-Jul	No	BAEA MAMU SPOW PFISH			No effect for all species	
	Down tree removal in old growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	Up to 2 days per tree	When necessary	All Year	No					
	Brushing Trail Corridors in 0.23 miles of prairie	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	½ mile per hour	Once per year	Apr-Jul	No					
	Down tree removal in prairies	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	Up to 2 days per tree	When necessary	All Year	No					

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Ossagon Trail* OG=1.13 CUT=0.31 CS=0.57	Brushing Trail Corridors in 2 nd growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	1/4 mile per hour	Once per year	Apr-Jul	No	BAEA MAMU SPOW PFISH		No	No effect for all species	
	Down tree removal in old-growth & 2 nd growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	Up to 2 days per tree	When necessary	All Year	No					
	Brushing Trail Corridors in coastal scrub	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	1/4 mile per hour	Once per year	Apr-Jul	No					
	Down tree removal in coastal scrub	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	Up to 2 days per tree	When necessary	All Year	No					
	Brushing Trail Corridors in old growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	½ mile per hour	Once per year	Apr-Jul	No					

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Zig Zag Trail No. 2* OG=0.5	Brushing Trail Corridors in old growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	½ mile per hour	Once per year	Apr-Jul	No	BAEA MAMU SPOW PFISH		No	No effect for all species	
	Down tree removal in old growth		Up to 2 days per tree	When necessary	All Year	No					
CREA Trail* OG=1.17	Brushing Trail Corridors in 1.19 miles old growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	½ mile per hour	Once per year	Apr-Jul	No	MAMU SPOW PFISH		No	No effect for all species	
	Down tree removal in old growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	Up to 2 days per tree	When necessary	All Year	No					
Zig Zag Trail No. 1* OG=0.45	Brushing in old growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	½ mile per hour	Once per year	Apr-Jul	No	MAMU SPOW PFISH		No	No effect for all species	
	Down tree removal in old growth		Up to 2 days per tree	When necessary	All Year	No					

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Ten Taypo Trail* OG=1.69	Brushing Trail Corridors in old growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	½ mile per hour	Once per year	Apr-Jul	No	MAMU SPOW PFISH		No	No effect for all species	
	Down tree removal in old growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	Up to 2 days per tree	When necessary	All Year	No					
Prairie Creek Trail* OG=2.04 PR=1.24	Brushing Trail Corridors in old growth and prairie	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	½ mile per hour	Once per year	Apr-Jul	No	BAEA MAMU SPOW PFISH		No	No effect for all species	
	Down tree removal in old growth and prairie edge	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	Up to 2 days per tree	When necessary	All Year	No					
Boat Creek	Brushing Trail Corridors in old growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	½ mile per hour	Once per year	Apr-Jul	No	MAMU SPOW		No	No effect for all species	

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Trail* OG=0.84 CUT=0.13	Brushing Trail Corridors in 2nd growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	1/4 mile per hour	Once per year	Apr-Jul	No	PFISH				
	Down tree removal in old-growth & 2 nd growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	Up to 2 days per tree	When necessary	All Year	No					
Friendship Ridge Trail* OG=2.03 CUT=0.19	Brushing Trail Corridors in old growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	½ mile per hour	Once per year	Apr-Jul	No	MAMU SPOW PFISH		No	No effect for all species	
	Down tree removal in old growth & 2 nd growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	Up to 2 days per tree	When necessary	All Year	No					
Fern Canyon Loop	Brushing Trail Corridors in old growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	½ mile per hour	Once per year	Apr-Jul	No	MAMU SPOW PFISH		No	No effect for all species	

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Trail* OG=0.48 CUT=0.04	Brushing Trail Corridors in 2nd growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	1/4 mile per hour	Once per year	Apr-Jul	No					
	Down tree removal in old growth, 2 nd growth and prairie	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	Up to 2 days per tree	When necessary	All Year	No					
Brown Creek Trail* OG=1.04	Brushing Trail Corridors in old growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	½ mile per hour (1.04)	Once per year	Apr-Jul	No	MAMU SPOW PFISH		No	No effect for all species	
	Down tree removal in old growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	Up to 2 days per tree	When necessary	All Year	No					
James Irvine	Brushing Trail Corridors in old growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	½ mile per hour	Once per year	Apr-Jul	No	MAMU SPOW		Yes	No effect for all species	

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Trail* OG=3.89	Down tree removal in old growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	Up to 2 days per tree	When necessary	All Year	No	PFISH				
Coastal Trail (South) CS=3.17	Brushing in coastal scrub	Power Tools (weed-eaters)	0.5 mile per hour in coastal scrub	2 times per year	Apr-Jun	Yes	BAEA PEFA SNPL MAMU SPOW PFISH		No	No effect for all species	
	Down tree removal in coastal scrub	Power Tools (chainsaws)	Up to 4 hours per tree	When necessary	All Year	Yes					All marbled murrelet, northern spotted owl, bald eagle and Pacific fisher habitat is on top of Gold Bluffs with the trail through the dunes below
South Fork Trail* OG =0.81	Brushing Trail Corridors in old growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	½ mile per hour	Once per year	Apr-Jul	No	MAMU SPOW PFISH		No	No effect for all species	
	Down tree removal in old growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	Up to 2 days per tree	When necessary	All Year	No					

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Miners Ridge Bike/Hike Trail* OG=2.60 CUT=1.02	Brushing Trail Corridors in old growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	½ mile per hour	Once per year	Apr-Jul	No	MAMU SPOW PFISH		Yes	No effect for all species	
	Brushing Trail Corridors in 2nd growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	1/4 mile per hour	Once per year	Apr-Jul	No				No effect for all species	
	Down tree removal in old growth and 2 nd growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	Up to 2 days per tree	When necessary	All Year	No				No effect for all species	
Clintonia Trail * OG=1.3	Brushing Trail Corridors in old growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	½ mile per hour	Once per year	Apr-Jul	No	MAMU SPOW PFISH		No	No effect for all species	
	Down tree removal in old growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	Up to 2 days per tree	When necessary	All Year	No				No effect for all species	

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Environ-mental Camp Trail* SP=0.45	Brushing Trail Corridors in spruce forest	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	½ mile per hour	Once per year	Apr-Jul	No	BAEA PEFA MAMU PFISH SPOW		No	No Effect for all species	
	Down tree removal in spruce forest	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	Up to 2 days per tree	When necessary	All Year	No					
Rhododen-dron Trail* OG=5.95	Brushing Trail Corridors in old growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	½ mile per hour	Once per year	Apr-Jul	No	BAEA MAMU SPOW PFISH		No	No effect for all species	
	Down tree removal in old growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	Up to 2 days per tree	When necessary	All Year	No					
Circle Trail*	Brushing Trail Corridors in old growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	½ mile per hour	Once per year	Apr-Jul	No	BAEA MAMU		No	No effect for all species	

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OG=0.26	Down tree removal in old growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	Up to 2 days per tree	When necessary	All Year	No	SPOW PFISH				
West Ridge Trail* OG=5.12 CUT=0.92	Brushing Trail Corridors in old growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	½ mile per hour	Once per year	Apr-Jul	No	MAMU SPOW PFISH		No	No effect for all species	
	Down tree removal in old growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	Up to 2 days per tree	When necessary	All Year	No					
Butler Creek Trail* OG=0.46	Brushing Trail Corridors in old growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	½ mile per hour	Once per year	Apr-Jul	No	MAMU SPOW PFISH		No	No effect for all species	
	Down tree removal in old growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	Up to 2 days per tree	When necessary	All Year	No					

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Foothill Trail* OG=1.70 PR=0.49	Brushing Trail Corridors in old growth and in prairie	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	½ mile per hour	Once per year	Apr-Jul	No	BAEA MAMU SPOW PFISH		No	No effect for all species	
	Down tree removal in old growth and in prairie	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	Up to 2 days per tree	When necessary	All Year	No					
Nature Trail * (PCSP) OG=1.41 PR=0.21	Brushing Trail Corridors in old growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	½ mile per hour	Once per year	Apr-Jul	No	BAEA MAMU SPOW PFISH		No	No effect for all species	
	Brushing trail in the Prairie	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	1/4 mile per hour	When necessary	Apr-Jul	No					
	Down tree removal in old growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	Up to 2 days per tree	When necessary	All Year	No					

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Elk Prairie Trail* OG=1.0 PR=0.21	Brushing Trail Corridors in old growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	½ mile per hour	Once per year	Apr-Jul	No	BAEA MAMU SPOW PFISH		No	No effect for all species	
	Brushing trail in the Prairie	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	1/4 mile per hour	When necessary	Apr-Jul	No					
	Down tree removal in old growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	Up to 2 days per tree	When necessary	All Year	No					
Revelation Trail* OG=0.31 PR=0.13	Brushing Trail Corridors in old growth and prairie	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	½ mile per hour	Once per year	Apr-Jul	No	BAEA MAMU SPOW PFISH		No	No effect for all species	
	Down tree removal in old growth and in prairie	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	Up to 2 days per tree	When necessary	All Year	No					

Location No. miles for each veg. type	Proposed Activity	Type of Equipment used to accomplish activity	Duration (hours to accomplish proposed activity)	Periodicity (i.e. times per month activity would occur)	Season in which activity is planned	Would activity generate noise > ambient level during noise restriction period? (Yes/No)	Is this location within 500 feet of suitable habitat? (List species)	Acres of habitat adversely affected within 500 feet of trails.	Is location within 0.25 miles of a SPOW activity center? (Yes/No)	Determination	Notes about start dates, species surveys, determinations and acres of affect.
Jogging Trail OG=0.36 PR=0.12 CUT=3.70	Brushing trail in the Prairie	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	1/4 mile per hour	When necessary	Apr-Jul	No	BAEA MAMU SPOW PFISH		No	No effects for all species	
	Brushing Trail Corridors in old growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	1/2 mile per hour in old growth	Once every other year	>15 Aug	Yes					
	Brushing Trail Corridors in 2 nd growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	1 mile per hour in old growth	Once every year	Jun	Yes					
	Down tree removal in old growth and 2 nd growth	Hand Tools (1Feb-15Sep) Power Tools (16Sep-31Jan)	Up to 2 weeks per tree	When necessary	All Year	Yes					
Skunk Cabbage Trail OG=0.69 CUT=2.92	Brushing Trail Corridors Coastal Scrub	Power Tools (weed-eaters)	1/2 mile per hour in old growth	2 times per year	Apr-Jun	Yes	BAEA MAMU SPOW PFISH		No	No effect for all species	SPOW surveys - Use hand tools within 500 feet of old-growth forest (24 Mar – 15 Sep)

Location No. miles for each veg. type	Proposed Activity	Type of Equipment used to accomplish activity	Duration (hours to accomplish proposed activity)	Periodicity (i.e. times per month activity would occur)	Season in which activity is planned	Would activity generate noise > ambient level during noise restriction period? (Yes/No)	Is this location within 500 feet of suitable habitat? (List species)	Acres of habitat adversely affected within 500 feet of trails.	Is location within 0.25 miles of a SPOW activity center? (Yes/No)	Determination	Notes about start dates, species surveys, determinations and acres of affect.
CS=0.44	Down tree removal in coastal scrub	Power Tools (chainsaws)	Up to 4 hours per tree	When necessary	All Year	Yes					
	Down tree removal in 2 nd growth and old growth	Power Tools (chainsaws)	Up to 2 weeks per tree	16 Sep – 23 Mar if within 500 ft. of old growth	All Year	Yes					
Lady Bird Johnson Trail OG=1.11 CUT=0.23	Brushing trails in old growth and 2 nd growth	Weed-eaters	1 mile per hour in old growth	Once every other year	16 Sep to 31 Jan	Yes	MAMU SPOW PFISH		No	No Effect for SPOW, MAMU	
	Down tree removal in old growth and 2 nd growth	Power Tools (chainsaws)	Up to 2 weeks	When necessary	All Year	Yes		17	No	MALAA SPOW MAMU PFISH	Estimate need to cut one down tree per year during the MAMU and SPOW breeding season.
Orick	Brushing trails in old growth	Power Tools (weed-eaters)	1 mile per hour in old growth	Once every other year	16 Sep to 31 Jan	Yes	BAEA		No	No Effect for all species	

Location No. miles for each veg. type	Proposed Activity	Type of Equipment used to accomplish activity	Duration (hours to accomplish proposed activity)	Periodicity (i.e. times per month activity would occur)	Season in which activity is planned	Would activity generate noise > ambient level during noise restriction period? (Yes/No)	Is this location within 500 feet of suitable habitat? (List species)	Acres of habitat adversely affected within 500 feet of trails.	Is location within 0.25 miles of a SPOW activity center? (Yes/No)	Determination	Notes about start dates, species surveys, determinations and acres of affect.
Horse Trail System (See explanation at bottom of table)	Down tree removal in 2nd growth and old growth	Chainsaws for trees > 5 feet diameter	Up to 2 weeks	When necessary	All Year	Yes	MAMU SPOW PFISH	17		MALAA SPOW MAMU PFISH No effect for BAEA	Estimate need to cut one down tree per year during the MAMU and SPOW breeding season.
	Brushing Trail Corridors in 2nd growth	Power Tools (weed-eaters)	1 mile per hour in 2nd growth	Once per year	Jun	Yes		37 MAMU 496 SPOW		MALAA SPOW MAMU PFISH No Effect for BAEA	
Redwood Creek Trail OG=2.50 CUT=4.15 PR=1.60	Redwood Cr. Bridge Placements	Hand Tools 1 Feb to 15 Sep Trail Tractor 16 Sep -31Jan	½ day per site (2 sites)	Twice per year	Jun & Sept	Yes	BAEA MAMU SPOW PFISH		No	No Effect for all species	
	Brushing trails in old growth	Power Tools (weed-eaters)	1 mile per hour in old growth	Once every other year	16 Sep to 31 Jan	Yes				No effect for all species	
	Down tree removal in 2nd growth, old growth, and prairie	Power Tools (chainsaws)	Up to 2 weeks	When necessary	All Year	Yes		17		MALAA SPOW MAMU No Effect for BAEA	Use hand saws upstream of first bridge from 1 Feb to 15 Sep. Estimate need to cut 1 tree during breeding season with a chainsaw. Will use hand saws to cut trees smaller than 5 feet diameter during the breeding season.

Location No. miles for each veg. type	Proposed Activity	Type of Equipment used to accomplish activity	Duration (hours to accomplish proposed activity)	Periodicity (i.e. times per month activity would occur)	Season in which activity is planned	Would activity generate noise > ambient level during noise restriction period? (Yes/No)	Is this location within 500 feet of suitable habitat? (List species)	Acres of habitat adversely affected within 500 feet of trails.	Is location within 0.25 miles of a SPOW activity center? (Yes/No)	Determination	Notes about start dates, species surveys, determinations and acres of affect.
	Brushing trails in 2 nd growth & prairie	weed-eaters	½ to 1 mile per hour	Once per year in 2 nd growth and 4x per year in prairie	Jun	Yes		80			First 1.5 miles (to first stream crossing)
Tall Trees Trail OG = 1.79	Brushing trails in old growth	Power Tools (weed-eaters)	1 mile per hour in old growth	Once every other year	16 Sep to 31 Jan	Yes	BAEA MAMU SPOW PFISH	17	No	No Effect for all species	
	Down tree removal in old growth	Power Tools (chainsaws)	Up to 2 weeks	When necessary	All Year	Yes				MALAA SPOW MAMU	Estimate need to cut one down tree per year during the MAMU and SPOW breeding season.
Dolason Prairie Trail OG=1.80 CUT=0.38 PR=1.39	Brushing trails in old growth	Power Tools (weed-eaters)	1 mile per hour in old growth	Once every other year	16 Sep to 31 Jan	Yes	MAMU SPOW PFISH		No	No Effect for all species	Use hand tools within 500 feet of old-growth forest from 1 Feb to 15 Sep
	Brushing Trail Corridors in 2 nd growth	Power Tools (weed-eaters)	1 mile per hour in 2 nd growth	Once per year	Jun	Yes				No Effect for all species	Use hand tools within 500 feet of old-growth forest from 1 Feb to 15 Sep
	Brushing in prairie	Power Tools (weed-eaters)	1/2 mile per hour in prairie	2 times per year	Apr-Jul	Yes				No Effect for all species	Use hand tools within 500 feet of old-growth forest from 1 Feb to 15 Sep

Location No. miles for each veg. type	Proposed Activity	Type of Equipment used to accomplish activity	Duration (hours to accomplish proposed activity)	Periodicity (i.e. times per month activity would occur)	Season in which activity is planned	Would activity generate noise > ambient level during noise restriction period? (Yes/No)	Is this location within 500 feet of suitable habitat? (List species)	Acres of habitat adversely affected within 500 feet of trails.	Is location within 0.25 miles of a SPOW activity center? (Yes/No)	Determination	Notes about start dates, species surveys, determinations and acres of affect.
	Down tree removal	Power Tools (chainsaws) (see notes)	Up to 2 weeks per tree	When necessary	All Year	Yes				No Effect for all species	Use hand saws for trees less than 4 feet diameter from 1 Feb to 15 Sep. Close trail if down tree is too big to cut with hand tools.
Emerald Ridge Trail OG=0.86	Brushing trails in old growth	Power Tools (weed-eaters)	1 mile per hour in old growth	Once every other year	16 Sep to 31 Jan	Yes	BAEA MAMU SPOW PFISH		No	No Effect for all species	Use hand tools within 500 feet of old-growth forest from 1 Feb to 15 Sep
	Down tree removal in old growth	Power Tools (chainsaws) (see notes)	Up to 2 weeks per tree	When necessary	All Year	Yes				No Effect for all species	Use hand saws for trees less than 4 feet diameter between 1 Feb and 15 Sep. Close trail if down tree is too big to cut with hand tools.

**** Coastal Trail (Last Chance) = begins at end of Endert's Beach Trail and ends at US101 intersection and is maintained in the north by RNP and south by the SPs.**

Coastal Trail Middle = begins at US101 south of the Damnation Creek Trailhead to south of Requa.

Coastal Trail (South) = begins near Carruther's Cove intersection and ends at Skunk Cabbage Creek Trail intersection.

Orick Horse Trail System : *To 1st jct. -OG=0.74 CUT=0.22* *Three Day Loop - OG=2.37 Cut=10.3*
Three Hour Loop - OG=0.61 CUT=1.42 **Overnight Loop Trail - OG=1.06 CUT=5.25 PR=0.54**
Six Hour Loop - OG=1.71 Cut=5.13

Table 2. Annual facility maintenance in Redwood National and State Parks. This summary analyzes disturbance affects only. RNSP will reinitiate consultation if any habitat loss is identified. State park facilities indicated by an * next to location name.

Location	Proposed Activity	Type of Equipment used to accomplish activity (i.e. power vs. hand)	Duration (Hours to accomplish proposed activity once)	Periodicity (i.e. times per month activity would occur)	Season in which activity is planned (i.e. Apr-Jun)	Would activity generate noise greater than ambient level? (Yes/No)	Is location w/i 0.25 miles of suitable habitat? (List species)	Acres of habitat affected within 0.25 miles of facility.	Is location w/i 1/4 mile of a spotted owl activity center? (Yes/No)	Determination	Limited Operating Procedures
Camp Lincoln*	Mowing of the vegetation	Power mower	<6 hours	1-2 times per month	Apr-Jun	No	No		No	No effect - All species	High ambient noise due to nearby county road.
	Tree hazard management	Chain saw & clipboards	variable	Once every other year	16 Sept to 23 Mar	Yes					
	Maintenance of Infrastructure	Both power and hand tools	variable	when necessary	anytime	No					
Templeman Grove - picnic area and adjacent meadow*	Mowing of the vegetation	Weedeater, tractor pulling mower	<4 hours	Once per month	Apr - Jun	No	BAEA MAMU SPOW		No	No effect - All species	
	Tree hazard management	Frontend loader, chain saw, hydraulic splitter	variable (< 1 week)	Once every other year	16 Sept to 23 Mar	Yes					
	Maintenance of Infrastructure	Both power and hand tools	variable	when necessary	Anytime	No					
Simpson Reed Parking Area*	Fence repair	Chain saw hammer & nail Post hole digger	Less than 1 day	variable	Anytime	Yes	BAEA MAMU SPOW		No	BAEA - NE MAMU & SPOW - MANLAA	This site is located adjacent to Hwy 199 with high ambient noise
Hanson Property*	Mowing of the vegetation	tractor pulling mower	<4 hours	once per 2 months	Apr - Jun	No	MAMU SPOW		No	No effect - All species	This site is located adjacent to Hwy 199

Location	Proposed Activity	Type of Equipment used to accomplish activity (i.e. power vs. hand)	Duration (Hours to accomplish proposed activity once)	Periodicity (i.e. times per month activity would occur)	Season in which activity is planned (i.e. Apr-Jun)	Would activity generate noise greater than ambient level? (Yes/No)	Is location w/i 0.25 miles of suitable habitat? (List species)	Acres of habitat affected within 0.25 miles of facility.	Is location w/i 1/4 mile of a spotted owl activity center? (Yes/No)	Determination	Limited Operating Procedures
Crescent City Admin. Building	Building maintenance	Power tools	Variable	daily	all year	No	No		No	No effect - All species	
CBEEC	Maintenance of Infrastructure	Both power and hand tools	variable	when necessary	anytime	No	No		No	No effect - All species	
Jedediah Smith Campground/picnic area /maint. Yard* and Hiouchi VC, Fire Cache, Housing	Mowing of the vegetation	push & riding mowers weed eaters	<6 hours	1-2 times per month	Apr - Jun	No -Jun Yes - Apr & May	BAEA MAMU SPOW	544	No	BAEA & SPOW - NE MAMU - MALAA	
	Tree hazard management	Frontend loader, chain saw, hydraulic splitter	~ one month	Once every other year	16 Sept to 23 Mar	Yes					
	Maintenance of Infrastructure	Both power and hand tools	variable	when necessary	anytime	No- Memorial Day to Labor Day Yes - Labor Day to Memorial Day					
Little Bald Hills Primitive Camp	Mowing of vegetation	Any tools will do	<3 hours	once per summer	Apr-Jun	No	No		No	No effects - All species	
Aubell*	Mowing of vegetation (Lawns)	Riding lawn mower	<1 hour	1-2 times per month	Apr - Jun	No	No		No	No effects - All species	

Location	Proposed Activity	Type of Equipment used to accomplish activity (i.e. power vs. hand)	Duration (Hours to accomplish proposed activity once)	Periodicity (i.e. times per month activity would occur)	Season in which activity is planned (i.e. Apr-Jun)	Would activity generate noise greater than ambient level? (Yes/No)	Is location w/i 0.25 miles of suitable habitat? (List species)	Acres of habitat affected within 0.25 miles of facility.	Is location w/i 1/4 mile of a spotted owl activity center? (Yes/No)	Determination	Limited Operating Procedures
	Mowing fields	Tractor mower	1 day	Once per year	Late Sept.	No					
	Routine maintenance of infrastructure	Both power and hand tools	variable	when necessary	anytime	No					
Howland Hill Outdoor School	Routine maintenance of infrastructure	Both power and hand tools	variable	when necessary	anytime	Yes	SPOW		No	SPOW - MANLAA	
Nickel Creek primitive camp including trailhead	Mowing of vegetation	weed eater and Power mower	<3 hours	1-2 times per month	Apr - Jun	No	BAEA SPOW		No	No effects - All species	
Mill Creek campground, maintenance facility, and residence*	Mowing of the vegetation	push & riding mowers weed eaters	<6 hours	every day	Apr - Jun	No- Memorial Day to Labor Day Yes - Labor Day to Memorial Day	MAMU SPOW	13	Yes	SPOW – MANLAA MAMU - MALAA	
	Tree hazard management	Front end loader, chain saw, hydraulic splitter	~ one month	Once every other year	16 Sept to 23 Mar						
	Maintenance of Infrastructure	Both power and hand tools	variable	when necessary	anytime						
DeMartin primitive	Mowing of vegetation	Tractor pulling mower and	<3 hours	1-2 times per month	Apr - Jun	No	No		No	No effects - All species	

Location	Proposed Activity	Type of Equipment used to accomplish activity (i.e. power vs. hand)	Duration (Hours to accomplish proposed activity once)	Periodicity (i.e. times per month activity would occur)	Season in which activity is planned (i.e. Apr-Jun)	Would activity generate noise greater than ambient level? (Yes/No)	Is location w/i 0.25 miles of suitable habitat? (List species)	Acres of habitat affected within 0.25 miles of facility.	Is location w/i 1/4 mile of a spotted owl activity center? (Yes/No)	Determination	Limited Operating Procedures
camp		weed eater									
False Klamath Cove	Mowing of vegetation	weed eater	<1 hour	1-2 times per month	Apr-Jun	No	BAEA PEFA		No	No effects - All species	
Klamath Youth Hostel	Routine maintenance of infrastructure	Power and hand tools	variable	anytime	anytime	No	BAEA PEFA		No	No effects - All species	
Wilson Creek picnic site	Garbage collection	trash bags	<1 hour	once per week	all year	No	BAEA PEFA		No	No effects - All species	
Lagoon Creek picnic area / trailhead	Routine maintenance of infrastructure	power and hand tools	variable	variable	anytime	No	BAEA PEFA		No	No effects - All species	
	mowing of vegetation	riding lawn mower and weed eater	<6 hours	once per month	Apr-Jun	No					
Requa maintenance facility and housing and Klamath Overlook	mowing of vegetation	Power mower, weed eater and riding lawn mower	<6 hours	1-2 times per month	Apr - Jun	No	BAEA PEFA		No	No effects - All species	
	maintenance of infrastructure	power and hand tools	variable	variable	anytime						
Flint Ridge primitive campground	mowing of vegetation	tractor pulling mower and	<1 hour	1-2 times per month	Apr - Jun	No	No		No	No effects - All species	

Location	Proposed Activity	Type of Equipment used to accomplish activity (i.e. power vs. hand)	Duration (Hours to accomplish proposed activity once)	Periodicity (i.e. times per month activity would occur)	Season in which activity is planned (i.e. Apr-Jun)	Would activity generate noise greater than ambient level? (Yes/No)	Is location w/i 0.25 miles of suitable habitat? (List species)	Acres of habitat affected within 0.25 miles of facility.	Is location w/i 1/4 mile of a spotted owl activity center? (Yes/No)	Determination	Limited Operating Procedures
and trailhead		weed eater									
High Bluff Overlook / picnic site	mowing of vegetation	weed eater	<2 hours	1-2 times per month	Apr - Jun	No	BAEA PEFA		No	No effects - All species	Annual PEFA surveys. Reinitiate consultation if PEFA eyrie is found within ½ mile of bluff.
	maintenance of infrastructure	hand tools	variable	anytime	anytime						
Ossagon primitive camp*	clearing of down trees	Chain saw	<1 hour	when necessary	anytime	No	No		No	No effects - All species	Suitable habitat up on Gold Bluffs with the camp situated on the beach below
Fern Canyon trailhead*	Grading of parking lot	Grader	< 2 hours	Once per year	anytime	No	No		No	No effects - All species	Suitable habitat up on Gold Bluffs with the trailhead located on the beach below
Miner's Ridge primitive camp*	clearing of down trees	Chain saw	<1 hour	when necessary	anytime	Yes	PEFA MAMU SPOW		No	No effects - All species	Use hand tools from 1 Feb to 15 Sep
Gold Bluffs beach campground *	maintenance of infrastructure	power and hand tools	variable	when necessary	anytime	No	BAEA PEFA		No	No effects - All species	
Big Tree* parking area	mowing of vegetation	weed eaters	<1 hour	once per month	Apr - Jun	No-Memorial Day to Labor Day Yes - Labor	BAEA SPOW MAMU	130	No	BAEA, SPOW – NE	
	Tree hazard management	Front end loader, chain saw,	~ one month	Once every other year	16 Sept to 23 Mar						

Location	Proposed Activity	Type of Equipment used to accomplish activity (i.e. power vs. hand)	Duration (Hours to accomplish proposed activity once)	Periodicity (i.e. times per month activity would occur)	Season in which activity is planned (i.e. Apr-Jun)	Would activity generate noise greater than ambient level? (Yes/No)	Is location w/i 0.25 miles of suitable habitat? (List species)	Acres of habitat affected within 0.25 miles of facility.	Is location w/i 1/4 mile of a spotted owl activity center? (Yes/No)	Determination	Limited Operating Procedures
		hydraulic splitter				Day to Memorial Day				MAMU - MALAA	
	maintenance of infrastructure	power and hand tools	variable	when necessary	anytime						
Prairie Creek* campground /picnic area/ maintenance yard/housing	Mowing of the vegetation	push & riding mowers weedeaters	<6 hours	1-2 times per month	Apr - Jun	No-Memorial Day to Labor Day Yes - Labor Day to Memorial Day	BAEA MAMU SPOW	396	No	BAEA, SPOW - NE MAMU - MALAA	
	Tree hazard management	Front end loader, chain saw, hydraulic splitter	~ one month	Once every other year	16 Sep to 23 Mar						
	Maintenance of Infrastructure	Both power and hand tools	variable	when necessary	anytime						
Wolf Creek Outdoor School/ Fire cache/ housing	Maintenance of Infrastructure	power and hand tools	variable	when necessary	anytime	Yes -without school groups No - with school groups	BAEA MAMU SPOW		No	BAEA, SPOW, MAMU - MANLAA	School or other user groups present throughout MAMU noise restriction period.
Gold Bluff Environmental Camp*	clearing of down trees	Chain saw	<1 hour	when necessary	anytime	Yes	SPOW		No	SPOW - MANLAA	Perform all work with hand tools from 1 Feb to 9 July.
Davison Ranch trailhead and horse	maintenance of infrastructure	power and hand tools	variable	when necessary	anytime	No	BAEA MAMU SPOW		No	No affects - All species	High ambient noise

Location	Proposed Activity	Type of Equipment used to accomplish activity (i.e. power vs. hand)	Duration (Hours to accomplish proposed activity once)	Periodicity (i.e. times per month activity would occur)	Season in which activity is planned (i.e. Apr-Jun)	Would activity generate noise greater than ambient level? (Yes/No)	Is location w/i 0.25 miles of suitable habitat? (List species)	Acres of habitat affected within 0.25 miles of facility.	Is location w/i 1/4 mile of a spotted owl activity center? (Yes/No)	Determination	Limited Operating Procedures
barn											
Elk Meadow Day use Area	Mowing Building maintenance	Line trimmer Power hand tools	Variable	When necessary	Anytime	Yes	No		No	No effect	
Lost Man picnic area/ trailhead	pit toilet and garbage collection	truck	<1 hour	once per month	all year	No	MAMU SPOW		No	No affects - All species	
LBJ picnic area /trailhead	pit toilet and garbage collection	truck	<1 hour	once per month	all year	No	MAMU SPOW		No	No affects - All species	
Dolason picnic area /trailhead	pit toilet and garbage collection	truck	<1 hour	once per month	all year	No	No		No	No affects - All species	
Tall Trees picnic area /trailhead	pit toilet and garbage collection	truck	<1 hour	once per month	all year	No	MAMU SPOW		No	MAMU & SPOW - MANLAA	Located at the end of the Tall Trees access road.
	mowing of vegetation	weed eater	<2 hours	2 times per summer	Apr - Jun	No					
Redwood Creek picnic	pit toilet and garbage	truck	<1 hour	once per month	all year	No	BAEA MAMU		No	No affects - All species	

Location	Proposed Activity	Type of Equipment used to accomplish activity (i.e. power vs. hand)	Duration (Hours to accomplish proposed activity once)	Periodicity (i.e. times per month activity would occur)	Season in which activity is planned (i.e. Apr-Jun)	Would activity generate noise greater than ambient level? (Yes/No)	Is location w/i 0.25 miles of suitable habitat? (List species)	Acres of habitat affected within 0.25 miles of facility.	Is location w/i 1/4 mile of a spotted owl activity center? (Yes/No)	Determination	Limited Operating Procedures
area /trailhead	collection						SPOW				
	mowing of vegetation	weed eater	<3 hours	once per month	Apr - Jun	No					
Old South Operations Center/ ranger residence	maintenance of infrastructure	power and hand tools	variable	when necessary	all year	No	MAMU SPOW		No	SPOW - NE MAMU - MANLAA	Located at the end of a high use road
	mowing of vegetation	riding lawn mower or tractor pulling mower and weed eater	<4 hours	once per month	Apr - Jun	No					
Redwood Information Center /picnic area/ campground	maintenance of infrastructure	power and hand tools	variable	when necessary	anytime	No	BAEA PEFA SNPL		No	No effects - All species	
Horse camps -Elam Creek -44 Creek	clearing of downed trees	Chain saw	<1 hour	when necessary	16 Sept to 23 Mar	Yes	BAEA MAMU SPOW		No	No effects - All species	Once per four year SPOW survey.
Elk Camp Barn	mowing of vegetation	tractor pulling mower, weed eater and rototiller	<1 hour	once/month	April and June	Yes	No		No	No effects - All species	
Dolason Barn	mowing of vegetation	tractor pulling mower, weed eater and rototiller	<1 hour	once/month	April and June	Yes	No		No	No effects - All species	
Long Ridge	mowing of	tractor pulling			April and					No effects - All	

Location	Proposed Activity	Type of Equipment used to accomplish activity (i.e. power vs. hand)	Duration (Hours to accomplish proposed activity once)	Periodicity (i.e. times per month activity would occur)	Season in which activity is planned (i.e. Apr-Jun)	Would activity generate noise greater than ambient level? (Yes/No)	Is location w/i 0.25 miles of suitable habitat? (List species)	Acres of habitat affected within 0.25 miles of facility.	Is location w/i 1/4 mile of a spotted owl activity center? (Yes/No)	Determination	Limited Operating Procedures
Barn	vegetation	mower, weedeater and rototiller	<1 hour	once/month	June	Yes	No		No	species	
Lyons Ranch	mowing of vegetation	tractor pulling mower, weedeater and rototiller	<1 hour	once/month	April and June	Yes	No		No	No effects - All species	
Home Place	mowing of vegetation	tractor pulling mower, weedeater and rototiller	<1 hour	once/month	April and June	Yes	No		No	No effects - All species	
Coyote Creek Barn	mowing of vegetation	tractor pulling mower, weedeater and rototiller	<1 hour	once/month	April and June	Yes	No		Yes	No effects - All species	
Coyote Creek Line Shack	mowing of vegetation	tractor pulling mower, weedeater and rototiller	<1 hour	once/month	April and June	Yes	No		No	No effects - All species	
Dooleyville Cabin	mowing of vegetation	weedeater and hand tools	<1 hour	once/month	April and June	Yes	No		No	No effects - All species	
Schoolhouse Peak Fire Lookout	mowing of vegetation	tractor pulling mower, weedeater and rototiller	<1 hour	once/month	April and June	Yes	No		No	No effects - All species	

Table 3. Annual roads maintenance activities in Redwood National and State Parks. (The primary season of downed tree removals is October to April).

Location Number of vehicles/ day notes minimum use along each road	Proposed Activity	Type of Equipment used to accomplish activity	Duration (Hours to accomplish proposed activity once)	Periodicity (i.e. times per month activity would occur)	Season in which activity is planned	Would activity generate noise > ambient level? (Yes/No)	Is this location w/I suitable habitat? (List species)	Acres of habitat affected within 0.25 miles of roads.	Is location w/I 1/4 mile of a N. spotted owl activity center? (Yes/No)	Determination	Limited Operating Procedures
Public use roads are identified by bold type – State parks roads indicated by an * next to location name											
Walker* (maintain by Del Norte county) >5 vehicles per day	Brushing	Weedeater, Chain saw	up to 3 weeks	Once per 5 years	Apr-Jul	Yes	BAEA MAMU SPOW		No	BAEA -NE SPOW, MAMU - MANLAA	
	Grading road surface	Grader	up to 1 week (Del Norte County)	Once per year	Jul-Sept	No					
	Culvert replacement	Backhoe, Excavator	Up to 6 hours/site	When necessary	anytime	Yes					
	Down tree removal	Chain saw	Up to 2 weeks	All year	All year	Yes					estimate 4 trees/year between 1 Feb and 15 Sep
Pacamo* <5 vehicles per day	Brushing	Weedeater, Chain saw	up to 3 weeks	Once per year	Apr-Jul (see notes)	Yes	BAEA MAMU SPOW	97	No	BAEA -NE SPOW - MANLAA MAMU - MALAA	
	Grading road surface	Grader	up to 2 days	Once per year	Jul-Sept (see notes)						
	Culvert replacemen	Backhoe	Up to 6 hours/site	When necessary	Jul-Oct (see notes)						
	Down tree removal	Chain saw	Up to 2 weeks	All year	All year (see notes)						
Howland Hill*	Brushing	Chain saw	3 weeks	Once per year	Apr-Jul	No	BAEA MAMU		No	BAEA -NE SPOW, MAMU	Once per four year SPOW survey. Backup warning signals will not be used from 24 Mar to 15 Sept.

Location Number of vehicles/ day notes minimum use along each road	Proposed Activity	Type of Equipment used to accomplish activity	Duration (Hours to accomplish proposed activity once)	Periodicity (i.e. times per month activity would occur)	Season in which activity is planned	Would activity generate noise > ambient level? (Yes/No)	Is this location w/I suitable habitat? (List species)	Acres of habitat affected within 0.25 miles of roads.	Is location w/I 1/4 mile of a N. spotted owl activity center? (Yes/No)	Determination	Limited Operating Procedures
>5 vehicles per day	Down tree removal	Chain saw	Up to 2 weeks	All year	All year	No	SPOW			– MANLAA	
	Grading road surface	Grader (see notes)	Up to two weeks	Once per year	Jul-Sept	No					
	Bridge maint.	Power tools	Variable	When	All year	No					
>5 vehicles per day	Brushing	Chain saw and Flail mower	~2 miles per day	4 times per year	Apr-Jul	Yes	BAEA PEFA SNPL		No	No effects - All species	
	Culvert replacement	Backhoe	Up to 6 hours	When necessary	Jul-Oct	No					
	Down tree removal	Chain saw	Up to 2 weeks	When necessary	All year	Yes					
	Ditch clearing	Grader	2-3 miles per day	Once per year	Apr-Sept	No					
Mill Creek campgrou nd access road* >5 vehicles per day	Brushing	Flail mower	~2 miles per day	Once per year	Apr-Jul	No	SPOW		No	SPOW MANLAA	
	Down tree removal	Chain saw	Up to 4 hours/tree	When necessary *	All Year	Yes					
	Road Repair	Backhoe, dumptruck, rollers	Up to 2 weeks	When necessary	All Year	yes					
Coastal			~2 miles per	Once per			BAEA			BAEA, PEFA &	

Location Number of vehicles/ day notes minimum use along each road	Proposed Activity	Type of Equipment used to accomplish activity	Duration (Hours to accomplish proposed activity once)	Periodicity (i.e. times per month activity would occur)	Season in which activity is planned	Would activity generate noise > ambient level? (Yes/No)	Is this location w/I suitable habitat? (List species)	Acres of habitat affected within 0.25 miles of roads.	Is location w/I 1/4 mile of a N. spotted owl activity center? (Yes/No)	Determination	Limited Operating Procedures
Drive and Alder Camp >5 vehicles per day	Brushing	Flail mower	day	year	Jan	No	PEFA SNPL MAMU SPOW		No	SNPL - NE MAMU & SPOW - MANLAA	
	Ditch maintenance	Grader	2-3 miles per day	Once per year	Anytime	No					
	Culvert replacement	Backhoe, Dump trucks, Excavator, & Bull dozer	Up to 6 weeks per site	When necessary	Jul-Oct	Yes					
	Down tree removal	Chain saw	Up to 2 weeks	All year	All year	Yes					
Newton B. Drury Memorial * Parkway >5 vehicles per day	Brushing	Flail mower	2-3 miles per day 4 days total	Once per year	Apr-Jun	No	BAEA MAMU SPOW		No	BAEA - NE MAMU & SPOW - MANLAA	Re-initiate consultation if tree larger than 6 feet diameter needs to be cut from 24 Mar to 15 Sep.
	Down tree removal	Chain saw, front-end loader and big trucks	Up to 2 weeks	All year (usually in winter)	All year	Yes					
West Ridge 0-2 vehicles per day	Brushing	Hand tools	2 days total	Once per year	Apr-Jul	No	BAEA MAMU SPOW		No	No effects - All species	
	Down tree removal	Chain saw	Up to 2 weeks	When necessary	15 Sep to 31 Jan	Yes					
Gold Bluffs Beach*	Grading road surface	Grader	Variable	Once per year	Apr-Sept	No	BAEA PEFA SNPL MAMU		No	BAEA , PEFA & SNPL - NE MAMU & SPOW -	
	Culvert	Backhoe	Up to 6 hours	When	Jul-Oct	No					

Location Number of vehicles/ day notes minimum use along each road	Proposed Activity	Type of Equipment used to accomplish activity	Duration (Hours to accomplish proposed activity once)	Periodicity (i.e. times per month activity would occur)	Season in which activity is planned	Would activity generate noise > ambient level? (Yes/No)	Is this location w/I suitable habitat? (List species)	Acres of habitat affected within 0.25 miles of roads.	Is location w/I 1/4 mile of a N. spotted owl activity center? (Yes/No)	Determination	Limited Operating Procedures
>5 vehicles per day	replacement		per site	necessary			SPOW			MANLAA	
	Sluff removal	Bull dozer, Grader	Variable	When necessary	Primarily in winter	No					
Cal Barrel* >5 vehicles per day	Brushing	Hand tools / Flail mower	2 days total	Once per year	Apr-Jul	No	BAEA MAMU SPOW		No	BAEA - NE MAMU & SPOW - MANLAA	
	Grading road surface	Grader	2-3 miles per day	Once per year	Jun	No					
	Culvert replacement	Backhoe	Up to 6 hours per site	When necessary	Jul-Oct	No					
	Down tree removal	Power tools/hand tools	Up to 2 weeks	When necessary	All year	Yes					
Davison >5 vehicles per day	Brushing	Flail mower	2 miles per day	Once per year	Apr-Jul	No	BAEA SPOW		No	BAEA, PEFA & SNPL - NE MAMU & SPOW - MANLAA	
	Grading road surface	Grader	2-3 miles per day	Once per year	Jul-Sept	No					Backup warning signals will not be used from 24 Mar to 15 Sept.
	Culvert replacement	Backhoe	Up to 6 hours per site	When necessary	Jul-Oct	No					Backup warning signals will not be used from 24 Mar to 15 Sept.
	Down tree removal	Chain saw	Up to 2 weeks	When necessary	All year	Yes					
Skunk Cabbage	Brushing	Flail mower	<½ day total	Once per year	Apr-Jul	No	BAEA MAMU		No	BAEA - NE MAMU &	

Location Number of vehicles/ day notes minimum use along each road	Proposed Activity	Type of Equipment used to accomplish activity	Duration (Hours to accomplish proposed activity once)	Periodicity (i.e. times per month activity would occur)	Season in which activity is planned	Would activity generate noise > ambient level? (Yes/No)	Is this location w/I suitable habitat? (List species)	Acres of habitat affected within 0.25 miles of roads.	Is location w/I 1/4 mile of a N. spotted owl activity center? (Yes/No)	Determination	Limited Operating Procedures
Trailhead >5 vehicles per day	Grading road surface	Grader	½ day total	Once per year	Jul-Sept		SPOW			SPOW - MANLAA	
	Culvert replacement	Backhoe	Up to 6 hours per site	When necessary	Jul-Oct						
	Down tree removal	Chain saw	Up to 2 weeks	When necessary	All year						
SOC >5 vehicles per day	Brushing	Chain saw and Flail mower	<½ day total	Once per year	Apr-Jul	No	SPOW		No	MAMU & SPOW - MANLAA	
	Grading road surface	Grader	½ day total	Once per year	Jul-Sept						
	Culvert replacement	Backhoe	Up to 6 hours	When necessary	Jul-Oct						
	Down tree removal	Chain saw	Up to 2 weeks	When necessary	All year						
Tall Trees Access >5 vehicles per day	Brushing	Flail mower	2 miles/day	Once per year	Apr-Jul	No	No		No	MAMU & SPOW - MANLAA	
	Grading road surface	Grader	2-3 miles per day	Twice per year	Jul-Sept						Backup warning signals will not be used from 24 Mar to 15 Sept.
	Culvert replacement	Backhoe, Excavator, & Dump Trucks	Up to 1 week per site	When necessary	Apr-Oct						Backup warning signals will not be used from 24 Mar to 15 Sept.
	Down tree removal	Chain saw	Up to 2 weeks	When necessary	All year (primarily						

Location Number of vehicles/ day notes minimum use along each road	Proposed Activity	Type of Equipment used to accomplish activity	Duration (Hours to accomplish proposed activity once)	Periodicity (i.e. times per month activity would occur)	Season in which activity is planned	Would activity generate noise > ambient level? (Yes/No)	Is this location w/I suitable habitat? (List species)	Acres of habitat affected within 0.25 miles of roads.	Is location w/I 1/4 mile of a N. spotted owl activity center? (Yes/No)	Determination	Limited Operating Procedures
					in winter)						
Skunk Cabbage Grove 0-1 vehicle per day	Brushing	Flail mower	<1\2 day total	Once per year	15 Sep to 31 Jan	Yes	BAEA MAMU SPOW		No	No effects - All species	
	Grading road surface	Grader	<1\2 day total	Once per year	15 Sep to 31 Jan	Yes					
	Down tree removal	Chain saw	Up to 2 weeks	When necessary	15 Sep to 31 Jan	Yes					
Redwood Creek Trailhead >5 vehicles per day	Brushing	Flail mower	<1\2 day total	Once per year	Apr-Jul	No	BAEA MAMU SPOW		No	BAEA - NE MAMU & SPOW - MANLAA	Nearby private lumber mill elevates ambient noise.
	Down tree removal	Chain saw	Up to 2 weeks	When necessary	All year	Yes					
Geneva/ Holter/ Ridge 0-2 vehicles per day	Brushing	Flail mower	2 miles/day	Once every other year	Apr-Jul	Yes	BAEA MAMU SPOW		Yes	BAEA & MAMU- NE SPOW - MANLAA	Once per four year SPOW surveys. Utilize hand tools w/i 1/4 mile of SPOW nest/activity center from 1 Feb to 9 Jul and w/i 1/4 mile of old-growth forest from 24 Mar to 15 Sep Schedule grading and down tree removal within 0.25 miles of old-growth forest from
	Grading road surface	Grader	2-3 miles/day	Once every other year	Jul-Sept	Yes					
	Down tree removal	Chain saw and Hand tools	Up to 2 weeks	When necessary	All year	Yes					

Location Number of vehicles/ day notes minimum use along each road	Proposed Activity	Type of Equipment used to accomplish activity	Duration (Hours to accomplish proposed activity once)	Periodicity (i.e. times per month activity would occur)	Season in which activity is planned	Would activity generate noise > ambient level? (Yes/No)	Is this location w/I suitable habitat? (List species)	Acres of habitat affected within 0.25 miles of roads.	Is location w/I 1/4 mile of a N. spotted owl activity center? (Yes/No)	Determination	Limited Operating Procedures
											16 Sep to 31 Jan
A-9-9/ A-9/ A-9-7 0-2 vehicles per day	Brushing	Flail mower	2 miles/day	Once every other year	Apr-Jul	Yes	BAEA MAMU SPOW	627	No	BAEA - NE MAMU PFISH MALAA SPOW MANLAA	Once per four year SPOW surveys. Schedule grading and culvert replacements to occur from 10 Jul to 31 Jan
	Grading road surface	Grader	2-3 miles/day	Once every other year	Apr-Jul	Yes					
	Culvert replacement	Backhoe	Up to 6 hours	When necessary	Jul-Oct	Yes					
	Down tree removal	Chain saw	Up to 2 weeks	When necessary	All year	Yes					
K&K 0-2 vehicles per day	Brushing	Flail mower	2 miles/day	Once every other year	Apr-Jul	Yes	No		No	No effects - All species	
	Grading road surface	Grader	2-3 miles/day	Once every other year	Jul-Sept	Yes					
	Culvert replacement	Backhoe	Up to 6 hours per site	When necessary	Oct	Yes					
	Down tree removal	Chain saw	Up to 2 weeks	When necessary	All year	Yes					
West-side Access/ M-Line	Brushing	Flail mower	2 miles/day	Once every other year	Apr-Jul	No	MAMU SPOW		No	MAMU & SPOW - MANLAA	
	Grading			Once every							

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> 5 vehicles per day (Mon - Thurs), 0-2 on (weekends)	road surface	Grader	2-3 miles/day	other year	Apr -Jul	No					
	Culvert replacement	Backhoe	Up to 6 hours per site	When necessary	Jul-Oct	No					
	Down tree removal	Chain saw	Up to 2 weeks	When necessary	All year	Yes					

Table 4. ROUTINE PERIODIC MAINTENANCE							
Proposed action = Clean inboard ditch and culvert inlet, and grade road surfaces when necessary. Equipment used = Grader, backhoe, excavator, bulldozer, dump truck, chain saw and slope mower that sometimes utilize backup safety warning signal. All activities generate noise greater than ambient levels. Periodicity of these actions = Once per four years. MAMU = marbled murrelet, SPOW = northern spotted owl. LOP's = Perform the projects that are within 0.25 miles of SPOW nest/activity center and within 0.25 miles of unsurveyed suitable SPOW habitat from 1 Aug through 31 Jan for a no effects determination, and from 10 Jul through 31 Jan for a MANLAA determination. In addition, perform the projects that are within 0.25 miles of marbled murrelet habitat from 16 Sep to 23 Mar.							
Road Name (note, roads with an "*" are open to the public).	Total Length of Road	Duration of action	Time of year action is planned to begin	Is the proposed project located w/in 0.25 miles of suitable habitat? (List species)	Is the proposed project located w/in 0.25 miles of a SPOW activity center?	Determinations NE = No effects MANLAA = May affect, but not likely to adversely affect MALAA = May affect, likely to adversely affect (in bold)	Notes about start dates, determinations and acres of affect
200	2.0	2 days	> 10 Jul	MAMU SPOW	Unsurveyed	MAMU – MALAA SPOW - MANLAA	7 acres of MAMU habitat affected
205	3.5	7days	> 15 Sep	MAMU SPOW	Unsurveyed	MAMU & SPOW -NE	
230	0.6	1 day	> 10 Jul	SPOW	Unsurveyed	SPOW - MANLAA	
240	1.9	2 days	> 10 Jul	SPOW	Unsurveyed	SPOW - MANLAA	
300	0.8	1 day	> 10 Jul	SPOW	Unsurveyed	SPOW - MANLAA	
305	0.3	.5 day	> 10 Jul	SPOW	Unsurveyed	SPOW - MANLAA	Adjacent to Davison Road which has > 5 vehicles per day
310	0.4	.5 day	> 10 Jul	SPOW	Unsurveyed	SPOW - MANLAA	Adjacent to Davison Road which has > 5 vehicles per day

Table 4. ROUTINE PERIODIC MAINTENANCE							
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Road Name (note, roads with an "*" are open to the public).	Total Length of Road	Duration of action	Time of year action is planned to begin	Is the proposed project located within 0.25 miles of suitable habitat? (List species)	Is the proposed project located within 0.25 miles of a SPOW activity center?	Determinations NE = No effects MANLAA = May affect, but not likely to adversely affect MALAA = May affect, likely to adversely affect (in bold)	Notes about start dates, determinations and acres of affect
130	1.8	3 days	> 10 Jul	SPOW	Unsurveyed	SPOW - MANLAA	High ambient noise of adjacent creek
A100/A140 Connector	0.3	1 Day	anytime	No	No	NE	
A110	1.1	3 days	anytime	No	No	NE	
A111	0.7	2 days	anytime	No	No	NE	
A112	1.6	5 days	anytime	No	No	NE	
A120	1.9	8 days	> 10 Jul	MAMU SPOW	Unsurveyed	MAMU – MALAA SPOW - MANLAA	25 acres of MAMU habitat affected
A121	1.1	3 days	> 10 Jul	MAMU SPOW	Unsurveyed	MAMU – MALAA SPOW - MANLAA	3 acres of MAMU habitat affected
A130	0.6	2 days	> 10 Jul	MAMU SPOW	Unsurveyed	MAMU – MALAA SPOW - MANLAA	35 acres of MAMU habitat affected

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Road Name (note, roads with an "*" are open to the public).	Total Length of Road	Duration of action	Time of year action is planned to begin	Is the proposed project located within 0.25 miles of suitable habitat? (List species)	Is the proposed project located within 0.25 miles of a SPOW activity center?	Determinations NE = No effects MANLAA = May affect, but not likely to adversely affect MALAA = May affect, likely to adversely affect (in bold)	Notes about start dates, determinations and acres of affect
A131	0.5	2 days	> 15 Sep	MAMU SPOW	Unsurveyed	NE	
A141	1.8	8 days	> 10 Jul	SPOW	Unsurveyed	SPOW - MANLAA	
A142	0.6	3 days	anytime	No	No	NE	
A150	1.2	4 days	> 15 Sep	MAMU SPOW	Unsurveyed	NE	
A160	2.0	5 days	> 15 Sep	MAMU SPOW	Unsurveyed	NE	
A170	1.3	7 days	> 15 Sep	MAMU SPOW	Unsurveyed	NE	
A300	1.9	8 days	anytime	No	No	NE	
A333	0.4	1 day	> 10 Jul	MAMU	Unsurveyed	MAMU – MALAA	4 acres of residual MAMU habitat affected

Table 4. ROUTINE PERIODIC MAINTENANCE							
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Road Name (note, roads with an "*" are open to the public).	Total Length of Road	Duration of action	Time of year action is planned to begin	Is the proposed project located within 0.25 miles of suitable habitat? (List species)	Is the proposed project located within 0.25 miles of a SPOW activity center?	Determinations NE = No effects MANLAA = May affect, but not likely to adversely affect MALAA = May affect, likely to adversely affect (in bold)	Notes about start dates, determinations and acres of affect
(A400)				SPOW		SPOW - MANLAA	
A350	0.4	1 day	anytime	No	No	NE	
540	0.3	1 day	anytime	No	No	NE	
551	0.1	.5 day	anytime	No	No	NE	
552 (B-552)	0.6	1 day	anytime	No	No	NE	
554	1.0	2 days	anytime	No	No	NE	
B-Line (North)	1.0	2 days	> 10 Jul	MAMU SPOW	Unsurveyed	MAMU – MALAA SPOW – MANLAA	15 acres of MAMU habitat affected.
530 (B-530)	0.4	.5 day	anytime	No	No	NE	
Shangri La Road	1.0	2 days	> 10 Jul	MAMU SPOW	Unsurveyed	MAMU – MALAA SPOW – MANLAA	13 acres of MAMU habitat affected

Table 4. ROUTINE PERIODIC MAINTENANCE							
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Road Name (note, roads with an "*" are open to the public).	Total Length of Road	Duration of action	Time of year action is planned to begin	Is the proposed project located w/in 0.25 miles of suitable habitat? (List species)	Is the proposed project located w/in 0.25 miles of a SPOW activity center?	Determinations NE = No effects MANLAA = May affect, but not likely to adversely affect MALAA = May affect, likely to adversely affect (in bold)	Notes about start dates, determinations and acres of affect
A150	0.1	.5 day	> 15 Sep	MAMU SPOW	Unsurveyed	NE	
A160	1.1	.5 day	> 15 Sep	MAMU SPOW	Unsurveyed	NE	
A170	0.7	1 day	> 15 Sep	MAMU SPOW	Unsurveyed	NE	
A-9-7-2	1.1	2 days	> 1 Aug	MAMU SPOW	Unsurveyed	MAMU - MALAA SPOW – NE	10 acres of MAMU habitat affected
L-Line	1.0	1 day	> 1 Aug	MAMU SPOW	Unsurveyed	MAMU – MALAA SPOW - NE	35 acres of MAMU habitat affected
L-2-2		1 day	> 1 Aug	MAMU SPOW	Unsurveyed	MAMU – MALAA SPOW - NE	65 acres of MAMU habitat affected

Table 4. ROUTINE PERIODIC MAINTENANCE							
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Road Name (note, roads with an "*" are open to the public).	Total Length of Road	Duration of action	Time of year action is planned to begin	Is the proposed project located within 0.25 miles of suitable habitat? (List species)	Is the proposed project located within 0.25 miles of a SPOW activity center?	Determinations NE = No effects MANLAA = May affect, but not likely to adversely affect MALAA = May affect, likely to adversely affect (in bold)	Notes about start dates, determinations and acres of affect
L-Line	2.0	3 days	> 1 Aug	MAMU SPOW	Unsurveyed	MAMU - MALAA SPOW - NE	29 acres of MAMU habitat affected
L-1 (west)		1 day	> 1 Aug	MAMU SPOW	Unsurveyed	MAMU - MALAA SPOW – NE	14 acres of MAMU habitat affected
L-1-1 (South)	1.2	3 days (once per 3 years)	> 1 Aug	MAMU SPOW	Unsurveyed	MAMU - MALAA SPOW – NE	11 acres of MAMU habitat affected
L-1-1 (North)	2.1	3 days	> 15 Sep	No	Unsurveyed	NE	
L-2	1.4	2 days	> 1 Aug	No	Unsurveyed	MAMU - MALAA SPOW – NE	79 acres of MAMU habitat affected
L-2-1	1.0	2.5 days	> 1 Aug	MAMU SPOW	Unsurveyed	MAMU - MALAA SPOW – NE	8 acres of MAMU habitat affected

Table 4. ROUTINE PERIODIC MAINTENANCE							
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Road Name (note, roads with an "*" are open to the public).	Total Length of Road	Duration of action	Time of year action is planned to begin	Is the proposed project located within 0.25 miles of suitable habitat? (List species)	Is the proposed project located within 0.25 miles of a SPOW activity center?	Determinations NE = No effects MANLAA = May affect, but not likely to adversely affect MALAA = May affect, likely to adversely affect (in bold)	Notes about start dates, determinations and acres of affect
L-2-3-1	0.6	1 day	> 1 Aug	MAMU SPOW	Unsurveyed	MAMU – MALAA SPOW – NE	10 acres of MAMU habitat affected
L-1 (east)	1.5	3 days	> 15 Sep	MAMU SPOW	Unsurveyed	NE	
M-11	0.8	1 day	> 15 Sep	MAMU SPOW	No	NE	
M-11-1		3 day	> 15 Sep	MAMU SPOW	Unsurveyed	NE	
M-11-1-1		1 day	> 15 Sep	MAMU SPOW	Unsurveyed	NE	
A-9-6	2.0	3 days	> 1 Aug	MAMU SPOW	Unsurveyed	MAMU – MALAA SPOW – NE	7 acres of MAMU habitat affected
A-9-6-1	1.6	2 days	> 1 Aug	SPOW	Unsurveyed	NE	

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Road Name (note, roads with an "*" are open to the public).	Total Length of Road	Duration of action	Time of year action is planned to begin	Is the proposed project located within 0.25 miles of suitable habitat? (List species)	Is the proposed project located within 0.25 miles of a SPOW activity center?	Determinations NE = No effects MANLAA = May affect, but not likely to adversely affect MALAA = May affect, likely to adversely affect (in bold)	Notes about start dates, determinations and acres of affect
Upper G-Line		1 day	> 10 Jul	SPOW	Unsurveyed	SPOW - MANLAA	
G-6-1	1.4	4 days	> 15 Sep	MAMU SPOW	Unsurveyed	NE	
G-4 / M-5	1.0	1.0 day	> 10 Jul	SPOW	Unsurveyed	SPOW - MANLAA	
M-7		2 days	> 15 Sep	MAMU SPOW	Unsurveyed	NE	
M-7-1 1/2		2 days	> 15 Sep	MAMU SPOW	Unsurveyed	NE	
M-2.5		7 days	> 15 Sep	MAMU SPOW	Unsurveyed	NE	
M-2	0.1	.3 day	> 15 Sep	MAMU SPOW	Unsurveyed	NE	

Table 4. ROUTINE PERIODIC MAINTENANCE							
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Road Name (note, roads with an "*" are open to the public).	Total Length of Road	Duration of action	Time of year action is planned to begin	Is the proposed project located within 0.25 miles of suitable habitat? (List species)	Is the proposed project located within 0.25 miles of a SPOW activity center?	Determinations NE = No effects MANLAA = May affect, but not likely to adversely affect MALAA = May affect, likely to adversely affect (in bold)	Notes about start dates, determinations and acres of affect
M-2-1	0.6	.5 day	> 15 Sep	MAMU SPOW	Unsurveyed	NE	
M-2-1-1	2.1	4 days	> 15 Sep	MAMU SPOW	Unsurveyed	NE	
Y-Line	2.5	5 days	> 15 Sep	MAMU SPOW	Yes	NE	
Boundary Road	0.1	.5 day	anytime	No	No	NE	
Bridge Road	0.2	.5 day	anytime	No	No	NE	
Coyote Creek Road	0.6	1 day	anytime	No	No	NE	
Coyote Peak Road		1 day	anytime	No	No	NE	

Table 4. ROUTINE PERIODIC MAINTENANCE							
Proposed action = Clean inboard ditch and culvert inlet, and grade road surfaces when necessary. Equipment used = Grader, backhoe, excavator, bulldozer, dump truck, chain saw and slope mower that sometimes utilize backup safety warning signal. All activities generate noise greater than ambient levels. Periodicity of these actions = Once per four years. MAMU = marbled murrelet, SPOW = northern spotted owl. LOP's = Perform the projects that are within 0.25 miles of SPOW nest/activity center and within 0.25 miles of unsurveyed suitable SPOW habitat from 1 Aug through 31 Jan for a no effects determination, and from 10 Jul through 31 Jan for a MANLAA determination. In addition, perform the projects that are within 0.25 miles of marbled murrelet habitat from 16 Sep to 23 Mar.							
Road Name (note, roads with an "*" are open to the public).	Total Length of Road	Duration of action	Time of year action is planned to begin	Is the proposed project located within 0.25 miles of suitable habitat? (List species)	Is the proposed project located within 0.25 miles of a SPOW activity center?	Determinations NE = No effects MANLAA = May affect, but not likely to adversely affect MALAA = May affect, likely to adversely affect (in bold)	Notes about start dates, determinations and acres of affect
Coyote Peak Spur	0.1	.5 day	anytime	No	No	NE	
High Prairie Road	0.7	1 day	anytime	No	No	NE	
Long Ridge Road	0.8	1 day	anytime	No	No	NE	
Lookout Road			anytime	No	No	NE	
Lower Rock Fork Road	0.4	.5 day	anytime	No	No	NE	
Main Stem Road	1.0	2 days	anytime	No	No	NE	
Upper Mid Basin Road	0.4	1 day	anytime	No	No	NE	

Table 4. ROUTINE PERIODIC MAINTENANCE							
Proposed action = Clean inboard ditch and culvert inlet, and grade road surfaces when necessary. Equipment used = Grader, backhoe, excavator, bulldozer, dump truck, chain saw and slope mower that sometimes utilize backup safety warning signal. All activities generate noise greater than ambient levels. Periodicity of these actions = Once per four years. MAMU = marbled murrelet, SPOW = northern spotted owl. LOP's = Perform the projects that are within 0.25 miles of SPOW nest/activity center and within 0.25 miles of unsurveyed suitable SPOW habitat from 1 Aug through 31 Jan for a no effects determination, and from 10 Jul through 31 Jan for a MANLAA determination. In addition, perform the projects that are within 0.25 miles of marbled murrelet habitat from 16 Sep to 23 Mar.							
Road Name (note, roads with an "*" are open to the public).	Total Length of Road	Duration of action	Time of year action is planned to begin	Is the proposed project located within 0.25 miles of suitable habitat? (List species)	Is the proposed project located within 0.25 miles of a SPOW activity center?	Determinations NE = No effects MANLAA = May affect, but not likely to adversely affect MALAA = May affect, likely to adversely affect (in bold)	Notes about start dates, determinations and acres of affect
Lower Mid Basin Road			anytime	No	No	NE	
Ranch Road		.1 day	anytime	No	No	NE	
Ranch Spur	0.2	.5 day	anytime	No	No	NE	
Rock Fork Road		2 days	June	No	No	NE	
Schoolhouse Loop	0.3	.5 day	anytime	No	No	NE	
Spring Road		.5 day	anytime	No	No	NE	
Spring Spur	0.6	.5 day	anytime	No	No	NE	
T. Bear Road	0.7	.5 day	anytime	No	No	NE	

Table 4. ROUTINE PERIODIC MAINTENANCE							
Proposed action = Clean inboard ditch and culvert inlet, and grade road surfaces when necessary. Equipment used = Grader, backhoe, excavator, bulldozer, dump truck, chain saw and slope mower that sometimes utilize backup safety warning signal. All activities generate noise greater than ambient levels. Periodicity of these actions = Once per four years. MAMU = marbled murrelet, SPOW = northern spotted owl. LOP's = Perform the projects that are within 0.25 miles of SPOW nest/activity center and within 0.25 miles of unsurveyed suitable SPOW habitat from 1 Aug through 31 Jan for a no effects determination, and from 10 Jul through 31 Jan for a MANLAA determination. In addition, perform the projects that are within 0.25 miles of marbled murrelet habitat from 16 Sep to 23 Mar.							
Road Name (note, roads with an "*" are open to the public).	Total Length of Road	Duration of action	Time of year action is planned to begin	Is the proposed project located within 0.25 miles of suitable habitat? (List species)	Is the proposed project located within 0.25 miles of a SPOW activity center?	Determinations NE = No effects MANLAA = May affect, but not likely to adversely affect MALAA = May affect, likely to adversely affect (in bold)	Notes about start dates, determinations and acres of affect
Upper Coyote Peak Road	0.4	.5 day	anytime	No	No	NE	
Upper Lyons Road	0.7		anytime	No	No	NE	
C-10		.5 day	> 10 Jul	SPOW	Unsurveyed	SPOW – MANLAA	
C-30		.5 day	> 15 Sept	SPOW MAMU	Unsurveyed	NE	

Table 5. NON ROUTINE EROSION CONTROL AND ROAD REPAIR									
Actions = Replacement or addition of culverts and installation of rolling dips. No vegetation removed during dip installation. Installation of two temporary bridges on Lower B 500. Periodicity = Once. All activities generate noise greater than ambient levels. Equipment = Excavator, backhoe, bulldozer, loader, grader, compaction equip., dump trucks with backup warning signals. MAMU = marbled murrelet, SPOW = northern spotted owl.									
Road Name	LOP's = Perform the projects that are within 0.25 miles of SPOW nest/activity center and within 0.25 miles of unsurveyed suitable SPOW habitat from 1Aug through 31 Jan for a no effects determination, and from 10 July through 31 January for a may affect not likely to adversely affect (MANLAA) determination. In addition, perform the projects that are within 0.25 miles of suitable marbled murrelet habitat from 16 September to 23 March.								
	Total Length of Road	# of stream X-ings	Time of year action is planned to begin	Estimate d number of culverts to replace	Estimate d number of rolling dips to be installed	Project Located within 0.25 miles of suitable habitat? (List species)	Is project located w/i 1/4 mile of a SPOW A.C.?	Determination	Notes about start dates, determinations and acres of affect
Endert's Beach	No effect - no threatened or endangered species habitat within 0.25 miles								
Coastal Drive	No effect - no threatened or endangered species habitat within 0.25 miles								
200	2.0	13	> 15 Sep	13		MAMU SPOW	Unsurveyed	MAMU – NE SPOW – MANLAA	Negligible amount of spotted owl habitat degradation
205	3.5	21	> 15 Sep		12	MAMU SPOW	Unsurveyed	NE	
240	1.9	4	> 15 Sep		3	MAMU SPOW	Unsurveyed	NE	

Table 5. NON ROUTINE EROSION CONTROL AND ROAD REPAIR									
Actions = Replacement or addition of culverts and installation of rolling dips. No vegetation removed during dip installation. Installation of two temporary bridges on Lower B 500. Periodicity = Once. All activities generate noise greater than ambient levels. Equipment = Excavator, backhoe, bulldozer, loader, grader, compaction equip., dump trucks with backup warning signals. MAMU = marbled murrelet, SPOW = northern spotted owl.									
Road Name	LOP's = Perform the projects that are within 0.25 miles of SPOW nest/activity center and within 0.25 miles of unsurveyed suitable SPOW habitat from 1Aug through 31 Jan for a no effects determination, and from 10 July through 31 January for a may affect not likely to adversely affect (MANLAA) determination. In addition, perform the projects that are within 0.25 miles of suitable marbled murrelet habitat from 16 September to 23 March.								
	Total Length of Road	# of stream X-ings	Time of year action is planned to begin	Estimate d number of culverts to replace	Estimate d number of rolling dips to be installed	Project Located within 0.25 miles of suitable habitat? (List species)	Is project located w/i 1/4 mile of a SPOW A.C.?	Determination	Notes about start dates, determinations and acres of affect
	300	0.8	6	> 15 Sep		1	MAMU SPOW	Unsurveyed	NE
	Off Highway	2.0	6	anytime	6		MAMU SPOW	Unsurveyed	MAMU – NE SPOW - MANLAA
	Streelow Creek Trail	1.6	UNK	> 15 Sep	4	UNK	MAMU SPOW	Unsurveyed	MAMU – NE SPOW – MANLAA
	B-Line	4.5	0	> 10 Jul	UNK	UNK	SPOW	Unsurveyed	SPOW - MANLAA
									MAMU residual habitat surveyed, no occupancy. Negligible amount of spotted owl habitat degradation

Table 5. NON ROUTINE EROSION CONTROL AND ROAD REPAIR									
Actions = Replacement or addition of culverts and installation of rolling dips. No vegetation removed during dip installation. Installation of two temporary bridges on Lower B 500. Periodicity = Once. All activities generate noise greater than ambient levels. Equipment = Excavator, backhoe, bulldozer, loader, grader, compaction equip., dump trucks with backup warning signals. MAMU = marbled murrelet, SPOW = northern spotted owl.									
Road Name	LOP's = Perform the projects that are within 0.25 miles of SPOW nest/activity center and within 0.25 miles of unsurveyed suitable SPOW habitat from 1Aug through 31 Jan for a no effects determination, and from 10 July through 31 January for a may affect not likely to adversely affect (MANLAA) determination. In addition, perform the projects that are within 0.25 miles of suitable marbled murrelet habitat from 16 September to 23 March.								
	Total Length of Road	# of stream X-ings	Time of year action is planned to begin	Estimate d number of culverts to replace	Estimate d number of rolling dips to be installed	Project Located within 0.25 miles of suitable habitat? (List species)	Is project located w/i 1/4 mile of a SPOW A.C.?	Determination	Notes about start dates, determinations and acres of affect
205 Spur	0.6	0	> 15 Sep	4	UNK	SPOW MAMU	No	MAMU – NE SPOW - MANLAA	Negligible amount of spotted owl habitat degradation
L-2-2	1.2	1	> 10 Jul	UNK	UNK	SPOW	Unsurveyed	SPOW – MANLAA	Negligible amount of spotted owl habitat degradation
L-2	1.4	7	> 10 Jul	3	0	SPOW	Unsurveyed	SPOW – MANLAA	Negligible amount of spotted owl habitat degradation
M-11 / M-11-1	0.8	4	> 15 Sep	8	9	MAMU SPOW	Yes	MAMU – NE SPOW - MANLAA	Negligible amount of spotted owl habitat degradation

Table 5. NON ROUTINE EROSION CONTROL AND ROAD REPAIR									
Actions = Replacement or addition of culverts and installation of rolling dips. No vegetation removed during dip installation. Installation of two temporary bridges on Lower B 500. Periodicity = Once. All activities generate noise greater than ambient levels. Equipment = Excavator, backhoe, bulldozer, loader, grader, compaction equip., dump trucks with backup warning signals. MAMU = marbled murrelet, SPOW = northern spotted owl.									
Road Name	LOP's = Perform the projects that are within 0.25 miles of SPOW nest/activity center and within 0.25 miles of unsurveyed suitable SPOW habitat from 1Aug through 31 Jan for a no effects determination, and from 10 July through 31 January for a may affect not likely to adversely affect (MANLAA) determination. In addition, perform the projects that are within 0.25 miles of suitable marbled murrelet habitat from 16 September to 23 March.								
	Total Length of Road	# of stream X-ings	Time of year action is planned to begin	Estimate d number of culverts to replace	Estimate d number of rolling dips to be installed	Project Located within 0.25 miles of suitable habitat? (List species)	Is project located w/i 1/4 mile of a SPOW A.C.?	Determination	Notes about start dates, determinations and acres of affect
L-1	1.0	UNK	> 10 Jul	UNK	UNK	SPOW	Unsurveyed	SPOW – MANLAA	Negligible amount of spotted owl habitat degradation
A-9-7	0.9	UNK	> 10 Jul	UNK	UNK	SPOW	Unsurveyed	SPOW - MANLAA	Negligible amount of spotted owl habitat degradation
C-Line (north)	5.8	14	> 10 Jul	1	7	MAMU SPOW	Unsurveyed	MAMU – NE SPOW - MANLAA	Replace culvert on 10 Jul and install dips after 15 Sep. Negligible amount of spotted owl habitat degradation. Culvert 0.25 mi. from MAMU habitat.
Upper G-Line		4	> 10 Jul	4	2	SPOW	Unsurveyed	SPOW - MANLAA	Negligible amount of spotted owl habitat degradation

Table 5. NON ROUTINE EROSION CONTROL AND ROAD REPAIR									
Actions = Replacement or addition of culverts and installation of rolling dips. No vegetation removed during dip installation. Installation of two temporary bridges on Lower B 500. Periodicity = Once. All activities generate noise greater than ambient levels. Equipment = Excavator, backhoe, bulldozer, loader, grader, compaction equip., dump trucks with backup warning signals. MAMU = marbled murrelet, SPOW = northern spotted owl.									
Road Name	LOP's = Perform the projects that are within 0.25 miles of SPOW nest/activity center and within 0.25 miles of unsurveyed suitable SPOW habitat from 1Aug through 31 Jan for a no effects determination, and from 10 July through 31 January for a may affect not likely to adversely affect (MANLAA) determination. In addition, perform the projects that are within 0.25 miles of suitable marbled murrelet habitat from 16 September to 23 March.								
	Total Length of Road	# of stream X-ings	Time of year action is planned to begin	Estimate d number of culverts to replace	Estimate d number of rolling dips to be installed	Project Located within 0.25 miles of suitable habitat? (List species)	Is project located w/i 1/4 mile of a SPOW A.C.?	Determination	Notes about start dates, determinations and acres of affect
	G-6-1	1.4	8	> 15 Sep	10	0	MAMU SPOW	Unsurveyed	NE
	B-5 (Westside Access road)		9	> 10 Jul		4	SPOW	Unsurveyed	SPOW – MANLAA
	M-7-1 1/2		1	> 15 Sep		1	MAMU SPOW	Unsurveyed	NE
Rodger's Peak			?	> 10 Jul		7	SPOW	Unsurveyed	SPOW - MANLAA

Table 5. NON ROUTINE EROSION CONTROL AND ROAD REPAIR									
Road Name	Actions = Replacement or addition of culverts and installation of rolling dips. No vegetation removed during dip installation. Installation of two temporary bridges on Lower B 500. Periodicity = Once. All activities generate noise greater than ambient levels. Equipment = Excavator, backhoe, bulldozer, loader, grader, compaction equip., dump trucks with backup warning signals. MAMU = marbled murrelet, SPOW = northern spotted owl.								
	LOP's = Perform the projects that are within 0.25 miles of SPOW nest/activity center and within 0.25 miles of unsurveyed suitable SPOW habitat from 1Aug through 31 Jan for a no effects determination, and from 10 July through 31 January for a may affect not likely to adversely affect (MANLAA) determination. In addition, perform the projects that are within 0.25 miles of suitable marbled murrelet habitat from 16 September to 23 March.								
	Total Length of Road	# of stream X-ings	Time of year action is planned to begin	Estimate d number of culverts to replace	Estimate d number of rolling dips to be installed	Project Located within 0.25 miles of suitable habitat? (List species)	Is project located w/i 1/4 mile of a SPOW A.C.?	Determination	Notes about start dates, determinations and acres of affect
B-5 (Westside Access rd.)		14	> 10 Jul		10	SPOW	Unsurveyed	SPOW - MANLAA	
Boundary Road	No effect - no threatened or endangered species habitat within 0.25 miles								
Bridge Road	No effect - no threatened or endangered species habitat within 0.25 miles								
Coyote Creek Road	No effect - no threatened or endangered species habitat within 0.25 miles								
Coyote Peak Road	No effect - no threatened or endangered species habitat within 0.25 miles								
Coyote Peak Spur	No effect - no threatened or endangered species habitat within 0.25 miles								

Table 5. NON ROUTINE EROSION CONTROL AND ROAD REPAIR									
Actions = Replacement or addition of culverts and installation of rolling dips. No vegetation removed during dip installation. Installation of two temporary bridges on Lower B 500. Periodicity = Once. All activities generate noise greater than ambient levels. Equipment = Excavator, backhoe, bulldozer, loader, grader, compaction equip., dump trucks with backup warning signals. MAMU = marbled murrelet, SPOW = northern spotted owl.									
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High Prairie Road	No effect - no threatened or endangered species habitat within 0.25 miles								
Long Ridge Road	No effect - no threatened or endangered species habitat within 0.25 miles								
Lookout Road	No effect - no threatened or endangered species habitat within 0.25 miles								
Lower Rock Fork Road	No effect - no threatened or endangered species habitat within 0.25 miles								
Main Stem Road	No effect - no threatened or endangered species habitat within 0.25 miles								
Upper Mid Basin Road	No effect - no threatened or endangered species habitat within 0.25 miles								

Table 5. NON ROUTINE EROSION CONTROL AND ROAD REPAIR									
Road Name	Actions = Replacement or addition of culverts and installation of rolling dips. No vegetation removed during dip installation. Installation of two temporary bridges on Lower B 500. Periodicity = Once. All activities generate noise greater than ambient levels. Equipment = Excavator, backhoe, bulldozer, loader, grader, compaction equip., dump trucks with backup warning signals. MAMU = marbled murrelet, SPOW = northern spotted owl.								
	LOP's = Perform the projects that are within 0.25 miles of SPOW nest/activity center and within 0.25 miles of unsurveyed suitable SPOW habitat from 1 Aug through 31 Jan for a no effects determination, and from 10 July through 31 January for a may affect not likely to adversely affect (MANLAA) determination. In addition, perform the projects that are within 0.25 miles of suitable marbled murrelet habitat from 16 September to 23 March.								
	Total Length of Road	# of stream X-ings	Time of year action is planned to begin	Estimate d number of culverts to replace	Estimate d number of rolling dips to be installed	Project Located within 0.25 miles of suitable habitat? (List species)	Is project located w/i 1/4 mile of a SPOW A.C.?	Determination	Notes about start dates, determinations and acres of affect
Lower Mid Basin Road	No effect - no threatened or endangered species habitat within 0.25 miles								
Ranch Road	No effect - no threatened or endangered species habitat within 0.25 miles								
Ranch Spur	No effect - no threatened or endangered species habitat within 0.25 miles								
Rock Fork Road	No effect - no threatened or endangered species habitat within 0.25 miles								
Schoolhouse Loop	No effect - no threatened or endangered species habitat within 0.25 miles								
Spring Road	No effect - no threatened or endangered species habitat within 0.25 miles								
Spring Spur	No effect - no threatened or endangered species habitat within 0.25 miles								

Table 5. NON ROUTINE EROSION CONTROL AND ROAD REPAIR									
Actions = Replacement or addition of culverts and installation of rolling dips. No vegetation removed during dip installation. Installation of two temporary bridges on Lower B 500. Periodicity = Once. All activities generate noise greater than ambient levels. Equipment = Excavator, backhoe, bulldozer, loader, grader, compaction equip., dump trucks with backup warning signals. MAMU = marbled murrelet, SPOW = northern spotted owl.									
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	Total Length of Road	# of stream X-ings	Time of year action is planned to begin	Estimate d number of culverts to replace	Estimate d number of rolling dips to be installed	Project Located within 0.25 miles of suitable habitat? (List species)	Is project located w/i 1/4 mile of a SPOW A.C.?	Determination	Notes about start dates, determinations and acres of affect
T. Bear Road	No effect - no threatened or endangered species habitat within 0.25 miles								
Upper Coyote Peak Road	No effect - no threatened or endangered species habitat within 0.25 miles								
Upper Lyons Road	No effect - no threatened or endangered species habitat within 0.25 miles								

Appendix II

Maps

Appendix III

Redwood National and State Parks Maintenance Program Project Tiering Form

Today's Date:

Project Name:

Project Location*:

Proposed Implementation Date(s):

Brief Description of Methods (equipment used, amount and type of vegetation to be removed, use of backup warning signals, scope of work, or any associated activities):

Project Leader (name and phone extension):

** Staff resource ecologist or wildlife biologist will determine habitat suitability in and around project area.*

Appendix IV

California Department of Parks and Recreation Tree Hazard Habitat Suitability Assessment Form

CHARACTERIZING TREES FOR POTENTIAL SUITABILITY AS NEST TREES AND CRITICAL HABITAT ELEMENTS

Page 1 of 1

Site: #72 Jed Smith Campground Reason for evaluating suitability: Tree hazard Date: 12-11-03

Observer(s): G. Eberly/(V.Gizinski, review)

Tree Species	Ref. No.	DBH Classes			Tree Status <u>Alive</u> Or <u>Dead</u>	Northern Spotted Owl potential nest tree evaluation criteria					Marbled Murrelet potential nest tree, or critical primary constituent element, evaluation criteria (for live trees)				If this tree is cut down will it damage an adjacent potential murrelet or spotted owl nest tree? <u>Yes</u> or <u>No</u>
		<18"	>18" - 32"	>32"		Side Cavity > 4" diam. present? <u>Yes</u> <u>No</u> <u>Unsure</u>	Platform nest present? <u>Deformity</u> <u>Mistletoe</u> <u>Broom</u> <u>Other species nest</u> <u>None</u> <u>Unsure</u>	Broken top present? <u>Broken top with cover</u> <u>Top broken without cover</u> <u>None</u> <u>Unsure</u>	Tree suitable for a SPOW nest? <u>Yes</u> <u>No</u> <u>Unsure</u>	Are there other trees with potential nest sites in the vicinity? <u>Yes</u> <u>No</u>	Are suitable nesting platforms present in tree? <u>Branch w? > 4" diam</u> <u>Deformity</u> <u>Mistletoe</u> <u>None</u>	Canopy cover over platform (to nearest 10%) <u>0</u>	Is this tree suitable for a MAMU nest? <u>Yes</u> <u>No</u>	Is tree height > 1/2 site potential? <u>Yes</u>	
GF	8		X		D	N	N	T	N	Y	N	0	N	N	N



United States Department of the Interior



FISH AND WILDLIFE SERVICE
Arcata Fish and Wildlife Office
1655 Heindon Road
Arcata, California, 95521
Phone: (707) 822-7201 FAX: (707) 822-8411

In Reply Refer To:
Log number
8-14-1998-24
81331-2008-F-0130

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 on the Maintenance Program in Redwood National
and State Parks, Humboldt and Del Norte Counties, California

This document transmits the U.S. Fish and Wildlife Service's (Service) biological opinion based on our review of the proposed maintenance program in Redwood National and State Parks (Parks), and its effects on the federally threatened marbled murrelet (*Brachyramphus marmoratus*) and northern spotted (*Strix occidentalis caurina*). This document was prepared in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*). Your request for formal consultation was received on April 1, 2009.

This biological opinion is based on information provided in the March 26, 2009, biological assessment and other sources of information. Documents related to this consultation are on file in this office.

Consultation History

Since 1998, the Parks' maintenance program has been covered under two programmatic consultations.

June 24, 1998	The Service issued a biological opinion to the Parks on their annual maintenance program. The 1998 Biological Opinion covered the period from 1998 through 2007.
July 20, 1998	The Service issued a biological opinion to the Parks on their periodic maintenance program. The 1998 Biological Opinion covered the period from 1998 through 2004.
October 17, 2005	The Service issued an amendment to the 1998 Biological Opinion on the Parks' periodic maintenance program. The 2005 amendment covered the period through 2007.
February 28, 2008	The Parks' annual and periodic routine maintenance activities and periodic non-routine maintenance activities were discussed at an Interagency Consultation Team meeting.
September 9, 2008	The Parks' submitted a draft biological assessment on their maintenance program for review.
January 8, 2009	The Service provided comments to the Parks on the draft biological assessment.

BIOLOGICAL OPINION

Description of the Proposed Action

Project Description

The Parks' maintenance program covers maintenance actions on trails, roads, and developed areas such as campgrounds, trailheads, and picnic areas. The type of maintenance activities that may occur in each of these areas is generally described below. The biological assessment has a detailed description of the proposed work. Refer to the biological assessment for specific information on the activities, types of equipment that will be used, and the timing, and frequency of each activity that will occur in the Parks' trails, roads and developed areas.

Trails

Annual trail maintenance involves clearing vegetation, reshaping of trail treads, and the removal of down trees. Tools used for trail work include hand tools, chainsaws, line trimmers, trail tractors, brush mowers, generators, and ATV quads. Three temporary footbridges are installed each year (2 on Redwood Creek and 1 on the Smith River). All work to install the footbridges is done using hand tools and battery powered hand tools. Permanent footbridges occur on many trails in the Parks and repairs occur as needed.

Roads

Road maintenance activities are divided into annual (once per year) and periodic (once every four or more years) actions. They are also divided into routine and non-routine actions. Typical routine maintenance activities include brushing, ditch and culvert cleaning, down tree removal, and road surface grading. Types of equipment used during routine maintenance include line trimmers, chainsaws, brush hog mowers, backhoes, graders, and dump trucks. Non-routine maintenance includes rolling dip installation, culvert replacement, and road bridge repair. Non-routine maintenance activities will occur one time in any location during the timeframe of this consultation. Equipment used during rolling dip installation includes bulldozers, graders, and backhoes. Excavators, backhoes, bulldozers, front loaders, graders, compactors, dump trucks, and chainsaws may be used during culvert replacements. Most of the above equipment as well as cranes, concrete mixers, concrete pumps, and generators are used to repair bridges.

Developed Areas

A wide variety of maintenance work occurs in the Parks' developed areas. Examples of typical work include mowing vegetation; trimming trees; removing hazard trees; maintaining buildings; repairing pipelines, underground wires, and pavement; and collecting garbage. Hazard tree management is an annual activity within California Department of Parks and Recreation (CDPR) campgrounds and administrative areas. There is no hazard tree management proposed in the National Park. CDPR uses a tree evaluation form to ensure that potential nest trees for the marbled murrelet or northern spotted owl will not be removed without further consultation with the Service. Types of equipment used in developed areas include chainsaws, mowers, dump trucks, mixers, pavers, front-end loaders, generators, and backhoes.

Conservation Measures

When used in the context of the Act, "conservation measures" represent actions proposed by the Federal agency that are intended to further the recovery of and/or to minimize or compensate for project effects on the species under review. Because conservation measures are pledged in the project description by the action agency, their implementation is required under the terms of the consultation (USDI Fish and Wildlife Service and USDC National Marine Fisheries Service 1998).

Recovery Measures

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

Minimization Measures

The Parks are proposing to implement the following minimization measures.

1. The majority of the maintenance activities that use equipment that produce noise above ambient levels in or within 500 feet (or 0.25 mile if back-up beepers are used) of suitable marbled murrelet nesting habitat will occur outside of the period March 24 through September 15. Actions that do not require implementation of this measure are specifically listed in the tables in the biological assessment. At

these locations from March 24 through September 15, work will be restricted to the period two hours after sunrise to two hours before sunset.

2. The majority of the maintenance activities that use equipment that produce noise above ambient levels in or within 500 feet (or 0.25 mile if back-up beepers are used) of unsurveyed or occupied northern spotted owl nesting habitat will occur outside of the period February 1 through July 9. Actions that do not require implementation of this measure are specifically listed in Table 1 of the biological assessment.
3. If a hazard tree is determined to be contributing to suitable marbled murrelet habitat (e.g., the tree is located within 0.5 mile of suitable nest trees and is one-half site potential in height or greater and/or is a potential nest tree), the Parks will contact the Service for guidance and recommendations.
4. Any hazard tree that has the potential to provide a contribution to northern spotted owl habitat suitability (e.g., trees greater than 18 inches diameter-at-breast-height (dbh), trees with large cavities, trees with noticeable deformities) and is within or adjacent to suitable nesting habitat will be preserved whenever possible.
5. No more than 0.1 acre of trees growing in the road fill will be removed at any culvert replacement location. No trees that are one-half potential tree height or that provide cover for suitable marbled murrelet nesting platforms will be removed during culvert replacements.
7. The Parks will conduct protocol northern spotted owl surveys every four years in the following locations: A-9 Road, A-9-9 Road, Holter Ridge Road, Skunk Cabbage Trail, Elam Horse Camp, Coastal Trail, Flint Ridge Trail, Howland Hill Road, and Mill Creek Campground Access Road.
8. No suitable marbled murrelet nesting habitat will be removed or degraded.
9. All park maintenance workers and contractors will be instructed to not leave any food scraps in or near suitable marbled murrelet nesting habitat and to not feed any wildlife.

Action Area

The action area is defined as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR §402.02). For purposes of this biological opinion, the action area includes all areas within the boundary of the Parks.

Time-frame of Biological Opinion

This biological opinion is valid from the date of issuance through January 31, 2019.

Status of the Species: Marbled Murrelet

Legal Status

The marbled murrelet was federally listed as a threatened species in Washington, Oregon and California on September 28, 1992 (USDI Fish and Wildlife Service 1992a). The final recovery plan was released in 1997 (USDI Fish and Wildlife Service 1997). The species is State-listed as endangered in California and as threatened in Oregon and Washington (USDI Fish and Wildlife Service 1997).

In 2004, the Service completed a 5-year status review of the marbled murrelet. As part of the status review process the Service contracted the task of compiling all new and relevant information available on the species. The contractor produced a report summarizing information relevant to the status of the species (McShane et al. 2004). Based on this report, the Service concluded that the California, Oregon and Washington distinct population segment of the marbled murrelet should remain listed as a threatened species. The Service also determined that the California, Oregon, and Washington distinct population segment of the marbled murrelet does not meet the criteria set forth in the Service's 1996 distinct population segment policy (61 FR 4722) (USDI Fish and Wildlife Service 2004a).

In 2008, the Service announced a 90-day finding that a petition to remove the California, Oregon, and Washington population of the marbled murrelet was warranted, and that a status review was initiated (USDI Fish and Wildlife Service 2008a). This finding also announced that the Service now believes that the discreteness analysis in the 2004 status review was flawed, and that the population may be a valid distinct population segment. Currently, the marbled murrelet remains listed and retains its' protected status as a threatened species under the Act until the original 1992 listing decision is revised through formal rule-making procedures.

In 2009, the Service completed a 5-year status review of the marbled murrelet and concluded that the species should remain listed as threatened and that the California, Oregon, and Washington populations constitute a distinct population segment.

Life History

Marbled murrelets are long-lived seabirds that spend most of their life in the marine environment, but use old-growth forests for nesting. Accounts of the taxonomy, ecology, and reproductive characteristics of the marbled murrelet are found in the following publications: Ecology and Conservation of the Marbled Murrelet (Ralph et al. 1995a), the Final Recovery Plan Marbled Murrelet (*Brachyramphus marmoratus*) Washington, Oregon, and California Populations (Recovery Plan) (USDI Fish and Wildlife Service 1997), the Final Supplemental Environmental Impact Statement on Management of Habitat for Late-successional and Old-growth Forest Related Species Within the Range of the Northern Spotted Owl (USDA Forest Service and USDI Bureau of Land Management 1994a), the Status of the Marbled Murrelet in North America: with Special Emphasis on Populations in California, Oregon, and Washington (Marshall 1988), Marbled Murrelet (*Brachyramphus marmoratus*) (Nelson 1997), and in the Evaluation

Report in the 5-Year Status Review (McShane et al. 2004). Information from these sources is incorporated by reference and summarized as follows.

Current and Historical Range

The breeding range of the marbled murrelet extends along the Pacific coast from Alaska to Monterey Bay in central California. Some wintering birds occur as far south as northern Baja California, Mexico. However, only the Washington, Oregon, and California population segment is federally listed as threatened (USDI Fish and Wildlife Service 1992a). Limited information is available on their historic distribution and numbers; however, most summaries give indications that the distribution of marbled murrelet populations was significantly reduced as habitat was removed throughout its' range. Populations declined as a result. In some areas, only small numbers of marbled murrelets persist or have been locally extirpated, risking maintenance of the species' distribution. These areas are identified as "areas of concern" (USDI Fish and Wildlife Service 1997). They include distribution gaps in central California, northwestern Oregon, and southwestern Washington, where very little suitable habitat remains, and what habitat does remain occurs in small, fragmented patches.

Marine Environment

The breeding and winter range of the marbled murrelet in the listed range occur within the oceanographic system known as the California Current. The California Current is subject to high interannual frequency of anomalous conditions such as an El Niño which can affect prey availability (McShane et al. 2004).

Courtship, foraging, loafing, molting, and preening occur in near-shore marine waters. Beginning in early spring, courtship continues throughout summer with some observations even noted during the winter period (Speckman 1996, Nelson 1997). Observations of courtship occurring in the winter suggest that pair bonds are maintained throughout the year (Speckman 1996, Nelson 1997). Courtship involves bill posturing, swimming together, synchronous diving, vocalizations, and chasing in flights just above the surface of the water. Copulation occurs both inland in the trees and at sea (Nelson 1997).

Marbled murrelets forage at all times of the day, but most actively in the morning and late afternoon (Strachan et al. 1995). They typically forage in pairs, but have been observed to forage alone or in groups of three or more (Carter and Sealy 1990, Strachan et al. 1995, Speckman et al. 2003). Strachan et al. (1995) believe pairing influences foraging success and cooperative foraging techniques may be employed. For example, pairs consistently dive together during foraging and often synchronize their dives by swimming towards each other before diving (Carter and Sealy 1990) and resurfacing together on most dives. Strachan et al. (1995) speculate pairs may keep in visual contact underwater. Paired foraging is common throughout the year, even during the incubation period, suggesting that breeding marbled murrelets may temporarily pair up with other foraging individuals or non-mates (Strachan et al. 1995, Speckman et al. 2003).

Marbled murrelets go through two molts each year. The timing of molts varies temporally throughout their range likely due to prey availability, stress, and reproductive success (Nelson 1997). Adult or after hatch-year marbled murrelets have two primary plumage types: alternate plumage during the breeding season and basic plumage during the winter. The pre-alternate molt occurs from late February to mid-May. This is an incomplete molt during which the birds lose their body feathers but retain their ability to fly (Carter and Stein 1995, Nelson 1997). A complete pre-basic molt occurs from mid-July through December (Carter and Stein 1995, Nelson 1997). During the pre-basic molt, marbled murrelets lose all flight feathers somewhat synchronously and are flightless for up to 2 months (Nelson 1997).

Little is known about marine-habitat preference outside of the breeding season, but use during the early spring and fall is thought to be similar to that preferred during the breeding season (Nelson 1997). Adults and subadults may move away from breeding areas prior to molting and must select areas with predictable prey resources during the flightless period (Carter and Stein 1995, Nelson 1997). During the non-breeding season, marbled murrelets disperse and can be found farther from shore (Strachan et al. 1995). During the winter there may be a general shift from exposed outer coasts into more protected waters (Nelson 1997). For example, many marbled murrelets breeding on the exposed outer coast of Vancouver Island appear to congregate in the more sheltered waters within the Puget Sound and the Strait of Georgia in fall and winter (Burger 1995). However, in many areas, marbled murrelets remain associated with their inland nesting habitat during the winter months (Carter and Erickson 1992). In central California, a radio telemetry study of marbled murrelet movement during the late summer and fall months revealed that most birds remained near their nesting areas immediately following molt, but then began to disperse distances greater than 100 miles to wintering areas (Peery et al. 2003).

Terrestrial Environment

Marbled murrelets generally nest in old-growth forests, characterized by large trees, multiple canopy layers, and moderate to high canopy closure. Marbled murrelet nests have been located at a variety of elevations from sea level to 5,020 feet (Burger 2002). However, most nests have been found below 3,500 feet. In California, nest stands are typically composed of low elevation conifers, which include coastal redwood and Douglas-fir. These forests are located close enough to the marine environment for the birds to fly to and from nest sites. The furthest known inland occupied site is in Washington, about 52 miles from the coast. However, marbled murrelets have been detected up to 70 miles from the coast in the southern Cascade Mountains (Evans Mack et al. 2003).

Radar and audio-visual studies have shown marbled murrelet habitat use is positively associated with the presence and abundance of mature and old-growth forests, large core areas of old-growth, low amounts of edge and fragmentation, proximity to the marine environment, total watershed area, and increasing forest age and height (McShane et al. 2004). In California and southern Oregon, areas with abundant numbers of marbled murrelets were farther from roads, occurred more often in parks protected from logging,

and were less likely to occupy old-growth habitat if it was greater than 3 miles from other nesting marbled murrelets (Meyer et al. 2002). Meyer et al. (2002) also found at least a few years passed before birds abandoned fragmented forests.

Marbled murrelets do not form dense colonies, which is atypical for most seabirds. Limited evidence suggests they may form loose colonies or clusters of nests in some cases (Ralph et al. 1995b). The marbled murrelets reliance on cryptic coloration to avoid detection would suggest they utilize a wide spacing of nests in order to prevent predators from forming a search image (Ralph et al. 1995b). However, active nests have been seen within 98 feet in Oregon (Nelson and Wilson 2002). Estimates of marbled murrelet nest densities vary depending upon the method of data collection. For example, nest densities estimated using radar range from 0.003 to 0.042 mean nests per hectare, while nest densities estimated from tree climbing efforts range from 0.11 to 1.42 mean nests per hectare (Nelson 2005).

Of particular importance to recovery options is evidence that breeding marbled murrelets displaced by the loss of nesting habitat apparently do not pack in higher densities into remaining habitat (McShane et al. 2004). Thus, currently unoccupied habitat with suitable nesting structure may be important to displaced marbled murrelets and first-time breeders.

There are few data available regarding marbled murrelet nest site fidelity because of the difficulty in locating nest sites and observing bands on birds attending nests. However, marbled murrelets have been detected in the same nesting stands for many years suggesting marbled murrelets have a high fidelity to nesting areas (Nelson 1997). Use of the same nest platform in successive years and multiple nests in the same tree has been documented, although it is not clear whether the repeated use involved the same birds (Divoky and Horton 1995, Nelson and Peck 1995, Nelson 1997, Hebert et al. 2003a).

It is unknown whether juveniles disperse from natal breeding habitat or return to their natal breeding habitat after reaching breeding age. Divoky and Horton (1995) predicted that juvenile dispersal is likely to be high because marbled murrelets are non-colonial and nest in widely dispersed nest sites. Conversely, Swartzman et al. (1997 cited in McShane et al. 2004) suggested juvenile dispersal is likely to be low, as it is for other alcid species.

When tending active nests during the breeding season, breeding pairs forage within commuting distance of the nest site. Daily movements between nest sites and foraging areas for breeding marbled murrelets averaged 10 miles in Prince William Sound, Alaska (McShane et al. 2004), 24 miles in Desolation Sound, British Columbia, and 48 miles in southeast Alaska (Hull et al. 2001). In California, Hebert et al. (2003b) found the mean extent of north-south distance traveled by breeding adults to be about 46 miles.

Known predators of adult marbled murrelets in the forest environment include the peregrine falcon (*Falco peregrinus*), sharp-shinned hawk (*Accipiter striatus*), common raven (*Corvus corax*), northern goshawk (*Accipiter gentilis*), and bald eagle (*Haliaeetus leucocephalus*). Common ravens and Steller's jays (*Cyanocitta stelleri*) are known to

take both eggs and chicks at the nest, while sharp-shinned hawks have been found to take chicks. Suspected nest predators include great horned owls (*Bubo virginianus*), barred owls (*Strix varia*), Cooper's hawks (*Accipiter cooperi*), northwestern crows (*Corvus caurinus*), American crows (*Corvus brachyrhynchos*), and gray jays (*Perisoreus canadensis*) (Nelson and Hamer 1995a, Nelson 1997). Predation by squirrels and mice has been documented at artificial nests and cannot be discounted as potential predators on eggs and chicks (Luginbuhl et al. 2001, Raphael et al. 2002, Bradley and Marzluff 2003).

Reproductive Biology

Life history information is limited for the marbled murrelet (USDI Fish and Wildlife Service 1997). However, marbled murrelets probably do not reach sexual maturity until at least their second year, and most birds probably do not lay eggs until they are at least 3 years old (USDI Fish and Wildlife Service 1997). Marbled murrelets are estimated to live an average of 10 years (Beissinger 1995). Marbled murrelets produce one egg per nest and usually only nest once a year, however re-nesting is documented (Hebert et al. 2003a). Nests are not built, but rather the egg is placed in a small depression or cup made in moss or other debris on the limb (USDI Fish and Wildlife Service 1997). In California, egg-laying and incubation span a long period, beginning around March 24 and ending August 15, with the nestling period beginning April 23 and ending September 13 (Hamer et al. 2002).

Incubation lasts about 30 days, and chicks fledge after about 28 days after hatching. Both sexes incubate the egg in alternating 24-hour shifts. The chick is fed up to eight times daily, and is usually fed only one fish at a time. Adults fly from the ocean to inland nest sites at all times of the day, but most often at dusk and dawn (Nelson and Hamer 1995b). New information from a radio-telemetry study in northern California indicates that inland flights at dusk are exclusively made by breeding birds, whereas inland flights at dawn are made by both breeding and non-breeding birds (B. Accord pers. comm.). The young are semiprecocial, capable of walking but not leaving the nest. Fledglings apparently fly directly from the nest to the ocean, but are sometimes found on the ground, indicating that they were unable to sustain flight to reach the marine environment (USDI Fish and Wildlife Service 1997).

Threats

Marbled murrelets remain subject to a variety of threats both in the terrestrial and marine environment including the loss of nesting habitat, predation, noise and visual disturbance, gill-net fishing operations, oil spills and marine pollution, trends in prey availability from oceanographic conditions and overfishing, and disease (USDI Fish and Wildlife Service 1997, McShane et al. 2004).

Habitat loss

Marbled murrelets prefer late-successional and old-growth forests for nesting. Loss of this type of habitat due to timber harvest was the primary reason for listing the species (USDI Fish and Wildlife Service 1992a). Loss of nesting habitat exacerbated by poor reproductive success in remaining habitat are the primary factors responsible for a decline

in the marbled murrelet population, compared to the historical population level in the early 1800's (USDI Fish and Wildlife Service 1997).

Predation

Predation of eggs and chicks is a major cause of nest failure (Nelson and Hamer 1995a). Even small increases in predation can have deleterious effects to population viability, due to the marbled murrelet's low reproductive rate (Nelson and Hamer 1995a). Poor reproductive success is likely caused by high predation rates. In particular, human activities which increase the number of predators or risk of predation near nesting areas should be discouraged (USDI Fish and Wildlife Service 1997).

Predation rates are influenced largely by habitat patch size, habitat quality, nest location relative to edge of nest stand, and proximity of nesting habitat to areas of human activity, where many of the corvid species are in high abundance. The quality of nesting habitat decreases as patch size decreases because the amount of forest edge increases in relation to the amount of interior forest habitat. As the amount of forest edge increases, the probability that nests would be located near an edge also increases. Nests placed near the edge of a stand are more likely subject to predation (Ralph et al. 1995b). Nelson and Hamer (1995a) found successful nests were farther from edges and were better concealed than unsuccessful nests. Furthermore, independent of patch size, the quality of nesting habitat decreases when in close proximity to human activity. Forest stands within 0.6 mile of human activity centers, such as campgrounds, can experience increased nest predation because human food sources attract corvids (Marzluff et al. 2000). The probability of predation on simulated marbled murrelet nests decreased from 95 percent to 50 percent when visitors and their food were not allowed into an area of the Olympic National Park (Marzluff and Neatherlin 2006).

Disturbance

Marbled murrelets may be sensitive to human-caused disturbance in the terrestrial environment due to their secretive nature and their vulnerability to predation. There are few data concerning the marbled murrelet's vulnerability to disturbance effects, however research on a variety of other species, including other seabirds, indicates an animal's response to disturbance follows the same pattern as its response to encountering predators. Anti-predator behavior has a cost to other fitness enhancing activities, such as feeding and parental care (Frid and Dill 2002).

Anecdotal researcher observations indicate that marbled murrelets typically exhibit a limited, temporary behavioral response to noise disturbance at nest sites and are able to adapt to auditory stimuli (Singer et al. 1995 cited in McShane et al. 2004, Long and Ralph 1998). Responses by marbled murrelet adults and chicks to calls from corvids and other potential predators include no response, alert posturing, and aggressive attack. Adults may temporarily leave a nest (McShane et al. 2004). However, the most typical behavior of chicks and adults in response to the presence of a potential predator is to flatten against a tree branch and remain motionless (Nelson and Hamer 1995a, McShane et al. 2004). In addition, there may be physiological responses researchers cannot account for with visual observations. Corticosterone studies have not been conducted on

marbled murrelets, but studies on other avian species indicate chronic high levels of this stress hormone may have negative consequences on reproduction or physical condition (Wasser et al. 1997, McShane et al. 2004).

Though largely inconclusive, Hebert et al. (2003a) examined the effects of operating chainsaw noise during incubation and chick rearing periods on nesting adult marbled murrelets and chicks. Adult marbled murrelets and chicks both spent less time motionless and resting and more time exhibiting “raised head” and “bill up” behaviors during the disturbance trial than pre- and post-trial. The relevance of these behaviors is unknown; however, a species that relies on being cryptic and motionless to avoid predation at the nest may risk being detected by a predator if it moves more often.

Gill-net fishing

Marbled murrelets can become entangled in gill-nets and drown. Marbled murrelets can also be killed by hooking with fishing lures and entanglement with fishing lines (Carter et al. 1995). There is little information available on marbled murrelet mortality from net fishing prior to the 1990s, although it was known to occur (Carter et al. 1995). In the mid-1990s, a series of fisheries restrictions and changes were implemented to address mortality of all species of seabirds, resulting in a lower mortality rate of marbled murrelets (McShane et al. 2004). Fishing effort has also decreased since the 1980s because of lower catches, fewer fishing vessels, and greater restrictions (McShane et al. 2004); although a regrowth in gill net fishing is likely to occur if salmon stocks increase.

Oil spills and marine contaminants

Marbled murrelets are highly vulnerable to oiling. Oil spills which have occurred near murrelet concentrations have had catastrophic effects on marbled murrelet populations (USDI Fish and Wildlife Service 1996). Marbled murrelets exposed to oil floating on the water’s surface likely die within days of exposure. Though the number of oil spills has generally declined since passage of the U.S. Oil Pollution Act in 1990, marbled murrelet and seabird mortality remains a significant conservation issue (McShane et al. 2004).

The primary consequence from the exposure of marbled murrelets to contaminants is reproductive impairment. Reproduction can be impacted by food web bioaccumulation of organochlorine pollutants and heavy metals discharged into areas where marbled murrelets feed and prey species concentrate (Fry 1995). However, marbled murrelet exposure is likely a rare event because marbled murrelets have widely dispersed foraging areas and they feed extensively on transient juvenile and subadult midwater fish species that are expected to have low pollutant loads (McShane et al. 2004). The greatest exposure risk to marbled murrelets may occur at regular feeding areas near major pollutant sources, such as those found in Puget Sound (McShane et al. 2004).

Reduced prey availability

Many fish populations have been depleted due to overfishing, reduction in the amount or quality of spawning habitat, and pollution. Other than anchovies and herring, primary marbled murrelet prey species have little commercial fishery value.

Oceanographic variation can also influence prey availability. While the effects to marbled murrelets from events such as the warm phase of the Pacific Decadal Oscillation or El Niño have not been well documented, El Niño events are thought to reduce overall prey availability and several studies have found that El Niño events can influence the behavior of marbled murrelets (McShane et al. 2004). Even though changes in prey availability may be due to natural and cyclic oceanographic variation, these changes may exacerbate other threats to marbled murrelets in the marine environment.

Disease

The emergence of fungal, parasitic, bacterial, and viral diseases and biotoxins has affected populations of seabirds in recent years. West Nile virus disease has been reported in California which is known to be lethal to seabirds, but little is known about its potential impact on marbled murrelets (McShane et al. 2004). No diseases have been documented to have caused marbled murrelet mortality; however, four marbled murrelets may have died from domoic acid toxicosis in central California in 1999 (Burkett et al. 1999).

Genetics

Loss of genetic variation among populations was identified as a potential threat to the marbled murrelet (McShane et al. 2004). Friesen et al. (2007) concluded that marbled murrelets are comprised of three genetic units: (1) western and central Aleutian Islands; (2) eastern Aleutian Islands to northern California; and (3) central California. All three populations are important to maintaining the species genetic resources and/or local adaptations and its long-term viability. Murrelets in the western and central Aleutian Islands and central California occupy the periphery of the species range and are genetically distinct.

Conservation Needs

Recovery objectives for the marbled murrelet include the following (USDI Fish and Wildlife Service 1997): (1) stabilize and then increase population size, changing the current downward trend to an upward trend throughout the listed range; (2) provide conditions in the future that allow for a reasonable likelihood of continued existence of viable populations; and (3) gather the necessary information to develop specific delisting criteria. Stabilizing and increasing habitat quality and quantity on land and at sea are the primary means for stopping the current population decline and encouraging future population growth (USDI Fish and Wildlife Service 1997).

In order to achieve the recovery objectives, the following short-term conservation actions are needed (USDI Fish and Wildlife Service 1997): (1) maintain all occupied nesting habitat on Federal lands administered under the NWFP (USDA Forest Service and USDI Bureau of Land Management 1994a); (2) on non-Federal lands, maintain as much occupied habitat as possible and use the Habitat Conservation Plan (HCP) process to avoid or reduce the loss of this habitat; (3) maintain potential and suitable habitat in large contiguous blocks; (4) maintain and enhance buffer habitat surrounding occupied habitat; (5) decrease adult and juvenile mortality; and (6) minimize nest disturbances to increase reproductive success.

In order to achieve the recovery objectives, the following long-term conservation actions are needed (USDI Fish and Wildlife Service 1997): (1) increase the amount and quality of suitable nesting habitat; (2) decrease fragmentation by increasing the size of suitable stands; (3) protect “recruitment” nesting habitat to buffer and enlarge existing stands, reduce fragmentation, and provide replacement habitat for current suitable nesting habitat lost to disturbance events; (4) increase speed of development of new habitat; and (5) improve and develop north/south and east/west distribution of nesting habitat.

Six marbled murrelet conservation zones occur throughout the listed range. They are as follows: Puget Sound (Zone 1); Western Washington Coast Range (Zone 2); Oregon Coast Range (Zone 3); Siskiyou Coast Range (Zone 4); Mendocino (Zone 5); and Santa Cruz Mountains (Zone 6). Specific conservation management plans need to be developed for each zone (USDI Fish and Wildlife Service 1997). Zones 1 to 4 must be managed to produce and maintain well distributed, viable populations to address the long-term survival and recovery of the marbled murrelet.

The Siskiyou Coast Range (Zone 4) extends from North Bend, Coos County, Oregon, south to the southern end of Humboldt County, California. It includes water within 1.2 miles of the shoreline. Actions in Zone 4 should focus on preventing the loss of occupied nesting habitat, minimizing the loss of unoccupied but suitable habitat, and decreasing the time for development of new suitable habitat (USDI Fish and Wildlife Service 1997).

The Mendocino Zone (Zone 5) extends south from the southern boundary of Humboldt County, California, to the mouth of San Francisco Bay. It includes water within 1.2 miles of the shoreline. The very small nesting and at-sea population along the coast of Mendocino, Sonoma, and Marin counties is important to future reconnection of murrelet populations in northern and central California (USDI Fish and Wildlife Service 1997).

The Santa Cruz Mountains Zone (Zone 6) extends south from the mouth of San Francisco Bay to Point Sur, Monterey County, California. It includes waters within 1.2 miles of the shoreline and the waters of Monterey Bay. This population is important to maintaining a well-distributed murrelet population in the three-state area (USDI Fish and Wildlife Service 1997).

Conservation Strategy

The conservation strategy is to conserve as much of the remaining suitable or occupied habitat on Federal land (i.e., the NWFP) and on key non-Federal lands. These habitats would provide a system of long-term habitat reserves which are needed to stabilize and eventually recover the declining population. This approach assumes that marbled murrelet populations have not already declined below an extinction threshold from which recover is not possible (USDA Forest Service and USDI Bureau of Land Management 1994a). It also assumes that marbled murrelet populations will respond positively to a long-term reversal in the trend of habitat loss (Raphael et al. 2002). Our ability to predict extinction thresholds for the marbled murrelet is still quite crude (National Research

Council 1995). In addition, our ability to estimate the size and trend in the marbled murrelet population is limited (Becker et al. 1997).

The NWFP is a conservative approach to managing marbled murrelet habitat, and it accommodates our inability to identify an extinction threshold. The biological opinion on the NWFP concluded that it "...should provide for the survival of a marbled murrelet population that is well distributed on Federal lands throughout the planning area" (USDI Fish and Wildlife Service 1994a). The NWFP is designed to enable Federal lands to bear most of the burden for recovering and maintaining late-successional species such as the marbled murrelet. The NWFP protects approximately 90 percent of suitable marbled murrelet habitat on Federal lands (USDI Fish and Wildlife Service 1997); it prohibits removal of occupied marbled murrelet habitat on Federal lands, including the Matrix where intensive timber harvest is otherwise allowed.

Non-Federal land makes an important contribution to marbled murrelet recovery where gaps occur in the distribution of suitable habitat (USDA Forest Service and USDI Bureau of Land Management 1994a, USDI Fish and Wildlife Service 1997). Removal of some occupied marbled murrelet habitat on non-Federal land is likely and potentially permissible, assuming sufficient high quality habitat is protected throughout the listed range to maintain well distributed, viable subpopulations. On non-Federal lands in California, the California Forest Practice Rules and California Endangered Species Act protect occupied marbled murrelet habitat and a 300-foot buffer around the occupied habitat during the breeding season. Non-Federal landowners who propose to harvest occupied habitat may incidentally take the marbled murrelet in known or likely occupied habitat, in accordance with section 7 or section 10 of the Act. The Service applies recommendations of the Recovery Plan when authorizing incidental take of marbled murrelets. These recommendations include the following (USDI Fish and Wildlife Service 1997): minimize the loss of occupied marbled murrelet habitat by evaluating and ranking various types of occupied habitat, and balance short-term risks with long-term tradeoffs.

Section 7 consultation on several HCPs and on tribal lands has authorized incidental take of the marbled murrelet. Each of these approved actions retained the highest quality marbled murrelet habitat as part of a management strategy that was consistent with the Recovery Plan.

Current Condition

The current condition of the species incorporates the effects of all past human and natural activities or events that have led to the present-day status of the species (USDI Fish and Wildlife and USDC National Marine Fisheries Service 1998).

Marine environment

The following two marine areas in California support the highest concentrations of murrelets during the breeding season: 1) nearshore waters (within 1.2 miles of the shore) from the Oregon-California border south to Cape Mendocino, including Humboldt and Arcata Bays, and river mouths (e.g., mouths of the Smith River, Klamath River,

Redwood Creek, and Eel River); and 2) nearshore waters (within 1.2 miles of the shore) in central California from San Pedro Point south to the mouth of the Pajaro River, including the mouths of Pescadero Creek, Waddell Creek, and other creeks (USDI Fish and Wildlife Service 1997). All other coastal areas between these concentration areas are also used by murrelets, especially in winter, including nearshore waters south of Zone 6 to the U.S.-Mexican border (USDI Fish and Wildlife Service 1997).

In the California Current, seabirds in general, have done poorly during the most recent El Niño. Response of the marbled murrelet to the El Niño is unknown, but it is likely that consistent with other seabird species, fewer marbled murrelets breed during an El Niño, and foraging effort is increased as birds have to disperse more widely in search of decreased prey (McShane et al. 2004).

During the 1990s, oil tanker and shipping traffic into west coast ports grew, increasing the amount of oil that could be spilled. However, fewer spills have occurred since the U.S. Oil Pollution Act was instated in 1990, and a moratorium on oil development offshore of northern California, Oregon and Washington was enacted in 1992. Though marbled murrelets continue to be killed by oil spills, the overall threat has been reduced since the early 1990s (McShane et al. 2004).

In the mid 1990s, a series of fisheries restrictions and changes were implemented to address mortality of all species of seabirds, resulting in a lower mortality rate of marbled murrelets. Fishing effort has also decreased since the 1980s because of lower catches, fewer fishing vessels, and greater restrictions; although a regrowth in gill net fishing is likely to occur if salmon stocks increase. In most areas, the threat from gill net fishing has been reduced or eliminated since 1992. However, threats to adult and juvenile marbled murrelets are still present in Washington Zones 1 and 2 (McShane et al. 2004). In central California gill-net fishing is currently prohibited in waters less than 60 fathoms deep. This restriction protects the diving zone used by marbled murrelets, thus eliminating the threat of entanglement.

The Service considers disturbance in the marine environment to be a concern for marbled murrelets, particularly in areas of high human activity.

Terrestrial Environment

Habitat Amount. The precise amount of suitable marbled murrelet habitat within the listed range is unknown at this time. However, based on recent agency estimates and the Service's internal files, the best estimate of potentially suitable habitat for the marbled murrelet within the listed range is approximately 2.2 million acres of which approximately 155,000 acres or 7 percent are classified as remnant habitat (USDI Fish and Wildlife Service 2003). Approximately 93 percent of the suitable habitat occurs on Federal land. Suitable habitat is distributed among the three States as follows: Washington, approximately 1 million acres; Oregon, approximately 800,000 acres; and California, approximately 400,000 acres (USDI Fish and Wildlife Service 2003). Though our ability to quantify suitable habitat has improved recently, the current estimates likely overestimate the amount in many areas because of the lack of detail on

the presence of nesting structure. In fact, northern spotted owl habitat was used as a surrogate for marbled murrelet habitat in some areas. Marbled murrelet habitat quality depends on its proximity to marine waters, landscape context, and stand size. This information is needed to refine estimates of total suitable habitat. Quality habitat must meet basic nesting requirements, provide refuge from predators, and be relatively stable against catastrophic disturbances. It is not possible at this time to estimate the amount of high quality habitat which contributes to long-term nesting success.

The NWFP protects marbled murrelet habitat on Federal land by prohibiting timber harvest of occupied murrelet habitat, regardless of the land allocation (USDA Forest Service and USDI Bureau of Land Management 1994a). In addition, the system of Federal reserves protects currently suitable marbled murrelet habitat and allows currently unsuitable habitat to develop into larger blocks of suitable habitat. Currently there are approximately 56,000 acres of old-growth redwood forest remaining in California, representing about 2.5 percent of the original old-growth redwood forest. More detailed descriptions of suitable marbled murrelet habitat throughout its listed range are given in Nelson (1997) and USDI Fish and Wildlife Service (1997) and are incorporated herein by reference.

Occupied habitat is defined as that portion of potentially suitable habitat which is occupied by nesting marbled murrelets (Evans Mack et al. 2003), or expected to be occupied, based on survey history in the area and the application of an occupancy index to unsurveyed areas. At least 483,919 acres of potentially occupied marbled murrelet habitat exist within the listed range of the species (Table 1); data are not available for Washington. Marbled murrelets may not occupy a large portion of potentially suitable habitat, due to the absence of nesting structure or its spatial configuration. As a result, the 2.2 million acres of suitable habitat likely overestimates the amount of actual occupied marbled murrelet habitat (USDI Fish and Wildlife Service 2003). For example, about 100,000 acres of late-seral forests occur on the Siskiyou and Rogue River National Forests and the Medford District of the Bureau of Land Management. Survey results in the area closest to the coast suggest that marbled murrelets actually occupy approximately 26 percent of the suitable habitat, based on existing survey data and assumptions about areas not adequately surveyed. Where published data were lacking, the Service solicited professional judgments from agency biologists and considers these simple estimates as the best available information (USDI Fish and Wildlife Service 2003).

Approximately 68,000 acres of occupied marbled murrelet habitat occur in the California portion of Zone 4 (Table 1). The agencies were unable to separate habitat estimates for Zones 3 and 4 in Oregon. In general, much of the habitat varies in quality. In California, high quality habitat occurs primarily in unmanaged redwood forests which are found close to the coast. Lower quality habitat occurs inland in managed Douglas-fir forests. In California, the estimated 360,000 acres of potentially suitable habitat far exceeds the estimated 68,000 acres of occupied habitat (USDI Fish and Wildlife Service 2003). This discrepancy exists largely as a result of our incomplete understanding of the inland distribution of the marbled murrelet. For example, most habitats previously thought to be

suitable on Forest Service lands in California are likely not occupied (Hunter et al. 1998). Comparisons or analyses using the larger amount of suitable habitat may underestimate the potential impacts of a proposed action and, therefore, should not be used to analyze the impacts of a proposed action.

The Service estimates that marbled murrelets likely occupy approximately 430 acres of habitat in Zone 5 and 7,250 acres of habitat in Zone 6. Most suitable habitat in these Zones was historically harvested; suitable habitat which remains is of lower quality and found in scattered, small patches in State and County Parks and on private lands.

Habitat Trend. Historically, the amount of suitable habitat has declined throughout the range of the marbled murrelet, due primarily to commercial timber harvest. Some habitat loss is attributed to natural disturbance, such as fire and windthrow. Timber harvest has eliminated most suitable habitat on private lands within Washington, Oregon, and California (USDI Fish and Wildlife Service 1997). In the early to mid-1800s, Western Washington and Oregon contained 14 to 20 million acres of old-growth forest, compared to about 3.4 million acres in 1991. This loss of habitat represents a reduction of 82 percent (USDI Fish and Wildlife Service 1997). About 1.3 million to 3.2 million acres of old-growth Douglas-fir/mixed conifer and 2.7 million acres of old-growth redwood forests occurred in northwestern California during the early to mid-1800s (USDI Fish and Wildlife Service and USDC National Marine Fisheries Service 1999).

Between 1992 and 2003, the loss of suitable marbled murrelet habitat totaled 22,398 acres over the 3-state area, of which 5,364 acres resulted from timber harvest and 17,034 acres resulted from natural events (McShane et al. 2004). Habitat loss and fragmentation is expected to continue in the near future, but at an uncertain rate (McShane et al. 2004). Gains in suitable nesting habitat are expected to occur on Federal lands over the next 40-50 years, but due to the extensive historic habitat loss and the slow replacement rate of marbled murrelets and their habitat, the species is potentially facing a severe reduction in numbers in the coming 20 to 100 years (Beissinger 2002).

Habitat Distribution. Breeding populations of marbled murrelets are not currently distributed continuously throughout the forested portions of Washington, Oregon, and California. A gap of 100 miles in the north/south distribution of suitable habitat exists in southwestern Washington and northwestern Oregon, and a north/south gap of 300 miles exists in central California in the southernmost portion of the species' range. These gaps consist of areas of second-growth and remnant older forests where marbled murrelets occur in low numbers. The inland distribution is greatest in Washington at about 50 miles from the marine environment; it narrows down in Oregon; and it declines to as close as 10 to 15 miles from the coast in California.

Habitat Quality. Overall, the quality of existing marbled murrelet habitat has diminished, compared to conditions which existed prior to logging (USDI Fish and Wildlife Service 1997). Total habitat area is greatly reduced, and remaining habitat is often fragmented and located further from the marine environment. In California, a large

amount of remaining habitat occurs on National, State, and County Park lands which are subject to a high degree of recreation and its associated effects on marbled murrelet populations.

Habitat quality varies on a range-wide basis. Some excellent old-growth habitat remains on Federal lands in each of the three states. However, habitat quality has declined throughout the marbled murrelet's range, compared to historic times. Habitat occurs in smaller patch sizes, consists of smaller trees, and contains more roads and clearcut openings. Predation has likely increased at the local level, due to increased numbers of predators which find food sources associated with human recreational activities. At a landscape level, the abundance of avian predators has probably increased. Ongoing research should shed more light on specific factors which affect marbled murrelet nest predation and stand size preferences. The best available information strongly suggests forest fragmentation may adversely affect the reproductive success of marbled murrelets (USDI Fish and Wildlife Service 1997).

Population

Population Numbers. The size of the listed population of the marbled murrelet in Washington, Oregon and California was initially estimated at 18,550-32,000 birds (Ralph et al. 1995b). Two largely divergent population estimates in Oregon account for the wide range in the estimated population size.

Monitoring to determine a trend in marbled murrelet populations began in 2000 and has continued annually since, as part of effectiveness monitoring for the NWFP (Bentivoglio et al. 2002) (Table 2). A separate population monitoring effort is conducted each year in Zone 6, which is not part of the NWFP area. The population point estimates for Zones 1-5 from the effectiveness monitoring are as follows: 2000, 18,571 birds; 2001, 22,180 birds; 2002, 23,673 birds; 2003, 22,217 birds; 2004, 20,578 birds; 2005, 20,223 birds; 2006, 18,622 birds (excluding Zone 5); and 2007, 17,354 birds (Table 2). The Effectiveness Monitoring Team has evaluated trend for zones 1-5 with all data (2000-2007) and without the 2000 data. The latter analysis was done because aspects of the survey protocol were not fully implemented in 2000, which could bias estimates for that year. For 2001-2007, the downward trend is statistically significant (P -value of 0.015), with an overall decline of 27 percent over this period. This trend is based on an annual rate of decline of 4.5 percent with a 95 percent CI of 8.0 percent to -1.0 percent annual decline. For 2000-2007, the average annual rate of decline of 2.2 percent is not statistically distinguishable from no trend ($P=0.19$). At the individual Zone scale, trend data are inconclusive for zones 1-5, using a significance level of 0.05. Zones 1, 3, and 4 have estimated rates of change consistent with the likely decline observed for the entire 5-zone area.

Four of the six Zones must be functional to effectively recover and maintain a well-distributed, viable marbled murrelet population, both in the short- and long-term (USDI Fish and Wildlife Service 1997)

Zone 4. Along with Zones 1, 2, and 3, Zone 4 appears to contain a larger, more robust population than Zones 5, or 6. However, information from a radio-telemetry study in this Zone indicates nesting success is very low (Hebert et al. 2003a).

Effects to the marbled murrelet population in Zone 4 occur both in the marine and terrestrial environment. Two oil spills, M/V Kure and Stuyvesant, have resulted in the deaths of marbled murrelets within this zone. The M/V Kure oil spill occurred in Humboldt Bay in November 1997. Ten dead marbled murrelets were recovered during cleanup and recovery efforts. Marbled murrelet mortality attributable to the Kure spill was “probably fifteen times higher than the known mortality of ten murrelets” (Ford et al. 2001).

The Stuyvesant oil spill occurred in September 1999 at the entrance to Humboldt Bay. A total of 24 marbled murrelets were recovered during the cleanup and recovery efforts. Modeling efforts estimate that mortality of murrelets was approximately 135 birds (A. Brickey pers. Comm.). In total, the M/V Kure and the Stuyvesant oil spills are estimated to have killed 300 birds in Zone 4. These estimated effects are for direct mortality only; oil can have a number of adverse effects on seabirds other than direct mortality (Burger and Fry 1993), but these effects have not been quantified for either oil spill.

Zone 5. The population in Zone 5 is extremely low. Recent surveys have confirmed the Recovery Plan’s assumption that Zone 5 is not expected to substantially contribute to recovery (USDI Fish and Wildlife Service 1997).

Zone 6. Effectiveness monitoring for the NWFP does not include Zone 6, but independent research conducted in Zone 6 provides reliable population estimates. Like Zone 5, population size in Zone 6 is also quite low. Information from a radio-telemetry study in this Zone indicates the marbled murrelet population is highly endangered. A juvenile-to-adult ratio of 0.02 derived from surveys at sea is alarmingly low and further indicates a general failure in reproduction (Peery et al. 2002). Recent surveys, indicate a decline of 8 to 10 percent from a 2001-2003 average of 681 birds to 378 birds in 2007 (Table 2 (Z. Peery, pers. comm. 2007). Although Zone 6 is highly vulnerable, it was expected to contribute to recovery of the marbled murrelet in the short-term (i.e., 50-100 years) (USDI Fish and Wildlife Service 1997).

Effects to the marbled murrelet population in Zone 6 occur both in the marine and terrestrial environment. Since 1992, multiple oil spills have occurred in Zone 6 resulting in mortalities within the range of 1 to 5 percent of the zone population (McShane et al. 2004). Overall, oiling continues to have significant additive effects to the small population in Zone 6.

Population Trend. Since 1995, four demographic modeling efforts have provided information on predicting population trends, and in one case, extinction probabilities of marbled murrelets into the future: Population Trends of the Marbled Murrelet Projected from Demographic Analyses (Beissinger 1995); Population Trends of the Marbled Murrelet Projected from Demographic Analyses (Beissinger and Nur 1997 in USDI Fish

and Wildlife Service 1997); a subsequent analysis by Beissinger and Peery in 2003; and the Evaluation Report for the 5-Year Status Review of the Marbled Murrelet in Washington, Oregon, and California by McShane et al. (2004).

These efforts employed a Leslie Matrix modeling structure using estimates for demographic parameters such as survival and fecundity. Estimates of survival were derived from life history analyses of similar species. Estimates of fecundity (i.e., number of female young produced per adult female) were generated from estimates of nest success, either from radio-telemetry studies or from juvenile-to-adult ratios obtained in the marine environment. Table 3 lists the four latest murrelet Leslie Matrix models and the values for common demographic parameters used in each.

In 1995, juvenile-to-adult ratios for murrelets ranged between 0.01 and 0.14, while fecundity was estimated at less than 0.2, a value well below the level of productivity needed to sustain stable populations (Beissinger 1995). Fecundity would have to range from 0.2 to 0.46 to sustain stable populations. Marbled murrelet populations in California, Oregon, and Washington may be declining at a rate of 4 to 7 percent per year, and perhaps as much as 12 percent per year (Beissinger and Nur 1997 in USDI Fish and Wildlife Service 1997).

In 2003, juvenile-to-adult ratios were once again reviewed, based on 8 additional years of survey data collected at-sea (Beissinger and Peery 2003). Juvenile-to-adult ratios varied from 0.038 to 0.089, depending on Zone. Fecundity estimates were developed for four Zones, but unlike the analysis in 1995, fecundity estimates were compared to reproductive histories of individual birds, based on recent radio-telemetry studies. Using a stage-based Leslie matrix model with a range of values for adult survival, fecundity derived from juvenile-to-adult ratios was too low to maintain stable populations in most zones. Rates of population decline ranged from 2.0 to 15.8 percent per year, depending upon the recovery zone and the values used for survival. A comparison of fecundity values derived from juvenile-to-adult ratios, to fecundity values from individual reproductive histories resulted in good agreement between the estimates. Both techniques support the assertion that fecundity is currently too low to maintain viable populations of marbled murrelets in the listed range (Beissinger and Peery 2003).

In 2004, radio telemetry data were used to estimate nest success (McShane et al. 2004). Using a stochastic Leslie Matrix model for each Zone with estimates for immigration, a range of values for survival, and what was considered higher estimates of nest success from radio telemetry data rather than juvenile-to-adult ratio data, McShane et al. (2004) found all zone populations were declining at a mean annual rate of between 2.1 and 6.2 percent per decade (McShane et al. 2004). McShane et al. (2004) predict the highest rate of decline for Zone 6 and the lowest rate of decline for Zone 2.

In summary, all sources concluded that the listed population apparently exhibits a long-term downward trend.

Population Distribution. The historic distribution of the marbled murrelet within its listed range was probably relatively continuous in near-shore waters and in coniferous forests near the coast from the Canadian border south to Monterey County, California (USDI Fish and Wildlife Service 1997). Current breeding populations are discontinuous and generally concentrated at-sea in areas adjacent to remaining late successional coniferous forests near the coast (Nelson 1997). At-sea observations of marbled murrelets are rare between the Olympic Peninsula in Washington and Tillamook County, Oregon, a gap of approximately 100 miles.

Off the California coast, marbled murrelets are concentrated in two areas at-sea that correspond to the three largest remaining blocks of older, coastal forest. The two at-sea concentration areas are located in Humboldt and Del Norte counties in northern California and San Mateo and Santa Cruz counties in central California. These forest blocks are separated by areas of little or no habitat, which correspond to locations at-sea where few marbled murrelets occur. A 300-mile gap occurs in the southern portion of the marbled murrelet's breeding range, between populations in Humboldt and Del Norte counties in the north and populations in San Mateo and Santa Cruz counties to the south. Marbled murrelets likely occurred in this gap prior to extensive logging of redwood forests (USDI Fish and Wildlife Service 1997).

Threats in the terrestrial environment

Habitat loss

McShane et al. (2004) found that the annual rate of habitat loss has slowed since the marbled murrelet was federally listed as threatened; however, habitat loss remains a threat to the species due to the continued permitted loss of habitat, and in particular occupied sites.

Predation

Losses of eggs and chicks to avian predators have been determined to be the most important cause of nest failure (Nelson and Hamer 1995a, McShane et al. 2004). Furthermore, McShane et al. (2004) conclude that since listing, threats from predation have actually increased. The abundance of several corvid species has increased dramatically in western North America as a result of forest fragmentation, increased agriculture, and urbanization (McShane et al. 2004). As predator abundance has increased, predation on murrelet chicks and eggs has also increased resulting in decreased reproductive success. This trend is likely to continue as forest fragmentation, agriculture, and urbanization continues to dominate the landscape.

Disturbance

Although detecting effects of sub-lethal noise disturbance at the population level in marbled murrelets is difficult, the potential for effects of noise disturbance on marbled murrelet fitness and reproductive success remains a concern and should not be discounted (McShane et al. 2004). As such, the Service has concluded in recent biological opinions that the potential for injury associated with visual and auditory disturbance to marbled murrelets in the terrestrial environment includes flushing from the nest, aborted feeding, and postponed feedings. These responses by individual marbled murrelets to disturbance

stimuli may reduce productivity of the nesting pair, as well as the entire population (USDI Fish and Wildlife Service 1997).

Disease

Though little is known about the potential impact of diseases and biotoxins on marbled murrelets, there is a possibility that marbled murrelets will be negatively affected in the near future because of the cumulative effects of stressors such as oceanic temperature changes, overfishing, and habitat loss (McShane et al. 2004).

Status of the Species: Northern Spotted Owl

Legal Status

The spotted owl was listed as threatened on June 26, 1990 due to widespread loss and adverse modification of suitable habitat across the owl's entire range and the inadequacy of existing regulatory mechanisms to conserve the owl (USDI Fish and Wildlife Service 1990a).

Life History

Taxonomy

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

Current and Historical Range

The current range of the spotted owl extends from southwest British Columbia through the Cascade Mountains, coastal ranges, and intervening forested lands in Washington, Oregon, and California, as far south as Marin County (USDI Fish and Wildlife Service 1990a). The range of the spotted owl is partitioned into 12 physiographic provinces (see Figure 1) based on recognized landscape subdivisions exhibiting different physical and environmental features (USDI Fish and Wildlife Service 1992b). These provinces are distributed across the species' range as follows:

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

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

its range, particularly within the coastal provinces where habitat reduction has been concentrated (USDI Fish and Wildlife Service 1992a).

Habitat Relationships

Home Range. Home-range sizes vary geographically, generally increasing from south to north, which is likely a response to differences in habitat quality (USDI Fish and Wildlife Service 1990a). Estimates of median size of their annual home range (the area traversed by an individual or pair during their normal activities (Thomas and Raphael 1993) vary by province and range from 2,955 acres in the Oregon Cascades (Thomas et al. 1990) to 14,211 acres on the Olympic Peninsula (USDI Fish and Wildlife Service 1994b). Zabel et al. (1995) showed that these provincial home ranges are larger where flying squirrels are the predominant prey and smaller where wood rats are the predominant prey. Home ranges of adjacent pairs overlap (Forsman et al. 1984; Solis and Gutiérrez 1990), suggesting that the defended area is smaller than the area used for foraging. Within the home range there is a smaller area of concentrated use during the breeding season (~20% of the homerange), often referred to as the core area (Bingham and Noon 1997). Spotted owl core areas vary in size geographically and provide habitat elements that are important for the reproductive efficacy of the territory, such as the nest tree, roost sites and foraging areas (Bingham and Noon 1997). Spotted owls use smaller home ranges during the breeding season and often dramatically increase their home range size during fall and winter (Forsman et al. 1984; Sisco 1990).

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

Habitat Use. Forsman et al. (1984) reported that spotted owls have been observed in the following forest types: Douglas-fir (*Pseudotsuga menziesii*), western hemlock (*Tsuga heterophylla*), grand fir (*Abies grandis*), white fir (*Abies concolor*), ponderosa pine (*Pinus ponderosa*), Shasta red fir (*Abies magnifica shastensis*), mixed evergreen, mixed conifer hardwood (Klamath montane), and redwood (*Sequoia sempervirens*). The upper elevation limit at which spotted owls occur corresponds to the transition to subalpine forest, which is characterized by relatively simple structure and severe winter weather (Forsman 1975; Forsman et al. 1984).

Roost sites selected by spotted owls have more complex vegetation structure than forests generally available to them (Barrows and Barrows 1978; Forsman et al. 1984; Solis and Gutiérrez 1990). These habitats are usually multi-layered forests having high canopy closure and large diameter trees in the overstory.

Spotted owls nest almost exclusively in trees. Like roosts, nest sites are found in forests having complex structure dominated by large diameter trees (Forsman et al. 1984; Hershey et al. 1998). Even in forests that have been previously logged, spotted owls select forests having a structure (i.e., larger trees, greater canopy closure) different than

forests generally available to them (Folliard 1993; Buchanan et al. 1995; Hershey et al. 1998).

Foraging habitat is the most variable of all habitats used by territorial spotted owls (USDI Fish and Wildlife Service 1992c). Descriptions of foraging habitat have ranged from complex structure (Solis and Gutiérrez 1990) to forests with lower canopy closure and smaller trees than forests containing nests or roosts (Gutiérrez 1996).

Habitat Selection. Spotted owls generally rely on older forested habitats because such forests contain the structures and characteristics required for nesting, roosting, and foraging. Features that support nesting and roosting typically include a moderate to high canopy closure (60 to 90 percent); a multi-layered, multi-species canopy with large overstory trees (with diameter at breast height [dbh] of greater than 30 inches); a high incidence of large trees with various deformities (large cavities, broken tops, mistletoe infections, and other evidence of decadence); large snags; large accumulations of fallen trees and other woody debris on the ground; and sufficient open space below the canopy for spotted owls to fly (Thomas et al. 1990). Nesting spotted owls consistently occupy stands with a high degree of canopy closure that may provide thermoregulatory benefits (Weathers et al. 2001) and protection from predators.

Foraging habitat for spotted owls provides a food supply for survival and reproduction. Foraging activity is positively associated with tree height diversity (North et al. 2000), 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. 2000; Irwin et al. 2000; Courtney et al. 2004), density of trees greater than or equal to 31 in (80 cm) dbh (North et al. 2000), volume of woody debris (Irwin et al. 2000), and young forests with some structural characteristics of old forests (Irwin et al. 2000). Northern spotted owls select old forests for foraging in greater proportion than their availability at the landscape scale (Forsman et al. 2005), but will forage in younger stands with high prey densities and access to prey (Rosenberg and Anthony 1992).

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

Spotted owls may be found in younger forest stands that have the structural characteristics of older forests or retained structural elements from the previous forest. In

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

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

Recent landscape-level analyses in portions of Oregon Coast and California Klamath provinces suggest that a mosaic of late-successional habitat interspersed with other seral conditions may benefit spotted owls more than large, homogeneous expanses of older forests (Zabel et al. 2003; Franklin et al. 2000; Meyer et al. 1998). In Oregon Klamath and Western Oregon Cascade provinces, Dugger et al. (2005) found that apparent survival and reproduction was positively associated with the proportion of older forest near the territory center (within 730 meters) (2,395 feet). Survival decreased dramatically when the amount of non-habitat (non-forest areas, sapling stands, etc.) exceeded approximately 50 percent of the home range (Dugger et al. 2005). The authors concluded that they found no support for either a positive or negative direct effect of intermediate-aged forest—that is, all forest stages between sapling and mature, with total canopy cover greater than 40 percent—on either the survival or reproduction of spotted owls. It is unknown how these results were affected by the low habitat fitness potential in their study area, which Dugger et al. (2005) stated was generally much lower than those in Franklin et al. (2000) and Olson et al. (2004), and the low reproductive rate and survival in their study area, which they reported were generally lower than those studied by Anthony et al. (2006). Olson et al. (2004) found that reproductive rates fluctuated biennially and were positively related to the amount of edge between late-seral and mid-seral forests and other habitat classes in the central Oregon Coast Range. Olson et al. (2004) concluded that their results indicate that while mid-seral and late-seral forests are important to spotted owls, a mixture of these forest types with younger forest and non-forest may be best for spotted owl survival and reproduction in their study area.

Reproductive Biology

The spotted owl is relatively long-lived, has a long reproductive life span, invests significantly in parental care, and exhibits high adult survivorship relative to other North American owls (Gutiérrez et al. 1995). Spotted owls are sexually mature at 1 year of age, but rarely breed until they are 2 to 5 years of age (Miller et al. 1985; Franklin 1992; Forsman et al. 2002). Breeding females lay one to four eggs per clutch, with the average

clutch size being two eggs; however, most spotted owl pairs do not nest every year, nor are nesting pairs successful every year (Forsman et al. 1984, Anthony et al. 2006), and renesting after a failed nesting attempt is rare (Gutiérrez 1996). The small clutch size, temporal variability in nesting success, and delayed onset of breeding all contribute to the relatively low fecundity of this species (Gutiérrez 1996).

Courtship behavior usually begins in February or March, and females typically lay eggs in late March or April. The timing of nesting and fledging varies with latitude and elevation (Forsman et al. 1984). After they leave the nest in late May or June, juvenile spotted owls depend on their parents until they are able to fly and hunt on their own. Parental care continues after fledging into September (Forsman et al. 1984). During the first few weeks after the young leave the nest, the adults often roost with them during the day. By late summer, the adults are rarely found roosting with their young and usually only visit the juveniles to feed them at night (Forsman et al. 1984). Telemetry and genetic studies indicate that close inbreeding between siblings or parents and their offspring is rare (Haig et al. 2001, Forsman et al. 2002).

Threats

Reasons for Listing

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

The degree to which predation and competition might pose a threat to the spotted owl was unknown in more provinces than any of the other threats, indicating a need for additional information. Few empirical studies exist to confirm that habitat fragmentation contributes to increased levels of predation on spotted owls (Courtney et al. 2004). However, great horned owls (*Bubo virginianus*), an effective predator on spotted owls, are closely associated with fragmented forests, openings, and clearcuts (Johnson 1992;

Laidig and Dobkin 1995). As mature forests are harvested, great horned owls may colonize fragmented forests, thereby increasing spotted owl vulnerability to predation.

New Threats

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

- “Although we are certain that current harvest effects are reduced, and that past harvest is also probably having a reduced effect now as compared to 1990, we are still unable to fully evaluate the current levels of threat posed by harvest because of the potential for lag effects...In their questionnaire responses...6 of 8 panel member identified past habitat loss due to timber harvest as a current threat, but only 4 viewed current harvest as a present threat” (Courtney and Gutiérrez 2004)
- “Currently the primary source of habitat loss is catastrophic wildfire, although the total amount of habitat affected by wildfires has been small (a total of 2.3% of the range-wide habitat base over a 10-year period).” (Courtney and Gutiérrez 2004)
- “Although the panel had strong differences of opinion on the conclusiveness of some of the evidence suggesting [barred owl] displacement of [spotted owls], and the mechanisms by which this might be occurring, there was no disagreement that [barred owls] represented an operational threat. In the questionnaire, all 8 panel members identified [barred owls] as a current threat, and also expressed concern about future trends in [barred owl] populations.” (Courtney and Gutiérrez 2004)

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

Barred owls were initially thought to be more closely associated with early successional forests than spotted owls, based on studies conducted on the west slope of the Cascades in Washington (Hamer et al 1989; Iverson 1993). However, recent studies conducted in the Pacific Northwest show that barred owls frequently use mature and old-growth forests (Pearson and Livezey 2003; Schmidt 2006a). In the fire prone forests of eastern Washington, a telemetry study conducted on barred owls showed that barred owl home ranges were located on lower slopes or valley bottoms, in closed canopy, mature, Douglas-fir forest, while spotted owl sites were located on mid-elevation areas with southern or western exposure, characterized by closed canopy, mature, ponderosa pine or Douglas-fir forest (Singleton et al. 2005).

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

The presence of barred owls has been reported to reduce spotted owl detectability, site occupancy, reproduction, and survival. Olson et al. (2005) found that the presence of barred owls had a significant negative effect on the detectability of spotted owls, and that the magnitude of this effect did not vary among years. The occupancy of historical territories by spotted owls in Washington and Oregon was significantly lower ($p < 0.001$) after barred owls were detected within 0.8 kilometer (0.5 miles) of the territory center but was “only marginally lower” ($p = 0.06$) if barred owls were located more than 0.8 kilometer (0.5 miles) from the spotted owl territory center (Kelly et al. 2003). Pearson and Livezey (2003) found that there were significantly more barred owl site-centers in unoccupied spotted owl circles than occupied spotted owl circles (centered on historical spotted owl site-centers) with radii of 0.8 kilometer (0.5 miles) ($p = 0.001$), 1.6 kilometer (1 mile) ($p = 0.049$), and 2.9 kilometer (1.8 miles) ($p = 0.005$) in Gifford Pinchot National Forest. In Olympic National Park, Gremel (2005) found a significant decline ($p = 0.01$) in spotted owl pair occupancy at sites where barred owls had been detected, while pair occupancy remained stable at spotted owl sites without barred owls. Olson et al. (2005) found that the annual probability that a spotted owl territory would be occupied by a pair of spotted owls after barred owls were detected at the site declined by 5 percent in the HJ Andrews study area, 12 percent in the Coast Range study area, and 15 percent in the Tyee study area.

Olson et al. (2004) found that the presence of barred owls had a significant negative effect on the reproduction of spotted owls in the central Coast Range of Oregon (in the Roseburg study area). The conclusion that barred owls had no significant effect on the reproduction of spotted owls in one study (Iverson 2004) was unfounded because of small sample sizes (Livezey 2005). It is likely that all of the above analyses underestimated the effects of barred owls on the reproduction of spotted owls because spotted owls often cannot be relocated after they are displaced by barred owls (E. Forsman, pers. comm., cited in USDI Fish and Wildlife Service 2008b). Anthony et al.

(2006) found significant evidence for negative effects of barred owls on apparent survival of spotted owls in two of 14 study areas (Olympic and Wenatchee). They attributed the equivocal results for most of their study areas to the coarse nature of their barred owl covariate.

In a recent analysis of more than 9,000 banded spotted owls throughout their range, only 47 hybrids were detected (Kelly and Forsman 2004). Consequently, hybridization with the barred owl is considered to be “an interesting biological phenomenon that is probably inconsequential, compared with the real threat—direct competition between the two species for food and space” (Kelly and Forsman 2004).

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

Wildfire. At the time of listing there was recognition that large-scale wildfire posed a threat to the spotted owl and its habitat (USDI Fish and Wildlife Service 1990a). New information suggests fire may be more of a threat than previously thought. In particular, the rate of habitat loss due to fire has been expected with over 102,000 acres of late-successional forest lost on Federal lands from 1993-2004 (Moeur et al 2005). Currently, the overall total amount of habitat loss from wildfires has been relatively small, estimated at approximately 1.2 percent on federal lands (Lint 2005). It may be possible to influence through silvicultural management how fire prone forests will burn and the extent of the fire when it occurs. Silvicultural management of forest fuels are currently being implemented throughout the spotted owl’s range, in an attempt to reduce the levels of fuels that have accumulated during nearly 100 years of effective fire suppression. However, our ability to protect spotted owl habitat and viable populations of spotted owls from large fires through risk-reduction endeavors is uncertain (Courtney et al. 2004). The NWFP recognized wildfire as an inherent part of managing spotted owl habitat in certain portions of the range. The distribution and size of reserve blocks as part of the NWFP design may help mitigate the risks associated with large-scale fire (Lint 2005).

West Nile Virus. WNV has killed millions of wild birds in North America since it arrived in 1999 (Caffrey 2003; Marra et al. 2004). Mosquitoes are the primary carriers (vectors) of the virus that causes encephalitis in humans, horses, and birds. Mammalian prey may also play a role in spreading WNV among predators, like spotted owls. Owls and other predators of mice can contract the disease by eating infected prey (Garmendia et al. 2000). One captive spotted owl in Ontario, Canada, is known to have contracted WNV and died (Gancz et al 2004), but there are no documented cases of the virus in wild spotted owls. Health officials expect that WNV eventually will spread throughout the

range of the spotted owl (Blakesley et al. 2004), but it is unknown how the virus will ultimately affect spotted owl populations.

Sudden Oak Death. Sudden oak death was recently identified as a potential threat to the spotted owl (Courtney and Guttierrez. 2004). This disease is caused by the fungus-like pathogen, *Phytophthora ramorum* that was recently introduced from Europe and is rapidly spreading. At the present time, sudden oak death is found in natural stands from Monterey to Humboldt Counties, California, and has reached epidemic proportions in oak (*Quercus* spp.) and tanoak (*Lithocarpus densiflorus*) forests along approximately 300 km of the central and northern California coast (Rizzo et al. 2002). It has also been found near Brookings, Oregon, killing tanoak and causing dieback of closely associated wild rhododendron (*Rhododendron* spp.) and evergreen huckleberry (*Vaccinium ovatum*) (Goheen et al. 2002). It has been found in several different forest types and at elevations from sea level to over 800 m. Sudden oak death poses a threat of uncertain proportion because of its potential impact on forest dynamics and alteration of key prey and spotted owl habitat components (e.g., hardwood trees - canopy closure and nest tree mortality); especially in the southern portion of the spotted owl's range (Courtney and Guttierrez. 2004).

Inbreeding Depression, Genetic Isolation, and Reduced Genetic Diversity. Inbreeding and other genetic problems due to small population sizes were not considered an imminent threat to the spotted owl at the time of listing. Recent studies show no indication of significantly reduced genetic variation in Washington, Oregon, or California (Barrowclough et al. 1999; Haig et al. 2001). However, in Canada, the breeding population is estimated to be less than 33 pairs and annual population decline may be as high as 35 percent (Harestad et al. 2004). Canadian populations may be more adversely affected by issues related to small population size including inbreeding depression, genetic isolation, and reduced genetic diversity (Courtney et al. 2004). Low and persistently declining populations throughout the northern portion of the species range (see "Population Trends" below) may be at increased risk of losing genetic diversity.

Climate change. Climate change, a potential additional threat to northern spotted owl populations, is not explicitly addressed in the NWFP. Climate change could have direct and indirect impacts on spotted owls and their prey. However, the emphasis on maintenance of seral stage complexity and related organismal diversity in the Matrix under the NWFP should contribute to the resiliency of the Federal forest landscape to the impacts of climate change (Courtney et al. 2004). There is no indication in the literature regarding the direction (positive or negative) of the threat.

Conservation Needs

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

Habitat-specific Needs

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

2. Suitable habitat conditions and spacing between local spotted owl populations throughout its range to facilitate survival and movement;
3. Suitable habitat distributed across a variety of ecological conditions within the spotted owl's range to reduce risk of local or widespread extirpation;
4. A coordinated, adaptive management effort to reduce the loss of habitat due to catastrophic wildfire throughout the spotted owl's range, and a monitoring program to clarify whether these risk reduction methods are effective and to determine how owls use habitat treated to reduce fuels; and
5. In areas of significant population decline, sustain the full range of survival and recovery options for this species in light of significant uncertainty.

Habitat-independent Needs

1. A coordinated research and adaptive management effort to better understand and manage competitive interactions between spotted and barred owls; and
2. Monitoring to better understand the risk that WNV and sudden oak death pose to spotted owls and, for WNV, research into methods that may reduce the likelihood or severity of outbreaks in spotted owl populations.

Conservation Strategy

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

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

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

Federal Contribution to Recovery

In May, 2008, the Service published the 2008 Final Recovery Plan for the Northern Spotted Owl (USDI Fish and Wildlife Service 2008b). The recovery plan identifies that competition with barred owls, ongoing loss of suitable habitat as a result of timber harvest and catastrophic fire, and loss of amount and distribution of suitable habitat as a result of past activities and disturbances are the most important range-wide threats to the spotted owl (USDI Fish and Wildlife Service 2008b). To address these threats, the present recovery strategy has the following three essential elements: barred owl control, dry-forest landscape management strategy, and managed owl conservation areas (MOCAs) (USDI Fish and Wildlife Service 2008b). The recovery plan lists recovery actions that address research of the competition between spotted and barred owls, experimental control of barred owls to better understand the impact the species is having on spotted owls, and, if recommended by research, management of barred owls (USDI Fish and Wildlife Service 2008b). The foundation of the plan for managing forest habitat in the non-fire-prone western Provinces of Washington and Oregon is the MOCA network on Federal lands, which are intended to support stable and well-distributed populations of spotted owls over time and allow for movement of spotted owls across the network (USDI Fish and Wildlife Service 2008b). On the fire-dominated east side of the Cascade Mountains in Washington and Oregon, and the California Cascades, the dry-forest habitat management strategy is intended to maintain spotted owl habitat in an environment of frequent natural disturbances (USDI Fish and Wildlife Service 2008b). Additionally, the recovery plan identifies Conservation Support Areas (CSAs) in Washington, the west side of the Cascades in Oregon, and in California. These CSAs are located on private, State, and Federal lands and are expected to support the MOCA network and the dry-forest landscape management approach (USDI Fish and Wildlife Service 2008b). In addition, the recovery plan recommends a research and monitoring program be implemented to track progress toward recovery, inform changes in recovery strategy by a process of adaptive management, and ultimately determine when delisting is appropriate (USDI Fish and Wildlife Service 2008b). The three primary elements of this program include 1) the monitoring of spotted owl population trends, 2) an inventory of spotted owl distribution, and 3) a comprehensive program of barred owl research and monitoring (USDI Fish and Wildlife Service 2008b). The recovery plan estimates that recovery of the spotted owl could be achieved in approximately 30 years (USDI Fish and Wildlife Service 2008b).

Current Condition

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

Range-wide Habitat and Population Trends

Habitat Baseline. The 1992 Draft Spotted Owl Recovery Plan estimated approximately 8.3 million acres of spotted owl habitat remained range-wide (USDI Fish

and Wildlife Service 1992). However, reliable habitat baseline information for non-Federal lands is not available (Courtney et al. 2004). The Service has used information provided by the Forest Service, Bureau of Land Management, and National Park Service to update the habitat baseline conditions on Federal lands for spotted owls on several occasions since the spotted owl was listed in 1990. The estimate of 7.4 million acres used for the NWFP in 1994 (USDA Forest Service and USDI BLM 1994a) was believed to be representative of the general amount of spotted owl habitat on these lands. This baseline has been used to track relative changes over time in subsequent analyses, including those presented here.

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

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

Range-wide Analysis 1994 – April 23, 2009. This section updates the information considered in USDI Fish and Wildlife 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 a variety of spatial and temporal scales. Data are entered into the database under various categories including, land management agency, land-use allocation, physiographic province, and type of habitat affected.

In 1994, about 7.4 million acres of suitable northern spotted owl habitat were estimated to exist on Federal lands managed under the NWFP. As of April 23, 2009, the Service had

consulted on the proposed removal of approximately 652,941 acres (Table 4) or 8.8 percent of 7.4 million acres (Table 5) of northern spotted owl suitable habitat on Federal lands. Of the total Federal acres consulted on for removal, approximately 188,929 acres or 2.5 percent of 7.4 million acres of northern spotted owl habitat were removed as a result of timber harvest. These changes in suitable spotted owl habitat are consistent with the expectations for implementation of the NWFP (USDA Forest Service and USDI BLM 1994b).

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

Due to ongoing technical difficulties with the Service's Consultation Effects Tracking system, the acres of habitat on federal NWFP lands that were consulted on and removed and downgraded in reserves and non-reserves in Table 5 do not match those acres of federal NWFP lands that were consulted on and removed and downgraded in Table 4. Until the technical difficulties are resolved, we continue to include Table 5 because it is useful for providing an approximate breakdown of habitat impacts by physiographic province and state.

Habitat loss from Federal lands due to management activities has varied among the individual provinces with most of the impacts concentrated within the Non-Reserve relative to the Reserve land-use allocations (Table 5). When habitat loss is evaluated as a proportion of the affected acres range-wide, the most pronounced losses have occurred within Oregon (84%), especially within its Klamath Mountains (50%) and Cascades (East and West) (33%) Provinces (Table 5), followed by much smaller habitat losses in Washington (7%) and California (8%) (Table 5). When habitat loss is evaluated as a proportion of provincial baselines, the Oregon Klamath Mountains (25%), Cascades East (8%), and the California Cascades (5.45%) all have proportional losses greater than the range-wide mean (5.3%) (Table 5).

From 1994 through April 23, 2009, habitat lost due to natural events was estimated at approximately 167,894 acres range-wide (Table 5). 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 (Table 5⁸), 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 5⁹).

Because there is no comprehensive spotted owl habitat baseline for non-Federal lands, there is little available information regarding spotted owl habitat trends on non-Federal lands. Yet, we do know that internal Service consultations conducted since 1992, have documented the eventual loss of 419,673 (Table 4) 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 652,941 acres of spotted owl habitat range-wide, resulting from all management activities, as of April 23, 2009, (Table 4).

Spotted Owl Numbers, Distribution, and Reproduction Trends. There are no estimates of the size of the spotted owl population prior to settlement by Europeans. Spotted owls are believed to have inhabited most old-growth forests or stands throughout the Pacific Northwest, including northwestern California, prior to beginning of modern settlement in the mid-1800s (USDI Fish and Wildlife Service 1989). According to the final rule listing the spotted owl as threatened (USDI Fish and Wildlife Service 1990a), approximately 90 percent of the roughly 2,000 known spotted owl breeding pairs were located on federally managed lands, 1.4 percent on State lands, and 6.2 percent on private lands; the percent of spotted owls on private lands in northern California was slightly higher (USDI Fish and Wildlife Service 1989; Thomas et al. 1990).

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

In January 2004, two meta-analyses modeled rates of population change for up to 18 years using the re-parameterized Jolly-Seber method (λ_{RJS}). One meta-analysis modeled all 13 long-term study areas excluding the Marin study area (Table 6), while the other modeled the eight study areas that are part of the effectiveness monitoring program of the NWFP (Anthony et al. 2006). Data were analyzed separately for individual study areas, as well as across all study areas in a meta-analysis.

Table 6. Spotted owl demographic study areas (adapted from Anthony et al. 2006).

Area	Fecundity	Survival	λ_{RJS}	Population Change
Wenatchee	Declining	Declining	0.917	Declining
Cle Elum	Declining	Declining?	0.938	Declining
Rainier	Stable	Declining	0.896	Declining
Olympic	Stable	Declining	0.956	Declining
Coast Ranges	Declining?	Stable	0.968	Declining
HJ Andrews	Stable?	Stable	0.978	Declining
Warm Springs	Stable	Stable	0.908	Declining
Tyee	Increasing	Stable	1.005	Stationary
Klamath	Stable	Stable	0.997	Stationary
S. Cascades	Declining	Stable	0.974	Stationary
NW California	Declining	Declining	0.985	Declining?

Hoopa	Increasing	Stable	0.98	Stationary
Simpson	Declining	Stable	0.97	Declining
Marin	Stable	Stable	NA	NA

Point estimates of λ_{RJS} ranged from 0.896 to 1.005 for the 13 long-term study areas, and in all study areas but one—the Tyee study area—these estimates were less than 1.0 (Anthony et al. 2006). There was strong evidence that populations in the Wenatchee, Cle Elum, Warm Springs, and Simpson study areas decreased during the period of study. There also was evidence that populations in the Rainier, Olympic, Oregon Coast Range, and HJ Andrews study areas were decreasing. The precision of the λ_{RJS} estimates for Rainier and Olympic study areas was poor and not sufficient to detect a statistically significant difference from 1.00; however, the estimate of λ_{RJS} for the Rainier study area (0.896) was the lowest of all of the areas. Populations in the Tyee, Klamath, South Oregon Cascades, Northwest California, and Hoopa study areas appeared to be stationary during the study, but there was some evidence that the spotted owl population in the Northwest California study area was decreasing ($\lambda_{RJS} = 0.959$ to 1.011).

The weighted mean λ_{RJS} for all of the study areas was 0.963 (standard error [SE] = 0.009, 95 percent confidence interval [CI] = 0.945 to 0.981), suggesting that populations over all of the study areas decreased by about 3.7 percent per year from 1985 to 2003. Anthony et al. (2006) explains that the indication populations were declining was based on the fact that the 95 percent confidence intervals around the estimate of the mean lambda did not overlap 1.0 (stable) or barely included 1.0.

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

The number of populations that declined and the rate at which they have declined are noteworthy, particularly the precipitous declines in the Wenatchee, Cle Elum, and Rainier study areas in Washington and the Warm Springs study area in Oregon. Estimates of population declines in these areas ranged from 40 to 60 percent during the study period of 1990 to 2003 (Anthony et al. 2006). Decreases in apparent adult survival rates were an important factor contributing to decreasing population trends. Survival rates decreased over time in five of the 14 study areas: four study areas in Washington, which showed the sharpest declines, and one study area in the California Klamath Province of northwest California (Anthony et al. 2006). In Oregon, there were no time trends in apparent survival for four of six study areas, and remaining areas had weak, non-linear trends. In California, three study areas showed no trend and one showed a significant linear decrease (Anthony et al. 2006). Like the trends in annual rate of population change, trends in the rate of adult survival showed clear decreases in some areas but not in others.

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

Environmental Baseline (in the Action Area): Marbled Murrelet

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 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. As stated earlier, the action area for this consultation includes all areas within the boundaries of the Parks.

Conservation Strategy

The Parks are located in murrelet conservation Zone 4. The primary conservation needs of the marbled 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 (U.S. Fish and Wildlife 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 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 (U.S. Fish and Wildlife Service 1997). It 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 (U.S. Fish and Wildlife Service 1997).

The Parks' conservation strategy identifies the following management goals for marbled murrelets (Redwood National and State Parks 2003): 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 (Redwood National and State Parks 2003): 1) implement short-term actions that protect and restore habitat; 2) coordinate research to increase knowledge of murrelets; and 3) treat the Parks' 50,000+

acres 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 acres of suitable marbled murrelet nesting habitat. This includes 41,100 acres of old growth forest occurring in stands greater than 0.5 acre in size and 362 acres of residual old growth stands (isolated old growth trees surrounded by mature tree buffers). The Parks represent approximately 62 percent (41,400 acres) of the occupied murrelet habitat in the California portion of Zone 4 (67,618 acres).

The old growth forests in the Parks are fragmented with only three stands containing more than 5,000 acres. The majority (83 percent) of the old growth stands are 100 acres or smaller in size with 31 percent of the stands less than 5 acres in size. In 2001 and 2002, 25 marbled murrelet nests were located in the Parks' contiguous old growth stands (Hebert et al. 2003a). All of the known murrelet nests are located in contiguous stands of old growth (Hebert et al. 2003a).

The Parks also contain over 50,000 acres 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

Since 2000, monitoring to determine marbled murrelet population trend has occurred annually in Zone 4 as part of the effectiveness monitoring for the NWFP (Huff et al. 2003). For sampling purposes, 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 marbled 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 (Hebert et al. 2003b). In 2000, the murrelet population point estimate for the northern strata of Zone 4 was 4,400 birds with a 95 percent confidence interval (CI) of 3,000-8,700. In 2001, the point estimate was 3,400 with a 95 percent CI of 2,400-5,900; in 2002, 3,800 birds with a CI of 2,600-5,000; in 2003, 3,700 with a CI of 2,600-5,700; in 2004, 3,200 birds with a CI of 2,000-7,800; in 2005, 3,300 with a CI of 2,200-5,400; in 2006, 3,600 with a CI of 2,700-4,900, in 2007, 3,511 with a CI of 2,401-7,026, and in 2008, 4,306 with a CI of 3,115-6,600.

In 2003, the rate of population change was estimated for Zone 4 with a stage-based Leslie matrix model (Beissinger and Peery 2003). The rate of population decline for this zone 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).

From 1989 through 2002, personnel from the Forest Service's Redwood Sciences Laboratory conducted inland audio/visual surveys at three sites in or near the Parks. Miller et al. (2003) reported 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". For example, in 1989 the mean number of detections at the James Irvine Trail was 74.5 ($\pm$ 36.18); by 2002 the mean number of detections was 38.5 ($\pm$ 25.5). Similarly, at Lost Man Creek, in 1989 the mean number of detections was 128.4 ($\pm$ 74.5); by 2002 the mean number was 39.4 ($\pm$ 19.9).

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.

In 2001 and 2003, 84-94 percent of the 78 known marbled murrelet nesting attempts in the Parks failed (Golightly pers. com. 2006). At least 56 percent of the nest failures were due to predation. For comparison, murrelet nest failure in the Santa Cruz area has been estimated at 84 percent (Peery et al. 2004), 54 percent in British Columbia (Bradley et al. 2004 as cited in Peery et al. 2004), and 67 percent rangewide (McShane et al. 2004). During the 3-year period, the average proportion of breeders in the Parks, as estimated with radiotelemetry, was 34 percent (Golightly pers comm. 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 as cited in Peery 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.

Environmental Baseline (in the Action Area): Northern Spotted Owl

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 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. As stated earlier, the action area for this consultation includes all areas within the boundaries of the Parks.

Conservation Strategy

The Parks are in the California Coast physiographic province as delineated in the Recovery Plan for the northern spotted owl (USDI Fish and Wildlife Service 2008b). 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.

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 approximately 41,000 acres of old-growth forests, all of which are considered to be suitable nesting and roosting habitat. As of 2005, there were approximately 23,230 acres of second-growth forest at least 40 years of age that may be suitable nesting and roosting habitat (Schmidt 2006a). There are approximately 230 acres with residual old-growth trees that are assumed to be suitable habitat (Schmidt 2006a).

Population Numbers, Distribution, and Reproduction

The first park-wide inventory was conducted between 1993 and 1995 and identified 37 activity centers (Sakai 2003). Each year since 1993, the Parks have monitored some portion of these known activity centers. From 1995 through 2003, the number of activity centers occupied by one or more owls ranged from a high of 30 in 1995 to a low of 11 in 2000 and the number of territories that fledged young during the same time period ranged from one to seven (Sakai 2003). In 2006, there were only 16 active sites (territories with one or more spotted owls present in the previous three years) in the Parks (Schmidt 2006a). All but one of the territories was located in the Redwood Creek watershed (Schmidt 2006a). During the early 1990's spotted owls were detected in Prairie Creek Redwoods, Del Norte Coast Redwoods and Jedediah Smith Redwoods state parks (Schmidt 2006a).

In 2005, 16 activity centers were monitored in the Parks (not including the Mill Creek acquisition area) (Schmidt 2006b). Eight territories were occupied by at least one spotted owl; three were occupied by pairs (Schmidt 2006b). Nesting was confirmed at one site, Coyote Creek (Schmidt 2006b).

In 2005, barred owls were observed in 21 of the known spotted owl territories and at least 10 of these territories appear to no longer be occupied by spotted owls (Schmidt 2006a). In 2005, there were an estimated 42 independent barred owl sites in the Parks (Schmidt 2006a).

In 2008, only 6 activity centers were occupied by one or more spotted owls and 3 of these territories were also occupied by barred owls. Two of the spotted owl sites produced 1 fledgling each.

Effects of the Action

This section presents an analysis of the direct and indirect effects of the proposed action on the marbled murrelet and northern spotted owl, together with the effects of other activities that are interrelated or interdependent with the proposed action. These effects are evaluated along with the environmental baseline and the predicted cumulative effects to determine the overall effects to the species.

Marbled Murrelet

Likelihood of the Species Presence

Based on results from past marbled murrelet surveys conducted in the Parks, the Parks assume that all stands with trees providing nesting opportunities have the potential to be occupied unless surveys indicate probable absence.

Habitat Modification

No marbled murrelet nesting habitat will be removed or degraded by the proposed action. None of the trees proposed to be removed are potential nest trees or trees meeting the one-half site potential tree height criteria and located within 0.5 mile of a potential nest. Since all potential nest trees, potential nesting platforms, and trees providing protective cover around nesting platforms will be retained, impacts due to the proposed action do not reach the level of habitat degradation.

Disturbance

Scientific Basis for Disturbance Effect

Management activities that require the use of heavy equipment, chainsaws, and large vehicles introduce noise, and visual disturbances into the environment. The effects of auditory and visual disturbances 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 and human presence. Regardless of these difficulties, research conducted on a variety of bird species does suggest that the effects of human disturbance can have a negative impact on reproductive success (Carney and Sydeman 1999, Frid and Dill 2002, Marzluff and Neatherlin 2006). Disturbance can affect productivity in a number of ways, including interference of courtship (Bednarz and Hayden 1988), nest abandonment (White and Thurow 1985), egg and hatchling mortality, due to exposure and predation (Drent 1972; Swensen 1979), and altered parental care (Fyfe and Olendorff 1976; Bortolotti et al. 1984).

Disturbance is defined as noise in excess of ambient levels in or within 500 feet (or 0.25 mile if back-up warning beepers are used) of suitable nesting habitat or as the reaction of nesting birds to human presence or activity, resulting in disruption of essential breeding behaviors. Disturbance during the breeding season 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.

Data on timing of various aspects of the breeding season indicate that murrelets in California have the longest breeding period in North America. Incubation commences as early as March 24 and ends as late as August 13; the nestling period may begin April 24 and end September 9 (Hamer and Nelson 1995). In California, we have defined the murrelet breeding season as the period from March 24 through September 15. The Service considers the use of motorized equipment during the breeding season (March 24 through September 15) to have the potential to significantly disrupt essential murrelet behaviors.

Effects of the Action – Disturbance

A limited operating period from March 24 through September 15 will be imposed for most of the maintenance actions utilizing mechanized equipment in or within 500 feet (or 0.25 mile if back-up warning beepers are used) of nesting habitat. No disturbance to breeding marbled murrelets associated with the activities that implement this limited operating period is anticipated.

The Parks are proposing to use mechanized equipment during the breeding season for a limited number of maintenance projects. Tables in the biological assessment list the specific projects where activities will occur during the breeding season within 500 feet (or 0.25 mile if back-up beepers are used) of nesting habitat. The Service anticipates that these activities could result in harassment of an undetermined number of nesting murrelets associated with a maximum 2,364 acres of occupied nesting habitat per year for 10 years. It is not expected that all of these acres will be disturbed every year because many of the activities will only occur on an as needed basis or periodically.

Injury or Mortality

Maintenance activities may require tree felling; however, the trees to be removed will not be potential nest trees or trees that provide cover to potential nesting platforms. Consequently, the likelihood that the proposed action will result in direct mortality of murrelets, particularly to young or the loss of eggs is discountable.

Summary of Project Effects on Numbers, Distribution, and Reproduction

No suitable murrelet habitat will be removed or degraded. The proposed action may affect the number and productivity of marbled murrelets in the Parks by disturbing breeding murrelets. The Service anticipates the proposed project will result in direct adverse effect to murrelets in the form of harassment of murrelets associated with 2,364 acres of occupied nesting habitat annually for 10 years. This annual amount (2,364 acres) of suitable nesting habitat represents approximately 6 percent of the suitable nesting habitat (41,400 acres) in the Parks; and 3 percent of the suitable nesting habitat (68,000 acres) in the California portion of Zone 4.

In the short-term, conservation needs of the marbled murrelet include the protection of occupied habitat, minimization of disturbance, and reduction of predation at nest sites.

The proposed project will result in disturbance of nesting marbled murrelets. The Parks have minimized the number of acres subject to disturbance by implementing limited operating periods on the majority of the proposed maintenance projects.

Over the long-term, the conservation needs of the marbled murrelet focus on increasing the amount, quality, and distribution of suitable nesting habitat to stop population decline and increase population growth. The proposed project does not impact the amount of nesting habitat.

Northern Spotted Owl

Likelihood of the Species Presence

Northern spotted owl protocol surveys have documented the presence of spotted owls within the Parks.

Habitat Modification

Scientific Basis for Habitat Effect

Management practices have the potential to reduce the quantity and quality of northern 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.

Changes in habitat function are categorized as removal or degrade. *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 any habitat function. *Degrade* 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.

Effects of the Action – Habitat Modification

Habitat Removal. Suitable northern spotted owl habitat will be removed as a result of some of the proposed maintenance activities. Shrubs, tree limbs, and trees growing in road fill will be removed during culvert replacement work. No more than 0.1 acre of trees will be removed in any given project location. The maximum cumulative amount of

habitat to be removed during the next 10 years would be 50 acres of nesting and roosting habitat and 50 acres of foraging habitat for a total of 100 acres spread across the Parks. The impact of this habitat removal on northern spotted owls is expected to be insignificant because vegetation removal will occur over a 10-year period in small patches of approximately 0.1 acre.

Habitat Degradation. Suitable northern spotted owl habitat may be degraded in association with the proposed hazard tree management program in the CDPR campgrounds and administrative areas. The hazard tree program will not cut or incidentally damage potential nest trees without further consultation with the Service. Impacts from the removal of hazard trees are expected to be insignificant because of the limited area where trees will be cut (campgrounds and administrative areas), small number of trees affected, and the suitability of the habitat will be maintained post-project.

Disturbance

Scientific Basis for Disturbance Effect

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

Although information specific to behavioral responses of northern spotted owls to disturbance is limited, research indicates that close proximity to recreational hikers can cause Mexican spotted owls (*S. o. lucida*) to flush from their roosts (Swarthout and Steidl 2001) and helicopter overflights can reduce prey delivery rates to nests (Delaney et al. 1999). Additional effects from disturbance, including altered foraging behavior and decreases in nest attendance and reproductive success, have been reported for other raptors (White and Thurow 1985; Andersen et al. 1989; McGarigal et al. 1991).

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

However, prolonged activities, such as those associated with timber harvest, may increase fecal corticosterone levels depending on their proximity to spotted owl core areas (Wasser et al. 1997; Tempel & Gutiérrez 2004).

Effects of the Action – Disturbance

A limited operating period from February 1 through July 9 will be imposed for most of the proposed projects utilizing motorized equipment in or within 500 feet (or 0.25 mile if back-up beepers are used) of unsurveyed or occupied nesting and roosting habitat. The period from July 10 through July 31 is after the period when the majority of young owls have fledged from the nest. As a result, we anticipate some change in the owl's behavior from the proposed maintenance activities implementing this limited operating period but would not expect them to result in abandonment of the breeding effort, disruption of nesting activities, or premature dispersal of juveniles.

The Parks are proposing to use mechanized equipment during the early breeding season (February 1 through July 9) to remove down trees and brush on some trails. Table 1 in the biological assessment lists the specific trails where these activities will occur during the early breeding season. The Service anticipates that these activities could result in harassment of an undetermined number of nesting northern spotted owls associated with a maximum of 801 acres of nesting and roosting habitat per year for 10 years. It is not expected that all of these acres will be disturbed every year because down tree removal will only occur on an as needed basis.

Injury or Mortality

Scientific Basis for Habitat Effect

In extreme cases, management activities could result in direct injury or mortality of adults, eggs, or young. The potential for northern spotted owls to be struck and killed or injured by falling trees 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. They may disperse prematurely in response to disturbance such as tree falling, 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 burning and harvest 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 nesting and roosting habitat removal will occur during culvert replacements along existing roads. In these locations, the habitat to be removed will consist of trees

and brush in patches of 0.1 acre or less. The Service anticipates that the likelihood the proposed maintenance actions may result in direct mortality of northern spotted owls, particularly to young or the loss of eggs, is discountable.

Summary of Project Effects on Numbers, Distribution, and Reproduction

Approximately 50 acres of suitable northern spotted owl nesting and roosting habitat and 50 acres of foraging will be removed as a result of the proposed maintenance activities during the next 10 years. The impact on northern spotted owls from the proposed habitat modification is expected to be insignificant because the habitat will be removed in 0.1 acre patches along existing roads over a 10-year period.

The Service anticipates the proposed project will result in direct adverse effects to northern spotted owls in the form of harassment of owls associated with 801 acres of suitable nesting and roosting habitat annually for 10 years. This annual amount (801 acres) of suitable nesting and roosting habitat represents approximately 1.2 percent of the suitable nesting and roosting habitat (64,460 acres) in the Parks.

The proposed project is not expected to impede achievement of a long-term conservation need to provide blocks of suitable nesting and roosting habitat; however, it would impact habitat quality to an undeterminable extent.

Cumulative Effects: Marbled Murrelet and Northern Spotted Owl

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur within the action area considered in this 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. Any Federal or State Park activities that occur within the Parks' boundaries will have a Federal nexus and require section 7 consultation with the Service. There are no private or tribal lands within the action area; therefore, cumulative effects would not be likely for activities within the action area.

Conclusion

Marbled Murrelet

After reviewing the current status of the marbled murrelet, the environmental baseline, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that implementation of the Parks' Maintenance Program is not likely to jeopardize the continued existence of the marbled murrelet. Critical habitat for this species has been designated, however, this action does not affect that area and no destruction or adverse modification of that critical habitat is anticipated.

The Service reached the non-jeopardy conclusion based on the following factors:

1. The proposed action will not remove or degrade suitable marbled murrelet nesting habitat.

2. Nesting marbled murrelets associated with 2,364 acres of suitable habitat will be subject to harassment annually through 2019; however this acreage represents a small percentage (approximately 6 percent) of the suitable habitat in the Parks

Northern Spotted Owl

After reviewing the current status of the northern spotted owl, the environmental baseline, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that implementation of the Parks' Maintenance Program is not likely to jeopardize the continued existence of the northern spotted owl. Critical habitat for this species has been designated, however, this action does not affect that area and no destruction or adverse modification of that critical habitat is anticipated.

The Service reached the non-jeopardy conclusion based on the following factors:

1. The proposed action will remove 50 acres suitable northern spotted owl nesting and roosting habitat and 50 acres of foraging habitat over the next 10 years. The impacts are expected to be insignificant because the habitat will be removed in patches of 0.1 acre along existing roads.
2. Nesting spotted owls associated with 801 acres of nesting and roosting habitat will be subject to harassment annually through 2019; however, this acreage represents a small percentage (approximately 1 percent) of the suitable habitat in the Parks.

INCIDENTAL TAKE STATEMENT

Introduction

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the taking of endangered and threatened species, respectively, without special exemption. Take is defined as harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or 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 such as breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance the terms and conditions of this Incidental Take Statement.

The measures described below are non-discretionary, and must be undertaken by the Parks so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, for the exemption in section 7(o)(2) to apply. The 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 CRF §402.14(i)(3)]

Amount or Extent of Take: Marbled Murrelet

The Service anticipates that an undetermined number of marbled murrelets could be taken as a result of the proposed action. The incidental take is expected to be in the form of:

Harassment of murrelets associated with 2,364 acres of occupied nesting habitat due to the Parks' maintenance program annually for 10 breeding seasons, 2009 through 2019.

Amount or Extent of Take: Northern Spotted Owl

The Service anticipates that an undetermined number of northern spotted owls could be taken as a result of this proposed action. The incidental take is expected to be in the form of:

Harassment of northern spotted owls associated with 801 acres of unsurveyed nesting and roosting habitat due to the Parks' maintenance program annually for 10 breeding seasons, 2009 through 2019.

Effect of the Take

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

Reasonable and Prudent Measures

The Service believes the impacts of the proposed action largely will be minimized by compliance with measures incorporated in the project design. Consequently, no reasonable and prudent measures are necessary.

Terms and Conditions

As mentioned above, the Service considers the measures incorporated in the project design to be sufficient to minimize take of marbled murrelets and northern spotted owls; therefore, no terms and conditions are necessary.

If during the course of the action, the level of incidental take is exceeded, such incidental take represents new information requiring reinitiation of consultation and review of the need to include reasonable and prudent measures. The Parks must immediately provide an explanation of the causes of the taking and review with the Service the need for possible inclusion of reasonable and prudent measures.

Monitoring Requirements

In order to monitor the impacts of incidental take, Parks must report the progress of the action and its impacts on the species to the Service, as specified below:

The Parks must report the progress of the proposed action and its impacts on the species to the Service in accordance with 50 CFR §13.45 and §18.27. Prior to January 31 of each year through 2019, the Parks shall provide an annual monitoring report describing the work completed. The report will include information on the following: number of acres of northern spotted owl nesting and roosting habitat and foraging habitat removed or degraded and number of acres of suitable habitat for both species where projects produced noise above ambient levels within 500 feet (or 0.25 mile if back-up beepers are used) during the breeding season.

Reporting Requirements

Any dead or injured marbled murrelet or northern spotted owl 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 Game 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 marbled murrelet or northern spotted owl or of the finding of any dead or injured marbled murrelet or northern spotted owl during implementation of the proposed action. Notification must include the date, time, and location of the incident or discovery of a dead or injured marbled murrelet or northern spotted owl, as well as any pertinent information on circumstances surrounding the incident or discovery. The Service contact for this written information is the Field Supervisor for the Arcata Fish and Wildlife Office at (707) 822-7201.

Coordination of Incidental Take with Other Laws, Regulations, and Policies

The incidental take statement provided in this biological opinion satisfies the requirements of the Act. The Service will not refer the incidental take of any migratory bird or bald eagle for prosecution under the Migratory Bird Treaty Act of 1918, as amended (16 U.S.C. §§ 668-668d), if such take is in compliance with the terms and conditions, including the amount and/or number specified herein.

CONSERVATION RECOMMENDATIONS

Sections 2(c) and 7(a)(1) of the Act direct 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 and the ecosystems upon which they depend. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

The Service has identified the following conservation recommendations which could be implemented by the Parks:

1. Coordinate with the Service in the project planning phase to develop guidelines for avoiding or mitigating adverse effects of the Parks' management activities on listed species.
2. Survey and monitor federally listed species within the Parks' boundaries.

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

REINITIATION NOTICE

This concludes formal consultation on the Parks' Maintenance Program. 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 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 not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operation causing such take must cease pending

reinitiation. If you have any questions regarding this biological opinion, please contact Robin Hamlin of my staff at (707) 822-7201.

cc:

RNSP, Orick, CA (K. Bensen)

CDFG, Eureka, CA (W. Condon)

LITERATURE CITED

- Andersen, D. E., O.J. Rongstad, and W. R. Mytton. 1989. Response of nesting red-tailed hawks to helicopter overflights. *The Condor* 91:296-299.
- Anderson, D.R. and K.P. Burnham. 1992. Demographic analysis of northern spotted owl populations. Pages 66-75 *in* Draft final recovery plan for the northern spotted owl: Appendix C. USDI Fish and Wildlife Service, Portland, Oregon.
- Anthony, R.G., E.D. Forsman, A.B. Franklin, D.R. Anderson, K.P. Burnham, G.C. White, C.J. Schwarz, J. Nichols, J.E. Hines, G.S. Olson, S.H. Ackers, S. Andrews, B.L. Biswell, P.C. Carlson, L.V. Diller, K.M. Dugger, K.E. Fehring, T.L. Fleming, R.P. Gerhardt, S.A. Gremel, R.J. Gutiérrez, P.J. Happe, D.R. Herter, J.M. Higley, R.B. Horn, L.L. Irwin, P.J. Loschl, J.A. Reid, and S.G. Sovern. 2006. Status and trends in demography of northern spotted owls, 1985-2003. Status and trends in demography of northern spotted owls, 1985-2003. Wildlife Monograph No. 163.
- Barrowclough, G.F. and R. J. Gutiérrez. 1990. Genetic variation and differentiation in the spotted owl. *Auk* 107:737-744.
- Barrowclough, G.F., R.J. Gutiérrez, and J.G. Groth. 1999. Phylogeography of spotted owl (*Strix occidentalis*) populations based on mitochondrial DNA sequences; gene flow, genetic structure, and a novel biogeographic pattern. *Evolution* 53(3):919-931.
- Barrows, C.W., and K. Barrows. 1978. Roost characteristics and behavioral thermoregulation in the spotted owl. *Western Birds* 9:1-8.
- Bart, J. 1995. Amount of suitable habitat and viability of northern spotted owls. *Conservation Biology* 9 (4):943-946.
- Bart, J., and E.D. Forsman. 1992. Dependence of northern spotted owls *Strix occidentalis caurina* on old-growth forests in the western USA. *Biological Conservation* 62:95-100.
- Becker, B. H., S. R. Beissinger, and H. R. Carter. 1997. At-sea density monitoring of marbled murrelets in central California: methodological considerations. *Condor* 99:743-755.
- Bednarz, J. C. and T. J. Hayden. 1988. The Los Medanos Cooperative Raptor Research and Management Program. Final Report 1985-1987. Report for Department of Energy; USDI Bureau of Land Management; University of New Mexico. 112 pp.

- Beissinger, S. B. 1995. Population trends of the marbled murrelet projected from demographic analyses. Pages 385 - 393 in C.J. Ralph, G.L. Hunt, M.G. Raphael, and J. F. Piatt, technical editors, Ecology and Conservation of the Marbled Murrelet. Gen. Tech. Rept. PSW-GTR-152. Albany, California: Pacific Southwest Experiment Station, Forest Service. 420 pp.
- Beissinger, S.B. 2002. Analysis of the effect of a 10 percent reduction of population size on marbled murrelet population dynamics in northern California. A report to the U.S. Fish and Wildlife Service, Arcata Field Office, California. April 5, 2002. 10 pp.
- Beissinger, S.B. and N. Nur. 1997. Population trends of the marbled murrelet projected from demographic analyses. Pages B-1 – B-35 in U.S. Fish and Wildlife Service. Recovery plan for the threatened marbled murrelet (*Brachyramphus marmoratus*) in Washington, Oregon, and California. Portland, Oregon. 203 pp.
- Beissinger, S.B. and M.Z. Peery. 2003. Range-wide analysis of juvenile ratios from marbled murrelet monitoring programs: implications for demographic analyses. Report submitted to U.S. Fish and Wildlife Service, Arcata, California.
- Bentivoglio, N., J. Baldwin, P. G. R. Jodice, D. E. Mack, T. Max, S. Miller, S. K. Nelson, K. Ostrom, C. J. Ralph, M. Raphael, C. Strong, C. Thompson, and R. Wilk. 2002. Northwest Forest Plan Marbled Murrelet Effectiveness Monitoring 2000 Annual Report. U.S. Department of Interior, Fish and Wildlife Service; U.S. Department of Agriculture, Pacific Northwest Research Station and Pacific Southwest Research Station; Oregon State University, Wildlife Cooperative Research Unit; Crescent Coastal Research; and Washington Department of Fish and Wildlife. April 2002. 73 pp.
- Bingham, B.B. and B.R. Noon. 1997. Mitigation of habitat “take”: application to habitat conservation planning. *Cons. Biology*. 11(1): 127-139.
- Blakesley, J.A., Franklin, A.B., and R.J. Gutiérrez. 1992. Spotted owl roost and nest site selection in northwestern California. 1992. *Journal of Wildlife Management*, 56(2):388-392.
- Blakesley, J.A., W. LaHaye, J.M.M. Marzluff, B.R. Noon, and S. Courtney. 2004. Scientific evaluation of the status of the northern spotted owl – demography. Chapter 8 In: Courtney, S.P., J.A. Blakesley, R.E. Bigley, M.L. Cody, J.P. Dumbacher, R.C. Fleischer, A.B. Franklin, J.F. Franklin, R.J. Gutiérrez, J.M. Marzluff, L. Sztukowski. 2004. Scientific evaluation of the status of the northern spotted owl. Sustainable Ecosystems Institute. Portland, Oregon. September 2004.

- Bortolotti, G. R., J. M. Gerrard, P. N. Gerrard, and D. W. A. Whitfield. 1984. Minimizing investigator-induced disturbance to nesting bald eagles. In: J. M. Gerrard and T. M. Ingram, editors. *The Bald Eagle in Canada*. Proc. Bald Eagle Days, Winnipeg. Pages 85-103.
- Bradley, J.E., and J.M. Marzluff. 2003. Rodents as nest predators: influences on predatory behavior and consequences to nesting birds. *Auk* 120:1180-1187.
- Bradley, R.W., F. Cooke, L.W. Loughheed, and W.S. Boyd. 2004. Inferring breeding success through radiotelemetry in the marbled murrelet. *Journal of Wildlife Management* 68:318-331.
- Buchanan, J.B. 2004. Managing habitat for dispersing northern spotted owls - are the current management strategies adequate? *Wildlife Society Bulletin* 32:1333-1345.
- Buchanan, J.B., L.L. Irwin, and E.L. McCutchen. 1995. Within-stand nest site selection by spotted owls in the eastern Washington Cascades. *Journal of Wildlife Management* 59:301-310.
- Burger, A.E. 1995. Marine distribution, abundance and habitat of marbled murrelets in British Columbia. Pages 295-312 in C.J. Ralph, G.L. Hunt, M.G. Raphael, and J.F. Piatt (eds.). *Ecology and conservation of the marbled murrelet*. General Technical Report. PSW-GTW-152. Pacific Southwest Experimental Station, U.S. Forest Service, Albany, California. 420 pp.
- Burger, A.E. 2002. Conservation assessment of marbled murrelets in British Columbia, a review of biology, populations, habitat associations and conservation. Pacific and Yukon Region, Canadian Wildlife Service. 168 pp.
- Burger, A.E. and D.M. Fry. 1993. Effects of oil pollution on seabirds in the northeast Pacific. In: Vermeer, K.; K.T. Briggs; K.H. Morgan; and D. Siegel-Causey D., editors. *The status, ecology, and conservation of marine birds of the North Pacific*. Canadian Wildlife Service Special Publication. Ottawa, Canada. Pp. 254-263.
- Burnham, K.P., D.R. Anderson, and G.C. White. 1994. Estimation of vital rates of the northern spotted owl. Colorado Cooperative Fish and Wildlife Research Unit, Colorado State University, Fort Collins, Colorado, USA.
- Burkett E.E., H.R. Carter, J.Y. Takekawa, S. Newman, R.T. Golightly, and J.L. Lanser. 1999. Marbled murrelet radio telemetry in central California in 1997 and 1998: a reduced effort noted in an El Nino year. *Pacific Seabirds* 26(1):32.
- Caffrey, C. 2003. Determining impacts of West Nile Virus on crows and other birds. *American Birds* (103rd Count) 57:14-21.

- Campbell, N. A. 1990. Biology. The Benjamin/Cummings Publishing Company, Inc. Redwood City, California.
- Carney, J. M., and W. J. Sydeman. 1999. A review of human disturbance effects on nesting colonial waterbirds. *Waterbirds* 22:68-79.
- Carsia, R. V., and S. Harvey. 2000. Adrenals. Chapter 19 in G. C. Whittow, editor. *Sturkie's Avian Physiology*. Academic Press, San Diego, CA.
- Carter, H.R., and R.A. Erickson. 1992. Status and conservation of the marbled murrelet in California, 1892-1987. In: H.R. Carter and M.L. Morrison (eds.). Status and conservation of the marbled murrelet in North America. Proceedings of the Western Foundation for Vertebrate Zoology 5.
- Carter, H.R., and S.G. Sealy. 1990. Daily foraging behavior of marbled murrelets. *Studies in Avian Biology* 14:93-102.
- Carter, H.R., and J.L. Stein. 1995. Molts and plumages in the annual cycle of the marbled murrelet. Pages 99-109 in C.J. Ralph, G.L. Hunt, M.G. Raphael, and J.F. Piatt (eds.). Ecology and conservation of the marbled murrelet. General Technical Report. PSW-GTW-152. Pacific Southwest Experimental Station, U.S. Forest Service, Albany, California. 420 pp.
- Carter, H.R., M.L.C. McAllister, and M.E. Isleib. 1995. Mortality of marbled murrelets in gill nets in North America. Pages 271-283 in C.J. Ralph, G.L. Hunt, M.G. Raphael, and J.F. Piatt (eds.). Ecology and conservation of the marbled murrelet. General Technical Report. PSW-GTW-152. Pacific Southwest Experimental Station, U.S. Forest Service, Albany, California. 420 pp.
- Chutter, M.J., I. Blackburn, D. Bonin, J. Buchanan, B. Costanzo, D. Cunningham, A. Harestad, T. Hayes, D. Heppner, L. Kiss, J. Surgenor, W. Wall, L. Waterhouse, and L. Williams. 2004. Recovery strategy for the northern spotted owl (*Strix occidentalis caurina*) in British Columbia. British Columbia Ministry of Environment, Victoria. 74 pp.
- Courtney, S.P. and R.J. Gutiérrez. 2004. Scientific evaluation of the status of the northern spotted owl – threats. In: Courtney, S.P., J.A. Blakesley, R.E. Bigley, M.L. Cody, J.P. Dumbacher, R.C. Fleischer, A.B. Franklin, J.F. Franklin, R.J. Gutiérrez, J.M. Marzluff, L. Sztukowski. 2004. Scientific evaluation of the status of the northern spotted owl. Sustainable Ecosystems Institute. Portland, Oregon. September 2004.
- Courtney, S.P., J.A. Blakesley, R.E. Bigley, M.L. Cody, J.P. Dumbacher, R.C. Fleischer, A.B. Franklin, J.F. Franklin, R.J. Gutiérrez, J.M. Marzluff, L. Sztukowski. 2004. Scientific evaluation of the status of the northern spotted owl. Sustainable Ecosystems Institute. Portland, Oregon. September 2004.

- Delaney, D. K., T. G. Grubb, P. Beier, L. L. Pater, and M. H. Reiser. 1999. Effects of helicopter noise on Mexican spotted owls. *Journal of Wildlife Management* 63:60-76.
- Diller, L.V. and D.M. Thome. 1999. Population density of northern spotted owls in managed young-growth forests in coastal northern California. *Journal of Raptor Research* 33: 275–286.
- Divoky, G.J., and M. Horton. 1995. Breeding and natal dispersal, nest habitat loss and implications for marbled murrelet populations. Pages 83-87 in C.J. Ralph, G.L. Hunt, M.G. Raphael, and J.F. Piatt (eds.). *Ecology and conservation of the marbled murrelet*. General Technical Report. PSW-GTW-152. Pacific Southwest Experimental Station, U.S. Forest Service, Albany, California. 420 pp.
- Drent, R. 1972. The natural history of incubation. In: D. S. Farner, editor. *Breeding Biology of Bird*. Washington, D.C. National Academy of Science. Pages 262-311.
- Dugger, K.M., F. Wagner, R.G. Anthony, and G.S. Olson. 2005. The relationship between habitat characteristics and demographic performance of northern spotted owls in southern Oregon. *The Condor* 107:863-878.
- Dunbar, D.L., B.P. Booth, E.D. Forsman, A.E. Hetherington, and D.J. Wilson. 1991. Status of the spotted owl, *Strix occidentalis*, and barred owl, *Strix varia*, in southwestern British Columbia. *Canadian Field Naturalist* 105:464-468.
- Evans Mack, D. M., W. P. Ritchie, S. K. Nelson, E. Kuo-Harrison, P. Harrison, and T. E. Hamer, compilers. 2003. Methods for surveying marbled murrelets in forests: a revised protocol for land management and research. Marbled Murrelet Technical Committee, Pacific Seabird Group. January 2, 2003. 76 pp.
- Folliard, L. 1993. Nest site characteristics of northern spotted owls in managed forest of northwest California. M.S. Thesis. University of Idaho, Moscow, Idaho.
- Ford, R.G., G.K. Himes Boor, B.E. Sharp, and J.L. Casey. 2001. Final Draft Report: Estimates of bird impacts resulting from the *M/V Kure* Humboldt Bay oil spill of November 5, 1997. Unpublished Report. 79 pp.
- Forsman, E.D. 1975. A preliminary investigation of the spotted owl in Oregon. M.S. thesis, Oregon State University, Corvallis. 127 pp.
- Forsman, E.D., E.C. Meslow, and H.M. Wight. 1984. Distribution and biology of the spotted owl in Oregon. *Wildlife Monographs* 87:1-64.

- Forsman, E.D., S. DeStefano, M.G. Raphael, and R.J. Gutierrez, (editors). 1996. Demography of the northern spotted owl. Studies in Avian Biology No. 17. Cooper Ornithology Society.
- Forsman, E.D., R.G. Anthony, J.A. Reid, P.J. Loschl, S.G. Sovern, M. Taylor, B.L. Biswell, A. Ellingson, E.C. Meslow, G.S. Miller, K.A. Swindle, J.A. Thraillkill, F.F. Wagner, and D. E. Seaman. 2002. Natal and breeding dispersal of northern spotted owls. Wildlife Monographs 149:1-35.
- Forsman, E.D., T.J. Kaminski, J.C. Lewis, K.J. Maurice, S.G. Sovern, C. Ferland, and E.M. Glenn. 2005. Home range and habitat use of northern spotted owls on the Olympic Peninsula, Washington. Journal of Raptor Research 39(4):365-377.
- Franklin, A.B. 1992. Population regulation in northern spotted owls: theoretical implications for management. Pp 815-827 in D. R. McCullough and R. H. Barrett (eds.). Wildlife 2001: populations. Elsevier Applied Sciences, London, England.
- Franklin, A.B., D.R. Anderson, R.J. Gutiérrez, and K.P. Burnham. 2000. Climate, habitat quality, and fitness in northern spotted owl populations in northwestern California. Ecological Monographs, 70(4): 539-590.
- Frid, A., and L. Dill. 2002. Human-caused disturbance stimuli as a form of predation risk. Conservation Ecology 6(1)11.
- Friesen, V.L., T.P. Birt, J.F. Piatt, R.T. Golightly, S.H. Newman, P.N. Hebert, B.C. Congdon, and G. Gissing. 2007. Population genetic structure and conservation of marbled murrelets (*Brachyramphus marmoratus*).
- Fry, M. 1995. Pollution and fishing threats to marbled murrelets. Pages 257-260 in C.J. Ralph, G.L. Hunt, M.G. Raphael, and J.F. Piatt (eds.). Ecology and conservation of the marbled murrelet. General Technical Report. PSW-GTW-152. Pacific Southwest Experimental Station, U.S. Forest Service, Albany, California. 420 pp.
- Fyfe, R. W. and R. R. Olendorff. 1976. Minimizing the dangers of nesting studies to raptors and other sensitive species. Can. Wildl. Serv. Occas. Paper 23. 17pp.
- Gancz, A., I.Kk. Barker, R. Lindsay, A. Dibernardo, K. McKeever, and B. Hunter. 2004. West Nile Virus outbreak in North American owls, Ontario, 2002. Emerging Infectious Diseases 10:2135-2142.
- Garmendia, A.E., H.J. Van Kruiningen, R.A. French, J.F. Anderson, T.G. Andreadis, A. Kumar, and A.B. West. 2000. Recovery and identification of West Nile virus from a hawk in winter. Journal of Clinical Microbiology 38:3110-3111.

- Goheen, E.M., E.M. Hansen, A. Kanaskie, M.G. Williams, N. Oserbauer, and W. Sutton. 2002. Sudden oak death caused by *Phytophthora ramorum* in Oregon. *Plant Disease* 86:441.
- Gremel, S. 2005. Factors controlling distribution and demography of northern spotted owls in a reserved landscape. M.S. thesis, University of Washington, Seattle. 49 pp.
- Gutiérrez, R.J. 1996. Biology and distribution of the northern spotted owl. Pages 2-5 in E.D. Forsman et al., editors. *Demography of the northern spotted owl*. Studies in Avian Biology No. 17. Cooper Ornithological Society.
- Gutiérrez, R.J., A.B. Franklin, and W.S. LaHaye. 1995. Spotted owl (*Strix occidentalis*) in: A. Poole and F. Gill, editors. *The birds of North America*, No. 179. The Academy of Natural Sciences and The American Ornithologists' Union, Washington, D.C. 28 pages.
- Gutiérrez, R. J., M. Cody, S. Courtney, and D. Kennedy. 2004. Assessment of the potential threat of the northern barred owl. In: Courtney, S.P., J.A. Blakesley, R.E. Bigley, M.L. Cody, J.P. Dumbacher, R.C. Fleischer, A.B. Franklin, J.F. Franklin, R.J. Gutiérrez, J.M. Marzluff, L. Sztukowski. 2004. Scientific evaluation of the status of the northern spotted owl. Sustainable Ecosystems Institute. Portland, Oregon. September 2004.
- Haig, S.M., R.S. Wagner, E.D. Forsman, E.D., and T.D. Mullins. 2001. Geographic variation and genetic structure in spotted owls. *Conservation Genetics* 2(1):25-40.
- Haig, S.M., T.D. Mullins, E.D. Forsman, P. Trail, and L. Wennerberg. 2004. Genetic identification of spotted owls, barred owls, and their hybrids: legal implications of hybrid identity. *Conservation Biology* 18:1347-1357.
- Hamer, T.E. and S.K. Nelson. 1995. Characteristics of marbled murrelet nest trees and nesting stands. In: C. J. Ralph, G. L. Hunt, M. G. Raphael, and J. F. Piatt, technical editors. *Ecology and Conservation of the Marbled Murrelet*. Gen. Tech. Rept. PSW-GTR-152. Albany, California: Pacific Southwest Experiment Station, Forest Service, U.S. Dept. of Agriculture; 420 pp.
- Hamer, T.E., S.G. Seim, and K.R. Dixon. 1989. Northern spotted owl and northern barred owl habitat use and home range size in Washington: preliminary report. Washington Department of Wildlife, Olympia, Washington.
- Hamer, T.E., D.L. Hays, C.M. Senger, and E.D. Forsman. 2001. Diets of northern barred owls and northern spotted owls in an area of sympatry. *Journal of Raptor Research* 35(3):221-227.

- Hamer, T.E., S.K. Nelson, and T.I. Mohagen II. 2002. Nesting chronology of the marbled murrelet in North America. Final report submitted to U.S. Fish and Wildlife Service, Portland, Oregon.
- Harestad, A., J. Hobbs, and I. Blackburn. 2004. Précis of the Northern Spotted Owl in British Columbia. Pages. 12-14 in Zimmerman, K., K. Welstead, E. Williams, J. Turner, (editors). Northern Spotted Owl Workshop Proceedings. Forrex Series (online No. 14), Vancouver, British Columbia, Canada.
- Hebert, P.N., R.T. Golightly, HR Carter, and DL Orthmeyer. 2003a. The breeding biology of marbled murrelets nesting in Redwood National and State Parks, California. In: Hebert, P.N. and R.T. Golightly. Breeding biology and human-caused disturbance to nesting of marbled murrelets (*Brachyramphus marmoratus*) in northern California. Progress report 2002. Progress report submitted to U.S. Fish and Wildlife Service, Arcata, California.
- Hebert, P.N., R.T. Golightly, HR Carter, and DL Orthmeyer. 2003b. At-sea distribution and movements of nesting and non-nesting marbled murrelets in northern California. In: Hebert, P.N. and R.T. Golightly. Breeding biology and human-caused disturbance to nesting of marbled murrelets (*Brachyramphus marmoratus*) in northern California. Progress report 2002. Progress report submitted to U.S. Fish and Wildlife Service, Arcata, California.
- Hershey, K.T., E.C. Meslow, and F.L. Ramsey. 1998. Characteristics of forests at spotted owl nest sites in the Pacific Northwest. *Journal of Wildlife Management* 62(4):1398-1410.
- Herter, D.R., and L.L. Hicks. 2000. Barred owl and spotted owl populations and habitat in the central Cascade Range of Washington. *Journal of Raptor Research* 34(4): 279-286.
- Huff, M., P. Jodice, J. Baldwin, S. Miller, R. Young, K. Ostrom, C. J. Ralph, M. G. Raphael, C. Strong, C. Thompson, and G. Falxa. 2003. Marbled murrelet effectiveness monitoring. Northwest Forest Plan 2002 Annual Summary Report (version 2). U.S. Department of Interior, U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station, Pacific Southwest Research Station, Oregon State University, Crescent Coastal Research, Washington Department of Fish and Wildlife. September 2003. 27 pp.
- Hull, C.L., G.W. Kaiser, C. Loughheed, L. Loughheed, S. Boyd, and F. Cooke. 2001. Intraspecific variation in commuting distance of marbled murrelets (*Brachyramphus marmoratus*): ecological and energetic consequences of nesting further inland. *Auk* 118:1036-1046.

- Hunter, J. E., K. N. Schmidt, H. B. Stauffer, S. L. Miller, C. J. Ralph, and L. Roberts. 1998. Status of the marbled murrelet in the inner North Coast ranges of California. *Northwestern Naturalist* 79:92-103.
- Irwin, L.L., D.F. Rock, and G.P. Miller. 2000. Stand structures used by northern spotted owls in managed forests. *Journal of Raptor Research* 34(3):175-186.
- Iverson, W.F. 1993. Is the barred owl displacing the spotted owl in western Washington? M.S. Thesis, Western Washington University, Bellingham, Washington.
- Iverson, W.F. 2004. Reproductive success of spotted owls sympatric with barred owls in western Washington. *Journal of Raptor Research* 38(1):88-91.
- Johnson, D.H. 1992. Spotted owls, great horned owls, and forest fragmentation in the central Oregon Cascades. M.S. Thesis, Oregon State University, Corvallis, Oregon.
- Kelly, E.G. and E.D. Forsman. 2004. Recent records of hybridization between barred owls (*Strix varia*) and northern spotted owls (*S. occidentalis caurina*). *Auk* 121:806-810.
- Kelly, E.G., E.D. Forsman, and R.G. Anthony. 2003. Are barred owls replacing spotted owls? *The Condor* 105:45-53.
- Knight, R.L., and S.K. Skagen. 1998. Effects of recreational disturbance on birds of prey: a review. Pages 355-359 in R.L. Glinski et al., editors. *Proceedings of the Southwest Raptor Management Symposium and Workshop*, National Wildlife Federation, Washington, D.C.
- Laidig, K.J., and D.S. Dobkin. 1995. Spatial overlap and habitat association of Barred Owls and Great Horned Owls in southern New Jersey. *Journal of Raptor Research* 29:151-157.
- Leskiw, T., and R.J. Gutiérrez. 1998. Possible predation of a spotted owl by a barred owl. *Western Birds* 29:225-226.
- Lint, J., technical coordinator. 2005. Northwest Forest Plan – the first 10 years (1994-2003): status and trends of northern spotted owl populations and habitat. PNW-GTR-648, USDA Forest Service, Pacific Northwest Research Station, Portland, Oregon.
- Livezey, K.B. 2005. Iverson (2004) on spotted owls and barred owls: comments on methods and conclusions. *Journal of Raptor Research* 39(1):102-103.

- Long, L.L., and C.J. Ralph. 1998. Regulation and observations of human disturbances near nesting marbled murrelets. U.S. Forest Service, Pacific Southwest Research Station, Redwood Sciences Laboratory, Arcata, California. June 1998. 35 pp.
- Luginbuhl, J.M., John M. Marzluff, Jeffrey E. Bradley, Martin G. Raphael, and Daniel E. Varland. 2001. Corvid survey techniques and the relationship between corvid relative abundance and nest predation. *Journal of Field Ornithology* 72(4): 556-572.
- Marra, P.P., S. Griffing, C. Caffrey, A.M. Kilpatrick, R. McLean, C. Brand, E. Saito, A.P. Dupuis, L. Kramer, and R. Novak. 2004. West Nile Virus and wildlife. *BioScience* 54(5):393-402.
- Marshall, D. B. 1988. Status of the marbled murrelet in North America: with special emphasis on populations in California, Oregon, and Washington. Biological Report 88(30) USDI Fish and Wildlife Service, Portland, OR. 19pp.
- Marzluff, J. M. and E. A. Neatherlin. 2006. Corvid response to human settlements and campgrounds: causes, consequences, and challenges for conservation. *Biological Conservation* 130:301-314.
- Marzluff, J. M., J. G. Raphael, and R. Sallabanks. 2000. Understanding the effects of forest management on avian species. *Wildlife Society Bulletin* 28:1132-1143.
- McGarigal, K., R.G. Anthony, and F.B. Issacs. 1991. Interactions of humans and bald eagles on the Columbia River estuary. *Wildlife Monographs* 115:1-47.
- McShane, C., T. Hamer, H. Carter, G. Swartzman, V. Friesen, D. Ainley, R. Tressler, K. Nelson, A. Burger, L. Spear, T. Mohagen, R. Martin, L. Henkel, K. Prindle, C. Strong, and J. Keaney. 2004. Evaluation report for the 5-year status review of the marbled murrelet in Washington, Oregon, and California. Unpublished report. EDAW Inc., Seattle, Washington. Prepared for the US Fish and Wildlife Service, Region 1, Portland Oregon.
- Meyer, J.S., L.L. Irwin, and M.S. Boyce. 1998. Influence of habitat abundance and fragmentation on northern spotted owls in western Oregon. *Wildlife Monographs* 139: 1-51.
- Meyer, C. B., S. L. Miller, and C. J. Ralph. 2002. Multi-scale landscape and seascape patterns associated with marbled murrelet nesting areas on the U.S. west coast. *Landscape Ecology* 17:95-115.
- Miller, G.S., S.K. Nelson, and W.C. Wright. 1985. Two-year-old female spotted owl breeds successfully. *Western Birds* 16:69-73.

- Miller, S.L., C.J. Ralph, W. Melberg, and L. Long. 2003. Abundance, distribution, and productivity of marbled murrelets along the coast of northern California and southern Oregon in 2003. Annual unpublished report to the Pacific Lumber Company. 15 pp.
- Moeur, M., T.A. Spies, M. Henstrom, J.R. Martin, J. Alegria, J. Browning, J. Cissel, W.B. Cohen, T.E. Demeo, S. Healey, R. Warbington. 2005. Northwest Forest Plan—The first 10 years (1994-2003): status and trend of late-successional and old-growth forest. Gen. Tech. Rep. PNW-GTR-646. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 142 p.
- National Research Council. 1995. Science and the Endangered Species Act. National Academy Press, Washington, D.C. 271 pp.
- Nelson, S. K. 1997. Marbled murrelet (*Brachyramphus marmoratus*). In: Poole, A. and F. Gill, editors. The Birds of North America. Number 276. The Academy of Natural Sciences. Philadelphia, PA, and the American Ornithologist's Union, Washington, D.C. 32pp.
- Nelson, S.K. 2005. Surveys for marbled murrelets in potential habitat in the Oregon coast range: Draft final report prepared for The Trustees Council of the New Carissa Oil Spill and the U.S. Fish and Wildlife Service. Oregon Cooperative Fish and Wildlife Research Unit, Oregon State University, Department of Fisheries and Wildlife, Corvallis, Oregon. 26 pp.
- Nelson, S. K. and T. E. Hamer. 1995a. Nest success and the effects of predation on marbled murrelets. Pages 89-97 in C.J. Ralph, G.L. Hunt, M.G. Raphael, and J. F. Piatt, technical editors. Ecology and Conservation of the Marbled Murrelet. Gen. Tech. Rept. PSW-GTR-152. Albany, California: Pacific Southwest Experiment Station, Forest Service, U.S. Dept. of Agriculture; 420 pp.
- Nelson, S. K., and T. Hamer. 1995b. Nesting biology and behavior of the marbled murrelet. Pages 57-67 in C. J. Ralph, G. L. Hunt, M. G. Raphael, and J. F. Piatt, technical editors. Ecology and Conservation of the Marbled Murrelet. Gen. Tech. Rept. PSW-GTR-152. Albany, California: Pacific Southwest Experiment Station, Forest Service, U.S. Dept. of Agriculture; 420 pp.
- Nelson, S.K., and R.W. Peck. 1995. Behavior of marbled murrelets at nine nest sites in Oregon. Northwestern Naturalist 76:43-53.
- Nelson, S. K., and A. K. Wilson. 2002. Marbled murrelet habitat characteristics on state lands in western Oregon. Final report, Oregon Cooperative Fish and Wildlife Research Unit, Oregon State University, Department of Fisheries and Wildlife, Corvallis. 151pp.

- North, M.P., G. Steger, R. Denton, G. Eberlein, T. Munton, and K. Johnson. 2000. Association of weather and nest-site structure with reproductive success in California spotted owls. *Journal of Wildlife Management* 64(3):797-807.
- Olson, G.S., E.M. Glenn, R.G. Anthony, E.D. Forsman, J.A. Reid, P.J. Loschl, and W.J. Ripple. 2004. Modeling demographic performance of northern spotted owls relative to forest habitat in Oregon. *Journal of Wildlife Management* 68(4):1039-1053.
- Olson, G.S., R.G. Anthony, E.D. Forsman, S.H. Ackers, P.J. Loschl, J.A. Reid, K.M. Dugger, E.M. Glenn, and W.J. Ripple. 2005. Modeling of site occupancy dynamics for northern spotted owls, with emphasis on the effects of barred owls. *Journal of Wildlife Management* 69(3):918-932.
- Pearson, R.R., and K.B. Livezey. 2003. Distribution, numbers, and site characteristics of spotted owls and barred owls in the Cascade Mountains of Washington. *Journal of Raptor Research* 37(4):265-276.
- Peery, Z., S. R. Beissinger, B. Becker, and S. Newman. 2002. Marbled murrelet (*Brachyramphus marmoratus*) demography in central California: 2001 progress report. Unpublished report, 21pp.
- Peery, Z., S. R. Beissinger, B. Becker, and S. Newman. 2003. Post-breeding season movements and distribution of marbled murrelets in central California. Unpublished preliminary report.
- Peery, M.Z., S.R. Beissinger, S.H. Newman, E.B. Burkett, and T.D. Williams. 2004. Applying the declining population paradigm: diagnosing causes of poor reproduction in the marbled murrelet. *Conservation Biology* 18(4):1088-1098.
- Ralph, C. J., G. L. Hunt, Jr., M. G. Raphael, and J. F. Piatt, technical editors. 1995a. Ecology and conservation of the marbled murrelet. Gen. Tech. Rep. PSW-GTR-152. Albany, California.: Pacific Southwest Experiment Research Station, Forest Service, U.S. Department of Agriculture; 420 pp.
- Ralph, C. J., G. L. Hunt, Jr., M.G. Raphael, and J. F. Piatt. 1995b. Ecology and conservation of the marbled murrelet in North America: An overview. Pages 3-22 in C.J. Ralph, G.L. Hunt, M.G. Raphael, and J.F. Piatt, technical editors. Ecology and Conservation of the Marbled Murrelet. Gen. Tech. Rept. PSW-GTR-152. Albany, California: Pacific Southwest Experiment Station, Forest Service, U.S. Dept. of Agriculture; 420 pp.
- Raphael, M. G., D. E. Evans Mack, and B. A. Cooper. 2002. Landscape-scale relationships between abundance of marbled murrelets and distribution of nesting habitat. *Condor* 104:331-342.

- Redwood National and State Parks. 2003. A conservation strategy for managing threatened and endangered species in Redwood National and State Parks. 116 pp.
- Rizzo, D.M., M. Garbeloto, J.M. Davidson, G.W. Slaughter, and S.T. Koike. 2002. *Phytophthora ramorum* as the cause of extensive mortality of *Quercus* spp. and *Lithocarpus densiflorus* in California. Plant Disease 86:205-214.
- Rosenberg, D.K. and R.G. Anthony. 1992. Characteristics of northern flying squirrel populations in young second- and old-growth forests in western Oregon. Can. J. Zool. 70:161-166.
- Sakai, H. 2003. A conservation strategy for managing threatened and endangered species in Redwood National and State Parks and addendums. Unpublished report
- Sapolsky, R. M., L. M. Romero, and A. U. Munck. 2000. How do glucocorticoids influence stress responses? Integrating permissive, suppressive, stimulatory, and preparative actions. Endocrine Reviews 21:55-89.
- Schmidt, K. 2006a. Draft biological assessment of impacts to terrestrial and aquatic threatened and endangered species from exotic plant management in Redwood National and State Parks. Unpublished report. Redwood National and State Parks, Orick, California.
- Schmidt, K. 2006b. Northern spotted owl monitoring and inventory, Redwood National and State Parks, 2005 annual report. Unpublished report. Redwood National and State Parks, Orick, California.
- Singer, S.W., D.L. Suddjian, and S.A. Singer. 1995. Fledging behavior, flight patterns, and forest characteristics at marbled murrelet tree nests in California. Northwestern Naturalist 76:54-62.
- Singleton, P., S. Graham, W. Gaines, and J. Lehmkuhl. 2005. The ecology of barred owls in fire-prone forests. USDA PNW December 2005 Progress Report; Wenatchee, Washington.
- Sisco, C.L. 1990. Seasonal home range and habitat ecology of spotted owls in northwestern California. M.S. Thesis. Humboldt State University, Arcata, California.
- Solis, D.M., and R.J. Gutiérrez. 1990. Summer habitat ecology of northern spotted owls in northwestern California. The Condor 92:739-748.
- Speckman, S.G. 1996. Marbled murrelet distribution and abundance in relation to the marine environment. Master's Thesis, University of Alaska, Fairbanks, Alaska. August 1996.

- Speckman, S.G., J.F. Piatt, and A.M. Springer. 2003. Deciphering the social structure of marbled murrelets from behavioral observations at sea. *Waterbirds* 26(3):266-274.
- Strachan, G., M. McAllister, and C.J. Ralph. 1995. Marbled murrelet at-sea foraging behavior. Pages 247-254 in C.J. Ralph, G.L. Hunt, M.G. Raphael, and J.F. Piatt (eds.). *Ecology and conservation of the marbled murrelet*. General Technical Report. PSW-GTW-152. Pacific Southwest Experimental Station, U.S. Forest Service, Albany, California. 420 pp
- Swarthout, E.C. and Steidl, R.J. 2001. Flush responses of Mexican spotted owls to recreationists. *J. Wildl. Manage.* 65(2):312-317.
- Swartzman, G., H.R. Carter, S.K. Nelson, P.H. Morrison, and K.L. Sallee. 1997. LIMBS (Landscape – level individual murrelet based simulation): a model for examining the effects of different forest management scenarios on marbled murrelets in northern California, Unpublished first draft report. 52 pp. Sierra Club and Environmental Protection Information Center, Garberville, CA.
- Swenson, J. E. 1979. Factors affecting status and reproduction of ospreys in Yellowstone National Park. *Journal of Wildlife Management* 43:595-601.
- Tempel, D. J. and R. J. Gutiérrez. 2003. Fecal corticosterone levels in California spotted owls exposed to low-intensity chainsaw noise. *Wildlife Society Bulletin* 31:698-702.
- Tempel, D. J. and R. J. Gutiérrez. 2004. Factors related to fecal corticosterone levels in California spotted owls: implications for assessing chronic stress. *Conservation Biology* 18:538-547.
- Thomas, J.W., and M.G. Raphael (Eds.). 1993. *Forest Ecosystem Management: An Ecological, Economic, and Social Assessment*. Report of the Forest Ecosystem Management Assessment Team (FEMAT). July 1993. Portland, OR: USDA Forest Service and the USDI Bureau of Land Management.
- Thomas, J.W., E.D. Forsman, J.B. Lint, E.C. Meslow, B.R. Noon, and J. Verner. 1990. A conservation strategy for the northern spotted owl. Report of the Interagency Scientific Committee to address the conservation of the northern spotted owl. Unpublished interagency document. 458 pages.
- Thomas, J.W., M.G. Raphael, R.G. Anthony, E.D. Forsman, A.G. Gunderson, R.S. Holthausen, B.G. Marcot, G.H. Reeves, J.R. Sedell, and D.M. Solis. 1993. Viability assessments and management considerations for species associated with late-successional and old-growth forests of the Pacific Northwest. USDA Forest Service, Portland, Oregon.

- USDA Forest Service and USDI Bureau of Land Management. 1994a. Final supplemental environmental impact statement on management of habitat for late-successional and old-growth forest related species within the range of the northern spotted owl. Portland, Oregon. 2 vols. and appendices.
- USDA Forest Service, and USDI Bureau of Land Management. 1994b. Record of decision for amendments to Forest Service and Bureau of Land Management planning documents within the range of the northern spotted owl; standards and guidelines for management of habitat for late-successional and old-growth forest related species within the range of the northern spotted owl. Portland, Oregon.
- USDI Fish and Wildlife Service. 1989. The northern spotted owl; a status review supplement. USDI Fish and Wildlife Service, Portland, Oregon.
- USDI Fish and Wildlife Service. 1990a. Endangered and Threatened Wildlife and Plants; determination of threatened status for the northern spotted owl. Fed. Reg. Vol. 55. 123: 26114-26194. June 26, 1990.
- USDI Fish and Wildlife Service. 1992a. Endangered and threatened wildlife and plants; Determination of threatened status for the Washington, Oregon, and California population of the marbled murrelet. Final rule. Fish and Wildlife Service. Federal Register 191:45328-45337. October 1, 1992.
- USDI Fish and Wildlife Service. 1992b. Endangered and Threatened Wildlife and Plants; determination of critical habitat for the northern spotted owl. Fed. Reg. Vol. 57. 10:1796-1838. January 15, 1992.
- USDI Fish and Wildlife Service. 1992c. Draft final recovery plan for the northern spotted owl. USDI Fish and Wildlife Service. 2 Volumes. Portland, Oregon.
- USDI Fish and Wildlife Service. 1994a. Biological Opinion for the Preferred Alternative (9) of the Supplemental Environmental Impact Statement on Management of Habitat for Late Successional and Old-Growth Forest Within the Range of the Northern Spotted Owl. 53 pp.
- USDI Fish and Wildlife Service. 1994b. Letter from D.C. Frederick (USFWS) to J. Belcher (Washington Department of Natural Resources) dated February 1, 1994, regarding correction to spotted owl home-range data for the Olympic Peninsula. USFWS, Olympia, Washington.
- USDI Fish and Wildlife Service. 1996. Endangered and threatened wildlife and plants; Final designation of critical habitat for the marbled murrelet; final rule. Fish and Wildlife Service. Federal Register 102:26256-26320.

- USDI Fish and Wildlife Service. 1997. Recovery plan for the threatened marbled murrelet (*Brachyramphus marmoratus*) in Washington, Oregon, and California. Portland, Oregon. 203 pp.
- USDI Fish and Wildlife Service. 2001. A range wide baseline summary and evaluation of data collected through section 7 consultation for the northern spotted owl and its critical habitat: 1994-2001. Portland, Oregon. Unpublished document. 41 pages.
- USDI Fish and Wildlife Service. 2003. Current estimates of marbled murrelet in 2003. Compiled for the 5-year review. Portland, Oregon.
- USDI Fish and Wildlife Service. 2004a. Marbled murrelet 5-year review process: overview. Portland, Oregon. 28 pp.
- USDI Fish and Wildlife Service. 2004b. Northern Spotted Owl: Five Year Review Summary and Evaluation. USDI Fish and Wildlife Service, Portland, Oregon. 73 pages.
- USDI Fish and Wildlife Service. 2008a. Endangered and threatened wildlife and plants; 90-day finding on a petition to remove the California, Oregon, and Washington Population of the marbled murrelet (*Brachyramphus marmoratus*) from the list of endangered and threatened wildlife. Fish and Wildlife Service. Federal Register 192:57314-57317.
- USDI Fish and Wildlife Service. 2008b. Final Recovery Plan for the Northern Spotted Owl, *Strix occidentalis caurina*. U.S. Fish and Wildlife Service, Portland, Oregon. xii + 142 pp.
- USDI Fish and Wildlife Service and USDC National Marine Fisheries Service. 1998. Final Consultation Handbook--Procedures for Conducting Consultation and Conference Activities Under Section 7 of the Endangered Species Act.
- USDI Fish and Wildlife Service and USDC National Marine Fisheries Service. 1999. Biological and conference opinions regarding issuance of an incidental take permit to the Pacific Lumber Company, Scotia Pacific Company LLC and Salmon Creek Corporation. February 24, 1999.
- Ward, J. W. Jr. 1990. Spotted owl reproduction, diet and prey abundance in northwest California. M.S. Thesis. Humboldt State University, Arcata, California.
- Wasser, S. K., K. Bevis, G. King, and E. Hanson. 1997. Noninvasive physiological measures of disturbance in the northern spotted owl. Conservation Biology 11:1019-1022.
- Weathers, W.W., P.J. Hodum and J.A. Blakesley. 2001. Thermal ecology and ecological energetics of the California spotted owl. The Condor 103(4):678.

- White, C. M., and T. L. Thurow. 1985. Reproduction of ferruginous hawks exposed to controlled disturbance. *The Condor* 87:14-22.
- Williams, D. F., J. Verner, H. F. Sakai, and J. R. Waters. 1992. General biology of major prey species of the California spotted owl. General technical report. PSW-133. USDA Forest Service, Pacific Southwest Research Station, Arcata, CA.
- Zabel, C. J., K.M. McKelvey, and J.P. Ward, Jr. 1995. Influence of primary prey on home-range size and habitat-use patterns of northern spotted owls (*Strix occidentalis caurina*). *Canadian Journal of Zoology* 73:433-439.
- Zabel, C. J., J.R. Dunk, H.B. Stauffer, L.M. Roberts, B.S. Mulder, and A. Wright. 2003. Northern spotted owl habitat models for research and management application in California (USA). *Ecological Applications* 13(4): 1027-1040.

Personal Communications

- Accord, B. 2004. Humboldt State University, Arcata, California. March 8, 2004.
- Brickey, A. 2004. US Fish and Wildlife Service, Arcata, California. November 22, 2004.
- Golightly, R. 2006. Humboldt State University, Arcata, CA. February 28, 2006.
- Peery, Z. 2007. Moss Landing Marine Lab, Moss Landing, California. September and October 2007.

Table 1. Estimated acreage of potentially occupied marbled murrelet nesting habitat at various landscape scales within the species' listed range (USDI Fish and Wildlife Service 2003).

Landscape scale ¹	Acres
Washington	
MMCZ1	No estimate available
MMCZ2	No estimate available
TOTAL	No estimate available
Oregon	
MMCZ3 and 4	408,621
TOTAL	408,621
California	
MMCZ4(CA)	67,618 ²
MMCZ5	430
MMCZ6	7,250
TOTAL	75,298
2 State (Oregon and California)	
OR	408,621
CA	75,298
TOTAL	483,919

1 MMCZ = Marbled Murrelet Conservation Zone.

2 Recently adjusted to include Humboldt Redwoods State Park acres: 8,672 from USDI Fish and Wildlife Service and USDC National Marine Fisheries Service 1999.

Table 2. Marbled murrelet population point estimates and associated 95 percent confidence intervals (CI) by Zone within the listed range.

	2000 Population Point Estimate	95 % CI	2001 Population Point Estimate	95 % CI	2002 Population Point Estimate	95 % CI	2003 Population Point Estimate	95 % CI
Zone 1 ¹	5,637	2,998 – 8,537	8,936	5,536 – 12,583	9,717	6,075 – 14,027	5,473	5,740 – 11,708
Zone 2 ¹	1,252	727 – 2,228	1,738	575 – 3,888	2,619	565 – 3,784	3,071	1,959 – 5,039
Zone 3 ¹	6,724	3,955 – 9,941	7,538	5,341 – 9,292	6,271	3,957 – 10,060	7,781	3,895 – 7,550
Zone 4 ¹	4,880	3,535 – 9,299	3,851	2,919 – 6,532	4,816	3,608 – 6,247	4,169	3,437 – 6,710
Zone 5 ¹	79	11 – 259	117	14 - 259	250	30 - 412	84	0 - 88
Zone 6 ²	NA		661	556 - 786	683	561 - 832	699	567-860
Listed Range	NA		22,841	NA	24,354	NA	22,916	NA
Zones 1-5	18,571		22,180	18,349- 28,997	23,673	18,063- 26,372	22,217	15,953- 25,203

¹ Data for Zones 1 through 5 from Northwest Forest Plan Effectiveness Monitoring Program.

² Data for Zone 6 from Z. Peery, pers. comm. 2007. No surveys in 2004, 2005, and 2006.

Table 2 (continued). Marbled murrelet population point estimates and associated 95 percent confidence intervals (CI) by Zone within the listed range.

	2004 Population Point Estimate	95% CI	2005 Population Point Estimate	95% CI	2006 Population Point Estimate	95% CI	2007 Population Point Estimate	95% CI
Zone 1 ¹	5,473	2,959 – 7,438	7,956	4,784- 11,589	5,899	4,013- 8,208	6,985	4,105- 10,382
Zone 2 ¹	3,071	1,742 – 4,596	2,492	1,629- 3,642	2,381	1,672- 3,430	2,525	1,271- 3,811
Zone 3 ¹	7,781	5,885 – 9,763	5,843	3,618- 7,309	6,375	4,569- 7,429	3,996	2,714- 5,929
Zone 4 ¹	4,169	3,084 – 9,167	3,642	2,680- 5,955	3,968	3,168- 5,467	3,791	2,687- 7,342
Zone 5 ¹	84	18-204	289	117-453	---	---	57	26-105
Zone 6 ²	---	---	---	---	---	---	378	238 -518
Listed Range	NA	NA	NA	NA	NA	NA	17,372	NA
Zones 1-5	20,578	15,959- 24,487	20,223	15,681- 21,563	18,622 ³	NA	17,354	12,800- 21,909

¹ Data for Zones 1 through 5 Northwest Forest Plan Effectiveness Monitoring.

² Data for Zone 6 from Z. Peery, pers. comm. 2007. No surveys in 2004, 2005, and 2006.

³ Does not include Zone 5.

Table 3. The estimated values for demographic parameters used in four population models for the murrelet.

Demographic Parameter	Beissinger 1995	Beissinger and Nur 1997—cited in USDI ¹ 1997	Beissinger and Peery 2003	McShane et al. 2004
Juvenile to Adult Ratio	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	(See nest success)
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%

¹Fish and Wildlife Service

Table 4. Changes to NRF¹ habitat acres from activities addressed in section 7 consultations (both formal and informal) and other causes range-wide from 1994 to April 23, 2009.

Northwest Forest Plan (NWFP) Group / Ownership		Consulted On Habitat Changes ²		Other Habitat Changes ³	
		Removed/Downgraded	Degraded	Removed/Downgraded	Degraded
Federal - Northwest Forest Plan	Bureau of Land Management	99786	56166	760	0
	Forest Service	114296	470722	34234	5481
	National Park Service	3866	4855	3	0
	Multi-agency⁴	15320	23314	132897	0
	NWFP Subtotal	233268	555057	167894	5481
Other Management and Conservation Plans (OMCP)	Bureau of Indian Affairs and Tribes	109370	28349	2398	0
	Habitat Conservation Plans	295889	14430	0	0
	OMCP Subtotal	405259	42779	2398	0
Other Federal Agencies & Lands⁵		241	466	28	70
Other Public & Private Lands⁶		14173	880	30240	20949
TOTAL Changes		652941	599182	200560	26500

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

² Includes both effects reported by USDI FWS (2001) and subsequent effects compiled in the Spotted owl Consultation Effects Tracker (web application and database).

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

⁴ The 'Multi-agency' grouping is used to lump a variety of NWFP mixed agency or admin unit consultations that were reported together prior to 6/26/2001, and the acres of habitat loss to natural events that can not be split out by administrative unit.

⁵ Includes lands that are owned or managed by other Federal agencies not included in the NWFP. ⁶ Includes lands not covered by Habitat Conservation Plans that are owned or managed by states, counties, municipalities, and private entities. Effects that occurred on private lands from right-of-way permits across Forest Service and FS lands are included here.

Table 5. Acres of suitable (NRF¹) habitat loss on Federal lands from 1994 to April 23, 2009, from proposed management activities and natural events: baseline and summary of effects by State, physiographic province and land use function.

Physiographic Province ⁴		Evaluation Baseline ²			Habitat Removed/Downgraded ³				% Provincial Baseline Affected	% of Range-wide Effects
		Reserves ⁵	Non-reserves ⁶	Total	Reserves ⁵	Non-reserves ⁶	Habitat loss to natural events ⁷	Total		
WA	Olympic Peninsula	548483	11734	560217	867	24	299	1190	0.21	0.31
	Eastern Cascades	506340	200509	706849	3919	5747	5754	15411	2.18	3.95
	Western Cascades	864683	247797	1112480	1681	10804	0	12485	1.12	3.20
	Western Lowlands	0	0	0	0	0	0	0	0.00	0.00
OR	Coast Range	422387	94190	516577	394	3770	66	4230	0.81	1.09
	Klamath Mountains	448509	337789	786298	23402	71479	101676 ⁸	196557	24.99	50.44
	Cascades East	247624	196035	443659	2343	12758	19547 ⁹	34648	7.81	8.89
	Cascades West	1012426	1033337	2015763	4020	64683	24583	93286	4.63	23.94
	Willamette Valley	593	5065	5658	0	0	0	0	0.00	0.00
CA	Coast	47566	3928	51494	405	69	100	574	1.11	0.15
	Cascades	61852	26385	88237	0	4808	0	4808	5.45	1.23
	Klamath	734103	345763	1079866	1492	9115	15869	26476	2.45	6.79
Total		4894566	2502532	7397098	38514	183257	167894	389665	5.26	100.0

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

² 1994 FSEIS baseline (USDA FS and USDI BLM 1994b).

³ Includes consulted-on effects reported by USDI FWS (2001) and subsequent effects compiled in the NSO Consultation Effects Tracking System database.

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

⁵ Land-use allocations intended to provide large blocks of habitat to support clusters of breeding pairs

⁶ Land-use allocations intended to provide habitat to support movement of spotted owls among reserves.

⁷ Acres for all physiographic provinces, except the Oregon Klamath Mountains and Oregon Cascades East, are from the Scientific Evaluation of the Status of the Northern Spotted Owl (Courtney et al. 2004).

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

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

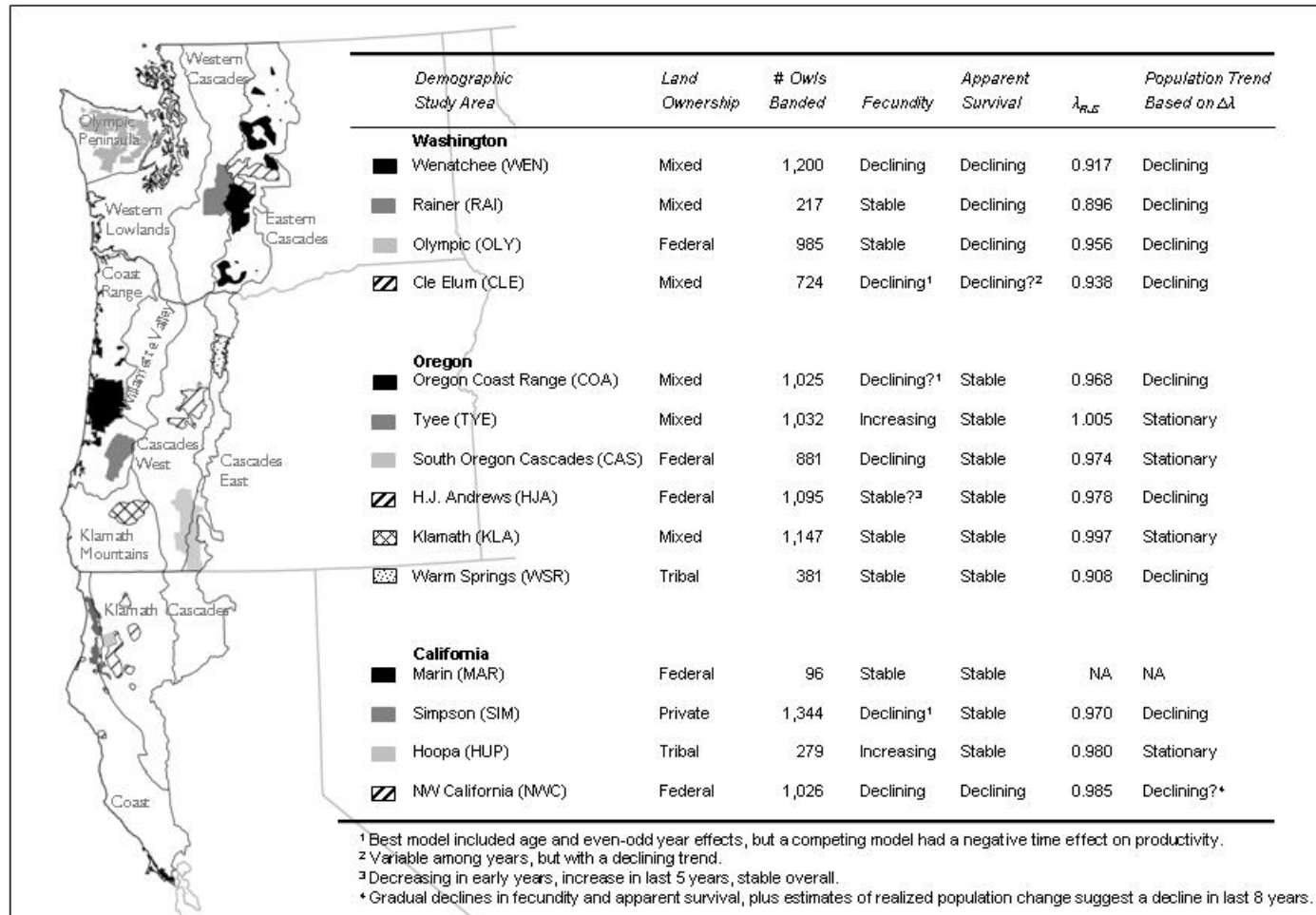


Figure 1. Physiographic provinces, spotted owl demographic study areas, and demographic trends (adapted from Anthony et al. 2006).

