



United States Department of the Interior
California Department of Parks and Recreation
Redwood National and State Parks
1111 Second Street
Crescent City, California 95531



N1621

March 15, 2011

Nancy Finley
Field Supervisor
U.S. Fish and Wildlife Service
Arcata Fish and Wildlife Office
1655 Heindon Road
Arcata, California 95521

Dear Ms. Finley:

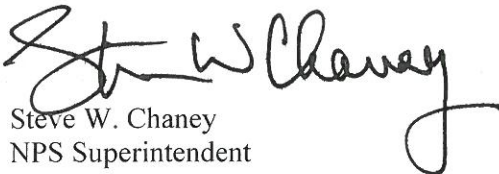
Enclosed you will find a biological assessment (BA) that addresses the impacts of Helicopter Use in Redwood National and State Parks. We propose to use helicopters for certain law enforcement and resource management activities. The BA was prepared in accordance with the requirements set forth under Section 7 of the Endangered Species Act (19 U.S.C. 1536 (c), 50 CFR 402).

Informal consultation on the proposed action occurred during an Interagency Consultation Team meeting on November 3, 2010 and during phone conversations after the meeting between biologists on your staff and ours.

We have determined that certain activities associated with helicopter use are likely to adversely affect the marbled murrelet, and other activities may affect, but are not likely to adversely affect, the marbled murrelet and northern spotted owl.

We are requesting concurrence and a biological opinion from you relative to this action. If you have any questions, please contact Kristin Schmidt at (707) 465-7741. Thank you for your assistance.

Sincerely,


Steve W. Chaney
NPS Superintendent


Jeff Bomke
State Parks Superintendent

Enclosure

**Biological Assessment of Impacts to
Terrestrial Threatened and Endangered Species
from Helicopter Use in
Redwood National and State Parks**

March 15, 2011

I. INTRODUCTION

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

II. CONSULTATION TO DATE

Redwood National and State Parks obtained a list from the Arcata Fish and Wildlife Service Office website identifying the endangered, threatened, and candidate species that may be present in the parks, dated December 14, 2010 (Document Number 1046314546-125532). This list included 24 species currently listed as threatened or endangered, and 4 species that are candidates for listing in Humboldt and Del Norte Counties.

Endangered

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

Threatened

Oregon Silverspot Butterfly (*Speyeria zerene hippolyta*)
Green Sturgeon (*Acipenser medirostris*)
California Coastal Chinook Salmon (*Oncorhynchus tshawytscha*)
Northern California Steelhead (*Oncorhynchus mykiss*)
Southern Oregon/ Northern California Coho Salmon (*Oncorhynchus kisutch*)
Southern Eulachon DPS (*Thaleichthys pacificus*)
Green Turtle (*Chelonia mydas*)
Olive Ridley Sea Turtle (*Lepidochelys olivacea*)
Loggerhead Turtle (*Caretta caretta*)
Northern Spotted Owl (*Strix occidentalis caurina*)
Marbled Murrelet (*Brachyramphus marmoratus*)
Western Snowy Plover (*Charadrius alexandrinus nivosus*)
Steller Sea Lion (*Eumetopias jubatus*)

Candidate

Mardon Skipper (*Polites mardon*)

Xantus's Murrelet (*Synthliboramphus hypoleucus*)

Yellow-billed Cuckoo (*Coccyzus americanus*)

Fisher (*Martes pennanti*)

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

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

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

Helicopter use in RNSP was covered previously under a formal consultation in a BA dated February 20, 2001 and USFWS Biological Opinion dated June 27, 2001 (Reference No. 1-14-2001-888). The lifespan of that consultation was 10 years, through 2010. Continuation of the Helicopter Use Program was discussed at an Interagency Consultation Team (ICT) meeting on November 3, 2010. During both the initial informal consultation in 2000 and the recent ICT meeting, it was agreed that during the breeding season effects to listed species would be dependent upon helicopter flight levels (altitude) over suitable habitat. Subsequent to the ICT meeting there were a number of phone calls and emails between RNSP and USFWS biologists to discuss limitations on helicopter use and means of analyzing impacts to listed species. Comments on the draft BA were received from USFWS on February 1, 2011.

In the previous consultation, it was agreed that during the breeding seasons of the spotted owl and marbled murrelet, flights $\geq 1,000$ ft (305 m) above potentially suitable habitat would not affect these species. Flights between 500 ft (152 m) and 1,000 ft above tree canopy may affect, but would not likely adversely affect, the 2 species. Flights < 500 ft above tree canopy could result in adverse effects. Since that consultation was completed there is new information from research showing that nesting seabirds (common murre) may be negatively affected by aircraft flying below 700 ft (213 m). Also subsequent to that consultation the USFWS issued harassment guidelines which indicate a helicopter must remain at least 0.25 mi (1,320 ft; 402 m) above suitable habitat to not affect listed species. However, we agreed that given the differences in breeding habitats between common murre and marbled murrelets, that is, open offshore rocks

versus closed forested canopy, flying above between 500 and 1,320 ft likely would not result in harm to nesting murrelets. However, to be consistent with the harassment guidelines flight ceilings of 0.25 mi above tree canopy would be the basis for a “no effect” determination.

III. CURRENT MANAGEMENT DIRECTION

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

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

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

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

The *General Management Plan/General Plan and Environmental Impact Statement/Report for Redwood National and State Parks* (USDI and CDPR 1999) provides comprehensive guidance for managing the national and state parks as one complex with similar resources. The General Management Plan/General Plan (GMP) provides overall vision and direction for the parks and identifies future planning needs. Under the GMP, the agencies will emphasize the protection of resources and will also provide a variety of opportunities for visitors to enjoy the parks. New visitor services and facilities will be provided to enhance the visitor experience if these services and facilities do not impact sensitive resources. The park agencies will cooperate with adjacent communities and landowners, local American Indian tribes, and other government agencies to

accomplish long-range resource management planning to reduce threats to park resources. Hiking, mountain biking, and camping are currently important components of the activities available to people that visit RNSP. No areas within RNSP are currently closed to visitor use but many areas are managed to exclude public use of motor vehicles.

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

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

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

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

Helicopter Use

The Office of Aircraft Services (OAS) was established by the Secretary of the Interior on July 1, 1973 to "...raise the safety standards, increase the efficiency, and promote the economical

operation of aircraft activities in the Department of the Interior.” OAS functions, responsibilities and organization are outlined in the Departmental Manual 112 DM 12 and include procurement of commercial or other aviation services in support of bureau programs, establishing and maintaining standards governing operational procedures, and developing and implementing aviation user training programs. Cooperator aircraft must adhere to flight operations standards and procedures as described in the Manual. Safety is a primary consideration for all OAS-related functions.

The California Public Resources Code (sec. 5093.36(b)) prohibits the hovering, landing, or flying of aircraft lower than 2,000 ft (610 m) above the ground over State Wilderness except for specified emergencies. There are two designated State Wilderness areas in RNSP; Marbled Murrelet State Wilderness in Prairie Creek Redwoods State Park and Redwood Heritage State Wilderness in Jedediah Smith Redwoods State Park.

IV. DESCRIPTION OF THE PROPOSED ACTION

Under the authority of OAS, NPS personnel may fly on board aircraft certified by OAS. The proposed action considered in this document is the use of helicopters to conduct the management activities described below. Helicopters flown by the U.S. Coast Guard, California Department of Forestry (CAL FIRE), California Campaign Against Marijuana Production (CAMP), the National Guard, and private contractors may be used for park work under the auspices of OAS. Staff at RNSP undergo OAS training in order to be allowed on board a helicopter used in conjunction with a particular work activity. There are two divisions at RNSP that have the need for helicopters to accomplish work: Geology and Fire Management in the Resources Management Division and Law Enforcement Park Rangers in the Visitor Services and Resource Protection Division.

Helicopter use will occur over the next 10 years (through 2020) unless new information becomes available that would require an amendment to this BA, or reinitiation of consultation, prior to that time.

Geology

The Geology Branch proposes to use helicopters to photograph and monitor watershed conditions within the Redwood Creek basin. Flights would occur any time of year, but especially after large storms as these events trigger widespread erosion and the need to assess storm damage throughout the watershed. Helicopter flights also would be used to monitor timber harvest activities upstream of the parks in Redwood Creek. In general, it is anticipated that Geology Branch flights would occur 1 to 2 times in a given year. Flights would always be at altitudes of ≥ 500 ft (152 m) above forested stands in the national park that are suitable threatened and endangered species habitat between January 1st and September 15th.

Fire Management

Aerial ignition for prescribed burn units was covered under the Fire Management Plan BA dated August 4, 2009. Any helicopter use for wildland fire suppression would be addressed using emergency consultation procedures.

Visitor Services and Resource Protection

Within the National and State Parks

Visitor Services and Resource Protection (VSRP) staff require the use of helicopters for park boundary checking, patrol, search and rescue (SAR), new personnel orientation, supplies and materials transport, spotting marijuana gardens, and marijuana eradication and cleanup activities. Due to the unpredictable nature of SAR operations, and the need to respond quickly, emergency consultation procedures would be used when a SAR operation may have impacted a listed species.

Landing sites that may be used by Coast Guard and other small-medium size helicopters in association with VSRP activities are High Bluff Overlook, old South Operations Center (old SOC), Schoolhouse Peak, William's Ridge, the fields at Aubell (North Operations Center), Crescent Beach, and Crescent Beach Environmental Center (CBEC). National Guard or CAMP helicopters used during marijuana eradication may need to land in any safe landing location. Given the large size of these ships, the most likely staging locations would be at one of the Bald Hills prairies.

Flights would stay ≥ 500 ft above ground or forest canopy for most VSRP activities including border checking, patrolling, orientation, supplies and materials transport, and marijuana spotting, except when flying over certain areas in the state parks (see *Within State Parks* section below). Routine patrols of the parks would occur with the frequency of one flight per month in May, June, July, August, and September (Table 1).

Park rangers and helicopter pilots are apprised of the locations of known bald eagle nests and peregrine falcon eyries and have been requested to maintain a 0.5 mi (805 m) radius buffer around a nest site during the nesting season (January 1 to August 31). This is the recommended exclusion zone for low-flying aircraft provided in the Pacific bald eagle recovery plan (USFWS 1986). If suspicious activity was suspected within one of these restricted areas that required a closer approach by a helicopter, park biologists would be notified and would initiate discussions with California Department of Fish and Game. No flights would take place over nearshore marine environments, or along coastal bluffs.

At the end of each year flight logs will be provided to the wildlife biologist indicating dates, times, and locations of flights.

Within the National Park

VSRP staff fly with the U.S. Coast Guard for the purpose of marijuana spotting. Coast Guard helicopters are Dolphins, mid-sized ships that fly relatively fast and do not hover. Helicopters would remain ≥ 500 ft above tree canopy to note the locations of grow sites, and would fly within the marbled murrelet daily restriction period between 2 hours after sunrise and 2 hours before sunset. Spotting would require flights once or twice per month beginning in May (Table 1), and could occur over suitable spotted owl and/or marbled murrelet habitat.

In order to remove material from a grow site, trash, hose, plants, etc. are piled in an opening

which could be a garden created by the growers. Marijuana eradication and cleanup would be accomplished by staging a helicopter at one of the known landing sites, flying to the grow site, hovering to hoist the material, and returning to the landing. As much work would be done from the ground as is possible.

Marijuana eradication is accomplished with assistance from the National Guard and/or CAMP. National Guard helicopters are large Sikorsky Pave Hawk single-rotor military helicopters. In order to remove material from grow sites helicopters must lower to near ground level, or at least below 500 ft above tree canopy. This type of helicopter use would generally take place in association with large (multiple acre) grow sites and if there were no alternative means of conducting the eradication and clean up operations from the ground. The need to hover below 500 ft above tree canopy and/or land for marijuana eradication would take place after September 1st (Table 1). During eradication, flights would avoid suitable forest habitat as much as possible by maintaining as direct a flight line as possible, at 0.25 mi altitude, between the landing location and the grow site. In order to minimize adverse impacts associated with marijuana eradication and cleanup, flying or hovering anywhere between 500 ft of old growth forest canopy and near ground level would be allowed to occur no more than twice during the breeding season, *and only when other options to clean up the site do not exist.*

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

Within the State Parks

The following conditions would be applied for all flight activities over state park lands within RNSP. Aircraft flying over state wilderness areas must maintain a minimum altitude of 2,000 feet (610 m) above the ground. Maps showing the areas included in designated wilderness in Prairie Creek and Jedediah Smith Redwoods State Parks have been provided to the Coast Guard as well as VSRP rangers.

Aircraft flying over old-growth habitat outside of state wilderness areas must maintain a minimum altitude of 0.25 mile (402 m) above tree canopy from March 24th through September 15th. During the period of September 16th through March 23rd aircraft must maintain a minimum altitude of 500 ft (152 m) above tree canopy.

Flights for marijuana spotting in state parks may occur ≥ 500 ft above 2nd growth forest tree canopy during the breeding seasons for the spotted owl and marbled murrelet. If a marijuana garden is located, a helicopter may not be used for eradication if old growth forest occurs within 0.25 mi of the grow site or within 2,000 ft of a state park wilderness area.

Minimum flight altitudes may be modified if marbled murrelet surveys conducted to the accepted protocol at the time of surveys indicate that marbled murrelets are not present within old growth stands and upon subsequent review and written approval by the California Department of Fish & Game and the USFWS.

Table 1. The months required for flight, flight height, and whether or not there may be a need to land in a location other than a designated heliport.

VSRP Activity	Flight Months	Flight Height	Need to Land¹
Border Checking	May-Aug.	≥500 ft	No
Patrol	May-Aug.	≥500 ft	Maybe
Marijuana Spotting	May-Oct.*	≥500 ft	No
Marijuana Eradication	Aug-Nov.*	<500 ft	Yes
Orientation	Jan.-Dec.*	≥500 ft	No
Supp./Mat. Transport	Jan.-Dec.	≥1,320 ft	No

¹ “Need to land” means landing in a place other than a designated heliport.

* Some restrictions apply in state park lands, see text.

Interrelated and Interdependent Activities

There are no interrelated or interdependent activities that involve this proposed action and threatened, endangered, or candidate species. Specific projects facilitated by helicopter use such as prescribed fire management are included in the Fire Management Plan BA.

V. STATUS AND DISTRIBUTION OF LISTED SPECIES

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

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

A. Species Account

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

Critical habitat for this species was designated on January 15, 1992 (USDI 1992a). No RNSP lands were designated as critical habitat for the northern spotted owl. A final recovery plan for the northern spotted owl was published in 2008 (USFWS 2008). The foundation of the recovery plan is a network of Managed Owl Conservation Areas (MOCAs) on federal lands supported by Conservation Support Areas (CSAs) on adjacent non-federal lands. Redwood National Park south of Prairie Creek was a designated MOCA and the 3 state parks were designated CSAs. Currently the 2008 Recovery Plan is under revision, and the draft revised plan recommends elimination of the MOCAs and habitat conservation will be based on the outcome of a habitat modeling exercise (USFWS 2010).

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

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

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

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

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

B. Habitat Status

Suitable northern spotted owl nesting, roosting, and foraging habitat has been well described in the literature (e.g., Forsman et al. 1984, Carey et al. 1990, Solis and Gutierrez 1990, Ripple et al. 1991, Blakesley et al. 1992, Hunter et al. 1995). Spotted owl home ranges are known to include structurally complex mature and old growth (>200 year old) conifer forest in greater amounts

and with less fragmentation than that available over the landscape (Hunter et al. 1995). Likewise, spotted owl nest, roost, and foraging sites show the same trend of being in the largest patches of old forest available (e.g., Solis and Guitierrez 1990 and Ripple et al. 1997). Dominant and codominant overstory canopy closure in suitable spotted owl habitat tends to be >60% with well-developed intermediate and shrub canopy layers.

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

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

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

It should be noted that spotted owls also are known to successfully nest in previously harvested 30-80 year old redwood forests. Redwood stands are believed to develop characteristics of mature forests (thus, suitable spotted owl habitat) more rapidly than other stand types due to a variety of species-specific and coastal environment conditions (USDI 1990 and Thomas et al. 1990). In precommercially thinned forests on Green Diamond Resource Company (GDRC) land, including land adjacent to RNSP, spotted owls nested in stands with a median age of 59 years, with 83% of nesting pairs using stands between 30 and 80 years old. Conifer-dominated nest stands tended to have more basal area of large (>90 cm dbh) conifers and more vertical vegetation layers than in randomly sampled stands. Likewise nest trees in GDRC stands were usually dominant trees in the canopy or residual trees that were very large and older than the surrounding stand (Folliard 1993). In contrast, spotted owls are not known to use second growth stands for nesting in RNSP. Second growth in the parks differs from that on GDRC land in that almost none of the previously harvested stands have been thinned. Many of the second growth redwood stands in RNSP are extremely dense, and may be passing through a stem exclusion

stage which causes mortality of smaller overstory trees and suppression of most understory regeneration and shrub communities (Bailey and Tappeiner 1998). These stands may not support spotted owl prey, supply adequate roost and nest sites, or allow for easy flight due to their high stem densities.

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

Figure 1 below shows where potentially suitable spotted owl habitat occurs within RNSP.

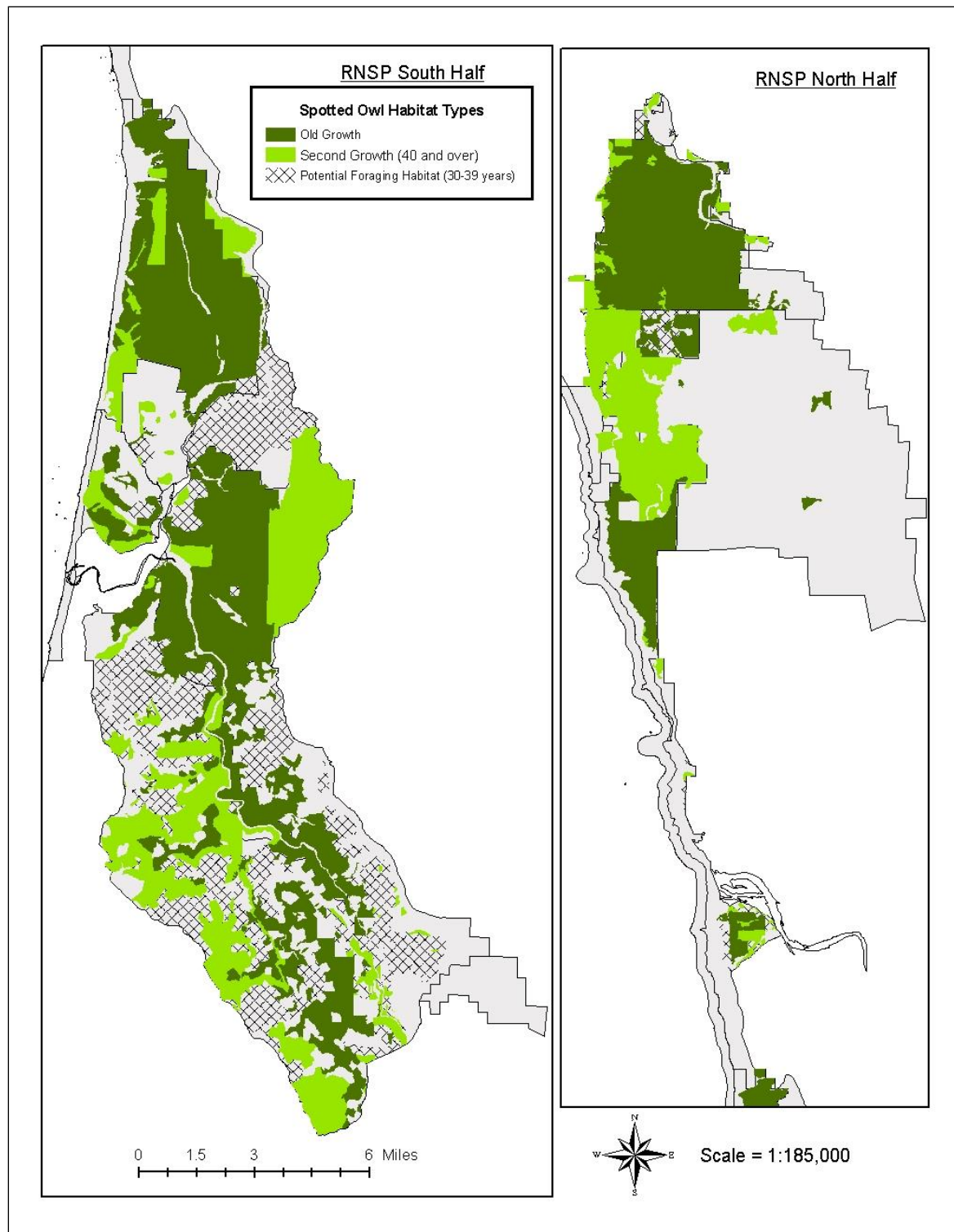


Figure 1. Suitable spotted owl nesting, roosting, and potential foraging habitat in Redwood National and State Parks.

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

A. *Species Account*

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

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

The marbled murrelet recovery plan divided the range of the murrelet into 6 Conservation Zones (CZs) beginning with CZ 1 in northern Washington and ending with CZ 6 in Santa Cruz County. Redwood National and State Parks (RNSP) fall in CZ 4. Zones 1-5 are in the area of effectiveness monitoring of the Northwest Forest Plan (NWP). In 2008, the estimated population of murrelets in CZs 1-5 was 17,700 ($\pm 3,200$, 95% C.I.; Falxa et al. 2009). Estimates for 2007 and 2008 represent the smallest population estimates since monitoring began and indicate a population decline since 2000. At the scale of the CZ in the NWP area marbled murrelet at-sea density estimates in 2009 ranged from 0.767 birds/km² to 4.18 birds/km² in CZ 4 (no surveys were conducted in CZ5 in 2009; USFWS 2009). There was a loss of 490 (S.E. 241) to 870 (S.E. 129) birds per year or about 3,900 ($\pm 4,553$, 95% C.I.) to 6,900 ($\pm 2,533$, 95% C.I.) birds from 2000 to 2008 equating with an overall population decline of 19 – 34% (USFWS 2009).

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

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

The 2009 status review indicated that the historic decline of murrelet reproduction is likely

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

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

Marbled murrelets’ use of forests within RNSP is influenced by topography (Miller and Ralph 1995). Highest detection rates per station and the greatest number of occupied stations occurred in the major drainages and at lower elevations; detection rates on major ridges were three times lower (Miller and Ralph 1995). No significant difference in occupancy based on stand size was detected, however, sample size in the largest stands was very small. In RNSP Golightly et al. (2009) measured habitat characteristics at the stand scale for 10 marbled murrelet nest sites and 11 random sites. Distance to the nearest paved road and tree canopy height were the variables that best discriminated between nest and random sites. Nests were farther from paved roads and were in stands with lower canopy heights than random sites. There also were increased numbers of downed logs in the vicinity of murrelet nest trees. Golightly et al. (2009) suggested that numbers of downed logs indicates openings in the canopy that increase access to nest sites. Murrelet nest trees had a greater mean dbh than the mean of all other trees measured in a plot around the nest tree, but were not necessarily the largest trees in the plot, indicating that large limbs and complex tree canopies are not limited to the largest trees in a stand. We assume that all stands with trees providing nesting opportunities for marbled murrelets have the potential to be occupied.

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

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

As indicated by the Hebert and Golightly (2006) study and posited by Golightly and Gabriel (2009) in their analysis of declining regional populations, the most significant threat to the marbled murrelet in RNSP is the high level of predation on murrelet eggs and chicks. Of the 14 known or suspected nest predators, 8 are known to occur commonly in suitable murrelet nesting habitat in RNSP including the Steller's jay (*Cyanocitta stelleri*), common raven (*Corvus corax*), great horned owl (*Bubo virginianus*), sharp-shinned hawk (*Accipiter striatus*), Cooper's hawk (*A. cooperii*), Pacific fisher (*Martes pennanti*), Townsend's chipmunk (*Tamias townsendi*), and Douglas squirrel (*Tamasciurus douglasii*) (Nelson and Hamer 1995, Marzluff et al. 1996).

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

clear cuts) had a two and half time greater chance of being predated than did proxy nests near regenerating clear cut edges or “natural” edges along riparian areas. These observations are a corroboration of Marzluff et al.’s (2004) study of the home range use of 25 radio tagged Steller’s jays. Steller’s jay use hard habitat edges more while foraging and of hard habitat edges, those associated with human settlements and campgrounds were used the most.

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

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

B. Habitat Status

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

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

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

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

Approximately 50,000 ac (20,234 ha) of second growth coniferous forest exists in RNSP that is currently unsuitable marbled murrelet nesting habitat. It is reasonable to expect that some, if not most, of the stands making up this younger forest will eventually obtain suitable nesting habitat characteristics. All of these second growth stands were cut within the last century with over 90% having been clearcut since 1940. Habitat recovery rates will vary greatly from stand to stand depending on how the stand was harvested, site capacity, reseeded method, and post-harvest manipulation. Unfortunately, even under the best of circumstances, it is not expected that these disturbed stands will become suitable nesting habitat for more than a century. Figure 2 shows the location of old-growth stands potentially suitable for nesting murrelets within RNSP.

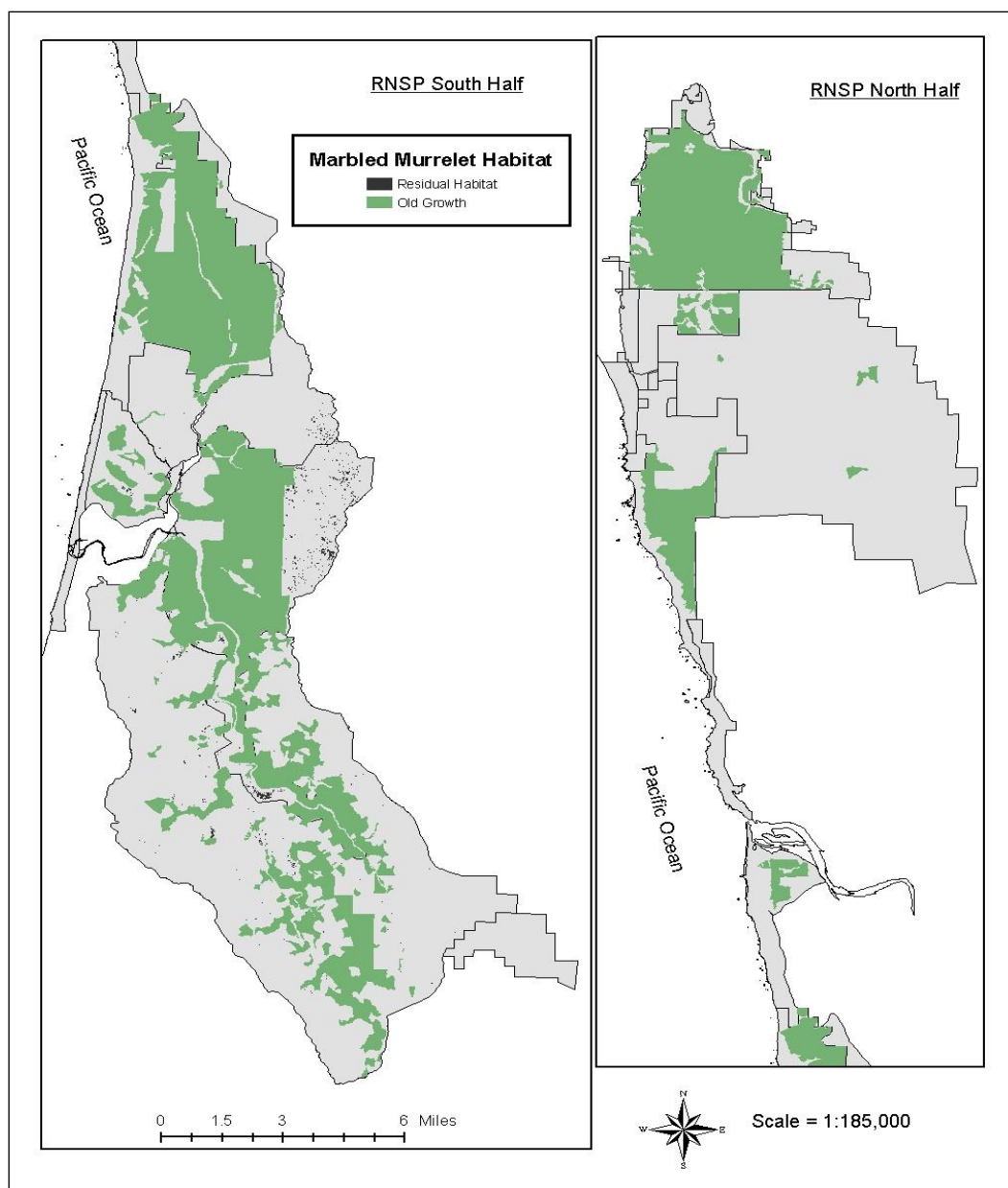


Figure 2. Suitable marbled murrelet nesting habitat in Redwood National and State Parks.

Marbled Murrelet Critical Habitat

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

- 1) individual trees with potential nesting platforms;

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

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

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

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

3. Fisher (*Martes pennanti*), Candidate

A. *Species Account*

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

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

population in northwest California is probably the largest in the western United States, although it is isolated (Aubry and Lewis 2003).

To date there have been 5 separate surveys for forest mesocarnivores in RNSP. Two were U.S. Forest Service surveys in areas of proposed highway construction at Cushing Creek (Gellman et al. 1993) and Wilson Creek (McKenzie et al. 1994), both in Del Norte county and both within a few of miles of the coast. In a state-sponsored distribution study, habitats were surveyed within 50 air km (31 mi) of the coast between the Oregon border and southern Humboldt County (Beyer and Golightly 1996). A park-sponsored survey took place in 2002 with the main objective of determining presence of the Humboldt marten (*M. americana* ssp. *humboldtensis*) in the parks (Slauson et al. 2003). And in 2010 study was conducted throughout the parks by U.S. Forest Service research in partnership with RNSP. Fishers were detected in all 5 of these surveys. Beyer and Golightly (1996) reported a "...high detection ratio...in an area of...[Redwood] National Park...". Slauson et al. (2003) detected fishers in old-growth, older second growth, and along the edges of these two types. Sample units with detections were distributed throughout the park, from Jedediah Smith State Park in the north to Devil's Creek (a tributary of Redwood Creek) in the south. Data from the 2010 study have yet to be analyzed, but preliminary information indicates fishers were detected at many different track plate locations. There is a modest number of fisher observations in the parks' wildlife observations database; reliable observations were recorded in Lost Man Creek and Prairie Creek watersheds, near the Wolf Creek Education Center, and along Newton B. Drury parkway as well as from the A-9 Road, C-9 Road, Bald Hills Road, and Maneze Prairie. The survey results coupled with the reliable database records indicate that fishers are probably well-distributed throughout the parks.

There are no records of fishers breeding within RNSP, although they are known to reproduce in private managed timberlands adjacent to the park (J. Thompson pers. comm.), and it is likely that RNSP harbors a breeding population. Data from studies in the western U.S. indicate fishers give birth in mid-March to early April, and breed shortly after. For example, 26 wild caught captive fishers from British Columbia showed a mean parturition date of 31 March (range 23 March-7 April) and a mean date of 12 April for mating (range 5 April – 27 April) (Hall 1942). Seglund (1995) documented a female entering a natal den on 10 April and moving to a maternal den on 26 April where she remained until 2 June. On managed forests in the redwood and redwood/Douglas-fir transition zone it appeared that parturition was occurring in late March (J. Thompson unpub. data). Raley (2002) documented similar dates for radio-collared fishers in the southern Oregon Cascades. In that study females gave birth in late March, bred between late March and early April, and remained in natal dens until kits were about 8 weeks old. Other studies have documented kits remaining in natal dens until 6-10 weeks of age (citations in Powell and Zielinski 1994, Seglund 1995).

Fishers are known to avoid areas of human disturbance. Seglund's (1995) study showed that fisher rest sites occurred >100 m (328 ft) from roads, homes, and campgrounds. However, fishers are frequently observed near roads in the park (RNSP unpub. data). Slauson et al. (2003) detected fishers at road-side track plate stations, including those near Newton B. Drury parkway, and near Alder Camp, Howland Hill Road, and Bald Hills Road. Conversely, Beyer and Golightly (1996) attributed low and high detection ratios at certain sites to proximity of a major highway and limited human access, respectively. From a management standpoint, disturbance

to females with young kits is of primary importance. Seglund (1995) indicated that denning females may be especially vulnerable when disturbed by loud noise near a natal den site. However, the mere presence of humans, for example walking on a trail in suitable denning or resting habitat, under most circumstances would not warrant concern (B. Zielinski pers. comm.).

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

B. Habitat Status

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

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

Fishers require large structures well-distributed throughout the home range for denning and resting; reuse of rest sites is rare (Seglund 1995, Zielinski et al. 2004a). In northwestern California 46% of rest sites were in large live trees and 44% were in large snags and logs, with females using snags more often than males (32% of the time for females versus 18% of the time for males). Large black oaks were often used when available. Zielinski et al. (2004b) determined the best predictors of suitable resting habitat include the presence of large trees (averaging 148 cm dbh), high canopy closure (95%), and the presence of one or more large snags >100 cm dbh. Rest sites in Seglund’s (1995) study area on the Shasta-Trinity National Forest

were within 100 m of perennial, annual, or ephemeral streams, associated with large amounts of down woody debris <12 cm in diameter, had up to four vertical vegetation layers, and were >100 m from human disturbance (a road, house, clearcut, or campground).

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

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

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

A. *Species Account*

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

Detrich and Garcelon (1986) performed surveys to identify suitable nesting habitats throughout coastal California and noted that areas along the coast in Jedediah Smith, Del Norte Coast, and Prairie Creek Redwoods State Parks, along with certain areas in Redwood National Park, offered good to excellent habitat potential. However, at that time no bald eagles were known to nest in RNSP. Field surveys to identify potential nesting activities during the breeding season were begun in 1997 and have continued to the present. In 1997 a nest was located on the ridge just south of the town of Orick and eagles have been present in the territory in every year since then with the exception of 2006 when the nest blew down in a winter storm; the pair built a new nest

near the old site the following year. This pair produced a total of 13 eaglets between 1999 and 2008, although reproduction did not occur in all of those years (Bensen 2009c).

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

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

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

On July 9, 2007 the USFWS published a final rule removing the bald eagle from the list of endangered and threatened wildlife in the lower 48 states (USDI 2007), claiming it recovered. The bald eagle remains protected under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. It remains an endangered species under the California Endangered Species Act.

B. Habitat Status

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

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

VI. IMPACTS TO THREATENED AND ENDANGERED SPECIES

A. Direct Effects

1. Northern Spotted Owl

Helicopter use during the breeding season of the northern spotted owl (February 1 through July 31) has the potential to affect this species. Although flights for some of the activities described in this document would be at least 0.25 mi in altitude, outside the breeding season, or over unsuitable habitat, some law enforcement activities would require lower flights over suitable habitat in the breeding season.

Some VSRP activities (patrolling, border checking, staff orientation, and marijuana spotting) are proposed to occur throughout the year but most often between May and August. Flights for these activities would occur at least ≥ 500 ft above suitable habitat forest canopy, except over state designated wilderness and old growth in state parks outside of wilderness. The US Fish and Wildlife Service's 2006 *Estimating the Effects of Auditory and Visual Disturbance to Northern Spotted Owls and Marbled Murrelets in Northwestern California* indicates helicopter use in an area with low ambient background levels needs to be 0.25 mi distant from suitable habitat to avoid harassment. In previous consultations in the 1990s, Level 1 teams (i.e., for the Forest Service and Bureau of Land Management) determined that helicopters flying between 500 and 1,000 ft above the tree canopy generate noise exceeding ambient background levels. However, this amount of noise disturbance was not considered sufficient to cause adverse behavior modifications such as nest or young abandonment or premature fledging, nor was it considered sufficient to cause actual physical disturbance to the canopy due to rotor wash.

Should a large marijuana garden (grow site) be discovered, eradication and cleanup using a helicopter would occur after September 1, after the breeding for the spotted owl, when the majority of fledglings are capable of flight.

A total of 45 ac (18 ha) of suitable spotted owl habitat occurs within 0.25 mi of 2 of the 7 identified Coast Guard helicopter landing locations (old South Operations Center and Aubell). Landing a helicopter during the breeding season at either of these sites has the potential to generate noise that could affect 30 ac (12 ha) (old SOC) or 15 ac (6 ha) (Aubell) of potentially occupied suitable habitat.

2. Marbled Murrelet

Helicopter use during the breeding season of the marbled murrelet (March 24 through September 15) has the potential to affect this species. Although flights for some of the activities described in this document would be at least 0.25 mi in altitude, outside the breeding season, or over unsuitable habitat, some law enforcement activities would require lower flights over suitable habitat in the breeding season.

Some VSRP activities (patrolling, border checking, staff orientation, and marijuana spotting) are proposed to occur throughout the year but most often between May and August. Flights for these activities would occur at least ≥ 500 ft above suitable habitat forest canopy, except over state designated wilderness and old growth in state parks outside of wilderness. The US Fish and Wildlife Service's 2006 *Estimating the Effects of Auditory and Visual Disturbance to Northern Spotted Owls and Marbled Murrelets in Northwestern California* indicates helicopter use in an area with low ambient background levels needs to be 0.25 mi distant from suitable habitat to avoid harassment. In previous consultations in the 1990s, Level 1 teams (i.e., for the Forest Service and Bureau of Land Management) determined that helicopters flying between 500 and 1,000 ft above the tree canopy generate noise exceeding ambient background levels. However, this amount of noise disturbance was not considered sufficient to cause adverse behavior modifications such as nest or young abandonment or premature fledging, nor was it considered sufficient to cause actual physical disturbance to the canopy due to rotor wash.

Should a large marijuana garden (grow site) be discovered, eradication and cleanup using a helicopter would occur after September 1, the timing of which is based primarily on the availability of the National Guard and CAMP for assistance. In order to remove material from a grow site, trash, hose, plants, etc. are piled in an opening, which could be a garden created by the growers. Eradication and cleanup would require a helicopter to lower and hover below 500 ft of tree canopy in order to hoist the refuse. This would generate noise well above ambient background levels. Depending on the proximity of the grow site to suitable habitat, noise or rotor wash could cause an adult murrelet to flush from a nest site, thus, increasing both the adult and egg or chick to increased predation.

Although multiple gardens comprised the previous 2 large grow sites in the National Park, each of the individual gardens were relatively small (< 1 ac). These openings were surrounded by forest ranging in condition from relatively poor-quality second growth to old-growth. Using the areas of the helicopter pick-up sites from the 2 grows as guides, an area of potential noise impact was calculated by buffering these small polygons out to 0.25 mi. This resulted in an area of approximately 200 ac (81 ha) that, if it contained potentially suitable habitat, could be impacted by helicopter noise disturbance. If a helicopter were used for eradication twice in a season a potential maximum of 400 ac (162 ha) of potentially occupied marbled murrelet habitat would be impacted in each of 10 years. However, the likelihood of reaching this maximum acre figure is low because 1) it is unlikely that grow sites will be established every year, 2) not all of the habitat within the 200 ac area is likely to be suitable for nesting, and 3) given the timing of activities near the end of the marbled murrelet breeding season, few late-nesters are to be expected to be present.

Impacts from rotor wash from a hovering or stationary helicopter occur at a distance of 3 times the diameter of the rotors (Phelps 2010). A Pave Hawk helicopter rotor is 54 ft (16 m) in diameter equating to 182 ft of wash impact. To be conservative this number was rounded up to 200 ft for analyzing the potential area of impact. Buffering the previously used pick-up polygons with 200 ft equates to an area of approximately 8 ac (3 ha) that, if suitable habitat, could be impacted by rotor wash. If a helicopter were used for eradication twice in a season a potential maximum of 16 ac (6.5 ha) of potentially occupied marbled murrelet habitat would be impacted in each of 10 years. These acres would overlap acres impacted by noise disturbance, the one

difference being potential structural damage to parts of the tree canopy caused by rotor wash.

A total of 45 ac (18 ha) of suitable marbled murrelet habitat occurs within 0.25 mi of 2 of the 7 identified Coast Guard helicopter landing locations (old South Operations Center and Aubell). Landing a helicopter during the breeding season at either of these sites has the potential to generate noise that could affect 30 ac (12 ha) (old SOC) or 15 ac (6 ha) (Aubell) of potentially occupied suitable habitat.

3. Marbled Murrelet Critical Habitat

Impacts associated with helicopter use in designated critical habitat would be outside of the breeding season. Flights with the smaller Coast Guard helicopters at altitudes ≥ 500 ft above tree canopy would not generate rotor wash that may result in damage to tree structure.

4. Fisher

Helicopter use during the breeding season of the fisher (March 15 through July 31) has the potential to impact this species. Although flights for some of the activities described in this document would be at least 0.25 mi in altitude, outside the breeding season, or over unsuitable habitat, many law enforcement activities would require lower flights over suitable habitat in the breeding season.

Some VSRP activities (patrolling, border checking, and staff orientation) are proposed to occur throughout the year but most often between May and August. Flights for these activities would occur at least ≥ 500 ft above suitable habitat forest canopy except over state designated wilderness and old growth in state parks outside of wilderness. It has been assumed that helicopters flying between 500 ft and 0.25 mi above the tree canopy generate noise exceeding ambient background levels. However, this amount of noise disturbance is not considered sufficient to cause adverse behavior modifications such as den site abandonment, nor is it considered sufficient to cause actual physical disturbance to the canopy due to rotor wash. No helicopter use below 500 ft would occur during the period when fisher kits are highly dependent. Fishers may abandon rest sites if located in forest adjacent to an eradication site.

5. Bald Eagle

Helicopter use during the breeding season of the bald eagle (January 1 through August 31) has the potential to impact this species. Although flights for many of the activities described in this document would be at least 0.25 mi in altitude, outside the breeding season, or over unsuitable habitat, there would be some activities that require lower flights over suitable habitat in the breeding season. Specifically, these include helicopter use for VSRP activities.

For all VSRP activities, except marijuana eradication and grow site cleanup, park rangers fly with the US Coast Guard. The Coast Guard pilots have been provided with eagle nest site UTM coordinates and will remain a 0.5 mi linear distance away from these sites. It is not anticipated that eradication efforts would take place near the 2 known eagle nests in RNSP. However, if for some reason this were to occur when young eagles were still present in the vicinity of a nest, parks' staff would notify the California Department of Fish and Game.

B. Cumulative Effects

Cumulative effects are those state and private actions similar to the proposed action that may occur in the future that have the potential to impact listed species in the park. Much private timber company land occurs immediately adjacent to park boundaries, and marijuana grows are a problem on these lands. It's possible that helicopter use may be required for eradication activities similar to those described in this document on lands bordering RNSP. Also, some of these lands are scheduled for timber harvest. Logging with helicopters has occurred, and will occur in the future, in forested stands adjacent to the park. However, this activity has been and most likely will continue to be outside the breeding seasons for the species considered in this document (G. Bundros pers. comm.). Thus, noise associated with timber harvest plans adjacent to RNSP is not likely to add to any impacts identified in the effects analyses for this proposed action.

Other low-flying aircraft are known to fly over the parks, especially along coastal areas. These aircraft may fly below 500 ft altitude at times, thus, exacerbating effects of RNSP helicopter use over old-growth forest habitat or up river corridors during the breeding seasons for the bald eagle, marbled murrelet, and northern spotted owl.

VII. DETERMINATION

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

Helicopter use for some VSRP activities (marijuana eradication and clean-up activities) may affect, and is likely to adversely affect, any marbled murrelets occupying as many 445 ac per year over a 10-year period.

Helicopter use for some VSRP activities not related to marijuana eradication and cleanup may affect, but is not likely to adversely affect, the marbled murrelet and northern spotted owl.

Helicopter use will not affect marbled murrelet designated critical habitat.

VIII. MANAGEMENT RECOMMENDATIONS

There are no management recommendations.

XIV. CONTRIBUTORS

Greg Bundros, NPS Geologist, Arcata

Laura Denny, NPS Supervisory Park Ranger, South Operations Center, Orick

Judy Wartella, NPS GIS Specialist, South Operations Center, Orick

Prepared by: Kristin Schmidt, Wildlife Biologist, South Operations Center, Orick

LITERATURE CITED

- Aubry, K.B. and D.B. Houston. 1992. Distribution and status of the fisher (*Martes pennanti*) in Washington. *Northw. Nat.* 73:69-79.
- Aubry, K.B. and J.C. Lewis. 2003. Extirpation and reintroduction of fishers (*Martes pennanti*) in Oregon: implications for their conservation in the Pacific states. *Biol. Conserv.* 114:79-90.
- Bailey, J.D. and J.C. Tappeiner. 1998. Effects of thinning on structural development in 40- to 100- year old Douglas-fir stands in western Oregon. *For. Ecol. and Mgmt.* 108(1998) 99-113.
- Becker, B.H. and S.R. Beissinger. 2006. Centennial decline in the trophic level of an endangered seabird after fisheries decline. *Conserv. Biol.* Vol. 20, No. 2: 470-479.
- Becker, B.H., M.Z. Peery, and S.R. Beissinger. 2007. Ocean climate and prey availability affect the trophic level and reproductive success of the marbled murrelet, and endangered seabird. *Marine Ecology Progress Series* 329:267-279.
- Beissinger, S.R. and M.Z. Peery. 2007. Reconstructing the historic demography of an endangered seabird. *Ecology* 88(2):296-305.
- Bensen, K. 2005. 2005 Bald eagle monitoring, Redwood National and State Parks, Annual Progress Report. Unpubl. report on file at Redwood National and State Parks. 5 pp.
- Bensen, K.J. 2009a. Forest and beach corvid monitoring and management, trail and backcountry management plan implementation – 2009 Progress report. Unpublished report, Redwood National and State Parks, Orick, CA. 21 pp.
- Bensen, K. 2009b. 2009 Bald eagle monitoring, Redwood National and State Parks, Annual Progress Report. Unpubl. report on file at Redwood National and State Parks. 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.
- Blakesley, J.A., A.B. Franklin, and R.J. Guitierrez. 1992. Spotted owl roost and nest site selection in northwestern California. *J. Wildl. Manage.* 56(2):388-392.
- Brand, L.A. and T. L. George. 2001. Predation risks for nesting birds in fragmented coast redwood forest. *J. Wildl. Mgmt.* 64:42-51.
- Buck, S., C. Mullis, and A.S. Mossman. 1994. Habitat use by fishers in adjoining heavily and lightly harvested forests. 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 368-376.
- 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.
- Carey, A.B., J.A. Reid, and S.P. Horton. 1990. Spotted owl home range and habitat use in southern Oregon coast ranges. *J. Wildl. Manage.* 54(1):11-17.
- Carey, A.B., S.P. Courtney, J.F. Franklin, J.M. Marzluff, M.G. Raphael, J.C. Tappeiner, and D.A. Thornburgh. 2003. Managing second-growth forest in the redwood region to enhance marbled murrelet habitat. Scientific panel on restoration of marbled murrelet habitat. Unpub. Rept., Sustainable Ecosystems Institute. 60 pp.
- Detrich, P.J. and D.K. Garcelon. 1986. Criteria and habitat evaluation for bald eagle reintroduction in coastal California. Prepared for Calif. Dept. Fish and Game. Institute for Wildlife Studies, Arcata, CA
- Falxa, G.A., J. Baldwin, D. Lynch, S.K. Nelson, S.L. Miller, S.F. Pearson, M.G. Raphael, C. Strong, T. Bloxton, B. Galleher, B. Hogoboom, M. Lance, and R. Young. 2009. DRAFT Marbled murrelet effectiveness monitoring, Northwest Forest Plan: 2008 summary report. Dated May 28, 2009. 18 pp.
- Foliard, L. 1993. Nest site characteristics of northern spotted owls in managed forests of northwest California. M.S. Thesis, University of Idaho. 114 pp.
- Forsman, E.D., E.C. Meslow, and H.M. Wight. 1984. Distribution and biology of the spotted owl in Oregon. *Wildl. Monogr.* 87, 1-64.
- Fraser, J.D., L.D. Frenzel and J.E. Mathisen. 1985. The impact of human activities on breeding bald eagles in north-central Minnesota. *J. Wildl. Mgmt.* 49(3):585-592.
- 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.
- Golightly, R.T. and P.O. Gabriel. 2009. Marbled Murrelets. Pp. 65-106 *In* Colwell, M.A., T.L. George, and R.T. Golightly [eds.]. A predator management strategy to address corvid impacts on productivity of Snowy Plovers (*Charadrius alexandrinus*) and Marbled Murrelets (*Brachyramphus marmoratus*) in coastal northern California. Final Report submitted to U.S. Fish and Wildlife Service, Arcata, CA. 115 pp.
- Golightly, R.T., C.D. Hamilton, and P.N. Hebert. 2009. Characteristics of marbled murrelet (*Brachyramphus marmoratus*) habitat in northern California. February 2009. National Park Service agreement #J8482060053 and California Department of Fish and Game agreement #'s P018S402 and S0685005. 49 pp.
- Grinnell, J., J.S. Dixon, and J. Linsdale. 1937. Fur-bearing mammals of California. Vol.1, Univ. of California Press, Berkeley.
- Hall, E.R. 1942. Gestation period in fisher with recommendations for the animal's protection in California. *Calif. Fish and Game* 28: 143-147.
- 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.
- Hebert, P.N., H.R. Carter, R.T. Golightly, and D.L. Orthmeyer. 2003. Radio-telemetry evidence of re-nesting in the same season by the marbled murrelet. *Waterbirds* 63:261-265.
- Hebert, P.N. and R.T. Golightly. 2006. Movements, nesting, and response to anthropogenic disturbance of marbled murrelets (*Brachyramphus marmoratus*) in Redwood National and State Parks, California. May 2006. California Dept of Fish and Game, Habitat Conservation Planning Branch Species Conservation and Recovery Program Report: 2006-02. California Dept of Transportation Report: F/CA/IR-2006/04. 321 pp.
- Hunter, J.E., R. J. Gutierrez, and A. B. Franklin. 1995. Habitat configuration around spotted owl sites in northwestern California. *The Condor*. 97:684-693.
- Kuletz, K. 2006. How many fish do murrelets need to raise a chick? Poster presented at Pacific Seabird Group Meeting, February 2006.
- 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.
- Liebezeit, J.R. and T.L. George. 2002. A summary of predation by corvids on threatened and endangered species in California and management recommendations to reduce corvid predation. Unpub Rept. 145 pp.
- Long, L.L., S.L. Miller, C.J. Ralph and E.A. Elias. 2008. Marbled murrelet abundance, distribution, and productivity along the coasts of northern California and southern Oregon, 2005-2007. Report to U.S. Fish and Wildlife Service and Bureau of Land Management, Arcata, CA. 49 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.
- Malt, J.M. and D.B. Lank. 2009. Marbled Murrelet nest predation risk in managed forest landscapes: dynamic fragmentation effects at multiple scales. *Ecological Applications* 19(5): 1274-1287).
- Marzluff, J.M., and E. Neatherlin. 2006. Corvid response to human settlements and campgrounds: Causes, consequences, and challenges for conservation. *Biological conservation* 130:301-314.
- Marzluff, J.M., J.J. Millspaugh, P. Hurvitz, and M.S. Handcock. 2004. Relating resources to a probabilistic measure of space use: forest fragments and Steller's jays. *Ecology*, 85(5): 1411-1427.
- 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.

- 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.
- Miller, S.L. and C.J. Ralph. 1995. Relationship of marbled murrelets with habitat characteristics at inland sites in California. 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.
- Mullis, C. 1985. Habitat utilization by fisher (*Martes pennanti*) near Hayfork Bally, California. M.S. Thesis. Humboldt State University, Arcata, CA 91 pp.
- Peery, M.Z., L.A. Hall, J.T. Harvey, and L.A. Henkel. 2008. Abundance and productivity of marbled murrelets off central California during the 2008 breeding season. Final Report submitted to California State Parks. September 2008. 10 pp.
- Phelps, M. 2010. Helicopter rotor wash can spoil all your plans. [www. flyingmag.com/pilot-technique/tip-week/](http://www.flyingmag.com/pilot-technique/tip-week/)
- 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.
- 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.
- [RNSP] Redwood National and State Parks. 2003. Survey protocol for the northern spotted owl-revised. 20 pp.
- [RNSP] Redwood National and State Parks. 2008. Corvid Management Strategy, Redwood National and State Parks. Unpub. Report on file at Redwood National and State Parks, Orick, CA. 45 pp.
- Ripple, W.J., D.H. Johnson, K.T. Hershey, and E. C. Meslow. 1991. Old-growth and mature forests near spotted owl nests in western Oregon. J. Wildl. Manage. 55(2):316-318.
- Ripple, W. J., P. D. Lattin, K. T. Hershey, F. F. Wagner, and E. C. Meslow. 1997. Landscape composition and pattern around northern spotted owl nest sites in southwest Oregon. J. Wildl. Manage. 61(1):151-158.

- Rosenburg, K.V. and M.G. Raphael, 1986. Effects of forest fragmentation on vertebrates in Douglas-fir forests. *In* Verner, J. M.L. Morrison, and C.J. Ralph (Eds.). *Wildlife 2000: modeling habitat relationships of terrestrial vertebrates*. Univ of Wisconsin Press, Madison. Pages 263-272.
- Schmidt, K. 2010. Spotted owl monitoring and inventory. Redwood National and State Parks, 2009 annual report. On file at South Operations Center, Orick, CA. 18 pp.
- Sealy, S.G. 1972. Adaptive differences in breeding biology in the marine bird family Alcidae. PhD Thesis, University of Michigan, Ann Arbor. 283 pp.
- Seglund, A.E. 1995. The use of resting sites by the Pacific fisher. M.S. Thesis. Humboldt State University, Arcata, CA. 66 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.
- Solis, D.M. Jr. and R.J. Gutierrez. 1990. Summer habitat ecology of northern spotted owls in northwestern California. *The Condor*. 92:739-748.
- 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
- 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. A report by the Interagency Scientific Committee to address the conservation of the northern spotted owl. USDA Forest Service and USDI Fish and Wildlife Service, Bureau of Land Management, and National Park Service. Portland, OR. 141 pp.
- [USDA] U.S. Department of Agriculture and [USDI] U.S. Department of the Interior. 1994. 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, OR: USDA Forest Service and USDI Bureau of Land Management.
- [USDI] U.S. Department of the Interior. 1986. Recovery plan for the Pacific bald eagle. USDI Fish and Wildlife Service. Portland, OR. 160 pp.
- [USDI] U.S. Department of the Interior. 1990. Endangered and threatened wildlife and plants; determination of threatened status for the northern spotted owl; final rule. *Fed. Reg.* 55(123):26114-26194.
- [USDI] U.S. Department of the Interior. 1992a. Endangered and threatened wildlife and plants; designation of critical habitat for the northern spotted owl; final rule. *Fed. Reg.* 57(10):1796-1838.

- [USDI] U.S. Department of the Interior. 1992b. Endangered and threatened wildlife and plants; determination of threatened status for the Washington, Oregon, and California population of the marbled murrelet; final rule. Fed. Reg. 57:45328-45337.
- [USDI] U.S. Department of the Interior. 1996. Endangered and threatened wildlife and plants; final designation of critical habitat for the marbled murrelet; final rule. 50 CFR part 17. Fed. Reg. 61(102):26256-26320.
- [USDI] U.S. Department of the Interior. 2007. Endangered and threatened wildlife and plants; removing the bald eagle in the lower 48 states from the list of endangered and threatened wildlife; final rule. USDI Fish and Wildlife Service. Fed. Reg. 72(130): 37346-37372.
- [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 1986. Pacific bald eagle recovery plan. Portland, OR. 170 pp.
- [USFWS] U.S. Fish and Wildlife Service. 1992. Protocol for surveying proposed management activities that may impact northern spotted owls. Unpub. Doc. on file at Redwood National and State Parks. 17 pp.
- [USFWS] United States Fish and Wildlife Service 1997. Recovery plan for the threatened Marbled Murrelet (*Brachyramphus marmoratus*) in Washington, Oregon, and California. Portland, OR. 203 pp.
- [USFWS] United States Fish and Wildlife Service. 2008. Final recovery plan for the Northern Spotted Owl, *Strix occidentalis caurina*. U.S. Fish and Wildlife Service, Portland, Oregon. xii + 142 pp.
- [USFWS] United States Fish and Wildlife Service. 2009. Marbled Murrelet (*Brachyramphus marmoratus*) 5-Year Review. Washington Fish and Wildlife Office, Lacey WA. iii + 104 pp.
- [USFWS] United States Fish and Wildlife Service. 2010. Draft revised recovery plan for the northern spotted owl, *Strix occidentalis caurina*. U.S. Fish and Wildlife Service, Portland, Oregon. xii + 163 pp.
- Zielinski, W.J. and N.P. Duncan. 2004. Diets of sympatric populations of American martens (*Martes americana*) and fishers (*Martes pennanti*) in California. J. of Mamm.
- 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.
- Zielinski, W.J., R.L. Truex, G.A. Schmidt, F.V. Schlexer, K.N. Schmidt, and R.H. Barrett. 2004b. Home range characteristics of fishers in California. J. Mamm. 85(4):649-657.
- Zielinski, W.J., T.E. Kucera, and R.H. Barrett. 1995. Current distribution of the fisher, *Martes pennanti* in California.
- Zeiner, D.C., W.F. Laudenslayer, Jr., K.E. Mayer, and M. White. 1990. California statewide wildlife habitat relationships system. California's wildlife, 3 volumes. Calif. Dept. Fish and Game, Sacramento, CA

Personal Communication

Keith Aubry. Research Biologist, USDA Forest Service, Olympia, WA
Greg Bundros. Geologist, National Park Service, Arcata, CA
Lowell Diller. Senior Research Biologist, Green Diamond Resource Company, Korbelt, CA
R.T. Golightly, Dept of Wildlife, Humboldt State University, Arcata, CA
Joel Thompson. Wildlife Biologist, Green Diamond Resource Company, Korbelt, CA
Bill Zielinski. Research Ecologist, USDA Forest Service, Arcata, CA



In Reply Refer To:
AFWO-11B0077-11F0076

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



MAY 13 2011

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 Helicopter Use in Redwood National and State Parks
(2011-2020), Humboldt and Del Norte Counties, California

This document transmits the Fish and Wildlife Service's (Service) biological opinion based on our review of the proposed helicopter use in Redwood National and State Parks (Parks), Humboldt and Del Norte Counties, California, and its effect on the federally listed as threatened marbled murrelet (*Brachyramphus marmoratus*), designated critical habitat for the marbled murrelet and northern spotted owl (*Strix occidentalis caurina*), in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*). Your request for formal consultation, dated March 15, 2011, was received on March 17, 2011.

This biological opinion is based on information provided in the March 15, 2011, biological assessment (Redwood National and State Parks 2011) and other sources of information. A complete administrative record of this consultation is on file at this office.

Marbled Murrelet Critical Habitat Determination

The Service has determined that the proposed project may modify, but is not likely to adversely modify critical habitat for the marbled murrelet. For a complete project description refer to the description of the proposed action in the following biological opinion. The following discussion deals only with aspects of the proposed action that apply specifically to critical habitat for the marbled murrelet. On May 24, 1996, the Service designated 3,887,800 acres (ac) (1,573,337 hectares [ha]) of land as critical habitat for the marbled murrelet in Washington, Oregon, and California; 693,200 ac (17.8 percent; 280,528 ha) of this land occurs in northern California (Service 1996). Marbled murrelet critical habitat is not designated on Federal lands in the Parks. Marbled murrelet critical habitat is designated on 175,500 (71,022 ha) acres of State lands in

**TAKE PRIDE[®]
IN AMERICA** 

northern California, approximately 23,445 ac (9,386 ha) of which occurs in the Parks, within marbled murrelet critical habitat units CA-02-a and CA-02-b. Critical habitat units CA-02-a and CA-02-b comprise approximately 13 percent of designated critical habitat for the marbled murrelet on State lands in northern California, approximately 3 percent of designated critical habitat for the marbled murrelet on all lands in northern California, and approximately 0.6 percent of overall designated critical habitat for the marbled murrelet. For critical habitat of the marbled murrelet, the Service identified the following features essential to the conservation of the species (primary constituent elements): individual trees with potential nesting platforms; and (2) forested areas within 0.5 miles of individual trees with potential nesting platforms, with a canopy height of at least one-half the site-potential tree height.

The Service has determined that the proposed action may modify, but is not likely to adversely modify designated critical habitat for the marbled murrelet. Our determination is based on the following factors:

1. Trees with potential nesting platforms will not be removed;
2. Based on height restrictions of hovering helicopters over State Parks lands in the Park, infrequent rotor wash events from hovering helicopters are not likely to exceed natural wind events, both in terms of air velocities generated and effects to limbs and tree tops in the old-growth forest canopies.

Northern Spotted Owl Determination

The Parks determined that the proposed project may affect, but is not likely to adversely affect, the northern spotted owl. The following discussion deals only with aspects of the proposed action that apply specifically to the northern spotted owl. For a complete project description, refer to the biological assessment and the description of the proposed action in the following biological opinion.

Surveys for northern spotted owls have been conducted throughout the Parks for the past 17 years. As many as 40 northern spotted owl territories were identified in the Parks during from 1993 through 1995. As of 2010, northern spotted owls were relocated in five of these historic sites, although since then northern spotted owls have gone undetected in at least two of these territories. Numbers of barred owls (*Strix varia*) in the Parks have increased over the last several years. As of 2009, barred owls have been observed in 31 (79%) of the known northern spotted owl territories within the Parks, and an additional 20 barred owl sites have been located apart from any known historic northern spotted owl activity centers.

Approximately 41,000 ac (16,000 ha) of old-growth forest in the Parks is considered suitable for nesting, roosting and foraging by northern spotted owls. Approximately 35,000 ac (14,164 ha) of second-growth forest is now greater than 40 years old and may be suitable nesting, roosting, and foraging habitat. Helicopter flights could occur over any of the aforementioned suitable or potentially suitable habitat for the northern spotted owl.

The Service concurs with your determination that the proposed project may affect, but is not likely to adversely affect the northern spotted owl, based on the following factors:

Disturbance

- Noise generated by helicopters may occur within 0.25 mile (mi) of nesting and roosting habitat from February 1 through July 31, but the helicopter flights will be infrequent, and will likely not adversely affect nesting northern spotted owls.

Habitat

- Habitat suitable for nesting, roosting, and foraging will not be affected by the infrequent helicopter flights.

Direct Injury

- Helicopters conducting surveys or landing to investigate illegal marijuana (*Cannabis sativa*) growing activities are not likely to encounter northern spotted owls, which are largely inactive and confined to forested areas during the day. Therefore, no direct injury or death of northern spotted owls is anticipated.

The northern spotted owl will not be addressed further in this biological opinion (except in “Conservation Recommendations”) and, unless new information reveals effects of the proposed action that may affect this species in a manner or to an extent not considered, no further action pursuant to the Act is necessary relative to the northern spotted owl. The following biological opinion will deal only with impacts to the marbled murrelet.

Consultation History

On June 27, 2001, the Service issued a biological opinion (1-14-2001-888) on helicopter use in the Parks, from 2001 through 2010. The Parks intends to continue the use of helicopters for various purposes, from 2011 through 2020. Service staff biologist Bill McIver discussed the continuation of this project with Kristin Schmidt, of your staff, on November 3, 2010, and provided informal comments on a draft biological assessment on February 1, 2011.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

The Parks propose to use helicopters to conduct a variety of park management activities during the period from 2011 through 2020, as described below. Helicopters flown by the U.S. Coast Guard, California Department of Forestry (CAL FIRE), California Campaign Against Marijuana Production (CAMP), the National Guard, and private contractors may be used. Helicopter use will occur over the next 10 years (through 2020), unless new information becomes available that would require an amendment to the biological opinion, or reinitiation of consultation, prior to that time.

Geology

The Geology Branch proposes to use helicopters to photograph and monitor watershed

conditions within the Redwood Creek basin inside of, and upstream beyond, the National Park boundary. Flights would occur any time of year, but especially after large storms as these events trigger widespread erosion and the need to assess storm damage throughout the watershed. Helicopter flights also would be used to monitor timber harvest activities upstream of the parks in Redwood Creek. In general, it is anticipated that Geology Branch flights would occur 1 to 2 times in a given year. Between 1 January and 15 September, flights would occur at altitudes greater than 500 feet above forested stands in the national park that contain suitable threatened and endangered species habitat.

Fire Management

Aerial ignition for prescribed burn units was covered under the Fire Management Plan Biological Assessment, dated August 4, 2009. Any helicopter use for wildland fire suppression would be addressed using emergency consultation procedures.

Visitor Services and Resource Protection

Within the National and State Parks

Visitor Services and Resource Protection (VSRP) staff require the use of helicopters for park boundary checking, patrol, search and rescue (SAR), new personnel orientation, supplies and materials transport, spotting marijuana gardens, and marijuana eradication and cleanup activities. Due to the unpredictable nature of SAR operations, and the need to respond quickly, emergency consultation procedures would be used when a SAR operation may impact a federally listed species.

Landing sites that may be used by Coast Guard and other small-medium size helicopters in association with VSRP activities are High Bluff Overlook, old South Operations Center (old SOC), Schoolhouse Peak, William's Ridge, the fields at Aubell (North Operations Center), Crescent Beach, and Crescent Beach Environmental Center (CBEC). National Guard or CAMP helicopters used during marijuana eradication may need to land in any safe landing location; however, given the large size of these aircraft, the most likely staging locations would be at one of the Bald Hills prairies.

Flights would stay greater than 500 feet above ground or forest canopy for most VSRP activities, including border checking, patrolling, orientation, supplies and materials transport, and marijuana spotting, except when flying over certain areas in the State Parks (see *Within State Parks* section below). Routine patrols of the State Parks would occur with the frequency of one flight per month in May, June, July, August, and September (Table 1).

Park rangers and helicopter pilots will be made aware of the locations of known bald eagle nests and peregrine falcon eyries and have been requested to maintain a 0.5-mile (805 meters) radius buffer around a nest site during the nesting season (January 1 to August 31). This is the recommended exclusion zone for low-flying aircraft provided in the Pacific Bald Eagle Recovery Plan (Service 1986). If suspicious activity is suspected within one of these restricted areas and a closer approach by a helicopter is necessary, park biologists will be notified and will initiate discussions with California Department of Fish and Game (CDFG) and Service. No flights will take place away from the coast over near shore marine environments, or along coastal bluffs.

At the end of each year, flight logs will be provided to the Parks wildlife biologist indicating dates, times, and locations of flights.

Within the National Park

VSRP staff fly with the U.S. Coast Guard for the purpose of detection of marijuana grow operations. Coast Guard helicopters are H-65 “Dolphins,” mid-sized aircraft that fly relatively fast and do not hover. Helicopters would remain greater than 500 feet above tree canopy to log the locations of grow sites, and would fly within the marbled murrelet daily restriction period (between 2 hours after sunrise and 2 hours before sunset). Spotting would require flights once or twice per month beginning in May (Table 1), and could occur over suitable marbled murrelet habitat.

Materials removed from a grow site, such as trash, hose, plants, etc., will be piled in a forest opening (e.g., within a garden created by the growers). Marijuana eradication and cleanup will be accomplished by staging a helicopter at one of the known landing sites, flying to the grow site, hovering to hoist the material, and returning to the landing. As much work would be done from the ground as is possible.

Marijuana eradication will be accomplished with assistance from the National Guard and/or CAMP. National Guard helicopters are large Sikorsky “Pave Hawk” single-rotor military helicopters. In order to remove material from marijuana grow sites, helicopters must lower to near ground level, or at least below 500 feet above tree canopy. This type of helicopter use would generally take place in association with large (multiple acre) grow sites and if there were no alternative means of conducting the eradication and cleanup operations from the ground. The need to hover below 500 feet and/or land for marijuana eradication would take place after September 1st (Table 1). During eradication, flights would avoid suitable marbled murrelet habitat by maintaining as direct a flight line as possible, at 0.25 mile altitude, between the landing location and the marijuana grow site. In order to minimize adverse impacts associated with marijuana eradication and cleanup, flying or hovering anywhere between 500 feet of old-growth forest canopy and near ground level would be allowed to occur no more than twice during the breeding season, *and only when other options to clean up the site do not exist*.

The exact location(s), date(s), and amount of suitable marbled murrelet habitat potentially or actually affected by a helicopter during eradications would be reported in the Parks annual incidental take report to the Service. Based on the previous formal consultation and biological opinion for helicopter use in the Parks, the size of marijuana grow sites recently found in the Parks, and recent GIS analyses, the Parks estimate that, per landing, a large helicopter landing at a marijuana grow site could affect marbled murrelets occurring within approximately 1,665 feet (200-acre area) of the grow site.

Within the State Parks

The following conditions would be applied for all flight activities over state park lands within the partnership. Aircraft flying over State wilderness areas must maintain a minimum altitude of 2,000 feet (610 meters) above the ground. Maps showing the areas included in designated wilderness in Prairie Creek and Jedediah Smith Redwoods State Parks have been provided to the Coast Guard, as well as VSRP rangers.

Aircraft flying over old-growth habitat outside of state wilderness areas must maintain a minimum altitude of 0.25 mile (402 meters) above tree canopy from March 24 through September 15. During the period of September 16 through March 23, aircraft must maintain a minimum altitude of 500 feet above tree canopy.

Minimum flight altitudes may be modified if marbled murrelet surveys conducted to the accepted protocol at the time of surveys indicate that marbled murrelets are not present within old-growth stands and upon subsequent review and written approval by the CDFG and Service.

Flights for marijuana spotting in state parks may occur greater than 500 feet above second-growth forest tree canopy during the breeding seasons for the spotted owl and marbled murrelet. If a marijuana garden is located, a helicopter may not be used for marijuana eradication purposes if old-growth forest occurs within 0.25 mile of the grow site or within 2,000 feet of a state park wilderness area.

Table 1. Months required for flight, flight height, and need to land in a location other than a designated heliport.

VSRP Activity	Flight Months	Flight Height	Need to Land
Border Checking	May-Aug.	≥500 feet	No
Patrol	May-Aug.	≥500 feet	Maybe
Marijuana Spotting	May-Oct.*	≥500 feet	No
Marijuana Eradication	Aug-Nov.*	<500 feet	Yes
Orientation	Jan.-Dec.*	≥500 feet	No
Supp./Mat. Transport	Jan.-Dec.	≥1,320 feet	No

¹ “Need to land” means landing in a place other than a designated heliport.

* Some restrictions apply in state park lands, see text.

Recovery Measures

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

STATUS OF THE SPECIES

Legal Status

The Service listed the marbled murrelet as a threatened species in Washington, Oregon and California on September 28, 1992 (57 Federal Register (FR) 45328). The final recovery plan was released in 1997 (Service 1997; also referred to as Recovery Plan). The species is state-listed as endangered in California and as threatened in Oregon and Washington (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 2004).

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 (73 FR 57314). 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 federally listed and retains its' protected status as a threatened species under the Act.

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 (Service 2009).

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 for the Marbled Murrelet* (*Brachyramphus marmoratus*) *Washington, Oregon, and California Populations* (Recovery Plan) (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* (U.S. Forest Service [USFS] and Bureau of Land Management [BLM] 1994); 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 (57 FR 45328). Limited information is available on their historic distribution and numbers; however, most summaries give indications that the distribution of 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" (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 inter-annual 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 murrelets may temporarily pair up with other foraging individuals or non-mates (Strachan *et al.* 1995; Speckman *et al.* 2003).

Marbled murrelets undergo two molts each year, the timing of which 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 in 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, 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 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 showed that most birds remained near their nesting areas immediately following molt, afterwards dispersed greater than 100 miles (mi) (161 kilometers [km]) 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 (ft) (1530 meters [m]) (Burger 2002). However, most nests have been found below 3,500 ft (1067 m). 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 mi (84 kilometers [km]) from the coast. However, marbled murrelets have been detected up to 70 mi (113 km) 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 mi (5 km) 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 breeding colonies that are typical for most seabirds. Limited evidence suggests they may form loose colonies or clusters of nests in some cases (Ralph *et al.* 1995b). The species relies on cryptic coloration to avoid detection, which suggests that marbled murrelets 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, which suggest that 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; Hébert *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 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 murrelets averaged 10 mi (16 km) in Prince William Sound, Alaska (McShane *et al.* 2004), 24 mi (39 km) in Desolation Sound, British Columbia, and 48 mi (77 km) in southeast Alaska (Hull *et al.* 2001). In California, Hébert *et al.* (2003b) found the mean extent of north-south distance traveled by breeding adults to be about 46 mi (74 km).

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 (Service 1997). However, 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 (Service 1997). Murrelets are estimated to live an average of 10 years (Beissinger 1995). Murrelets produce one egg per nest and usually only nest once a year, however re-nesting is documented (Hébert *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 (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).

After a female marbled murrelet lays an egg, the breeding pair begins 24-hour shifts of incubation duty; adults exchange incubation duties at dawn and dusk (Nelson and Hamer 1995a, Hébert and Golightly 2006). During the breeding season, peak periods of inland activity (*i.e.*, flights to and from old-growth nesting forests stands) of adults occur at dawn and dusk (Mack *et al.* 2003). Circling is common flight behavior over occupied forest stands (Paton 1995). 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). 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 (Hébert and Golightly 2006). 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 (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 (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 (57 FR 45328). 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 (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 (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 murrelet nests decreased from 95 percent to 50 percent when visitors and 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 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 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 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, Hébert *et al.* (2003a) examined the effects of operating chainsaw noise during incubation and chick rearing periods on nesting adult murrelets and chicks. Adult 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. 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 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 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 murrelet populations (61 FR 26256). 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 Oil Pollution Act (33 U.S.C. 2701-2761) in 1990, 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 murrelets feed and prey species concentrate (Fry 1995). However, murrelet exposure is likely a rare event because 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 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 murrelet prey species have little commercial fishery value.

Oceanographic variation can also influence prey availability. While the effects to 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. Marbled 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 (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 (Service 1997).

In order to achieve the recovery objectives, the following short-term conservation actions are needed (Service 1997): (1) maintain all occupied nesting habitat on Federal lands administered under the NWFP (USFS and BLM 1994); (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 (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 (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 mi (1.9 km) 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 (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 mi (1.9 km) 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 (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 mi (1.9 km) 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 (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 (USFS and U.S. BLM 1994). 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 murrelet population that is well distributed on Federal lands throughout the planning area" (Service 1994). 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 (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 (USFS and BLM 1994; 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 (91 m) 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 (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 (Service and National Marine Fisheries Service 1998).

Marine environment

The following two marine areas in California support the highest concentrations of marbled murrelets during the breeding season: 1) nearshore waters (within 1.2 mi [1.9 km] 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 mi [1.9 km] 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 (Service 1997). All other coastal areas between these concentration areas are also used by marbled murrelets, especially in winter, including nearshore waters south of Zone 6 to the U.S.-Mexican border (Service 1997).

In the California Current, seabirds 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 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 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 ac of which approximately 155,000 ac (62,726 ha), or 7 percent, are classified as remnant habitat (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 ac; Oregon, approximately 800,000 ac; and California, approximately 400,000 ac (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, spotted owl habitat was used as a surrogate for 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 murrelet habitat on Federal land by prohibiting timber harvest of occupied murrelet habitat, regardless of the land allocation (USFS and BLM 1994). 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

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 un-surveyed areas. At least 483,919 ac (195,835 ha) of potentially occupied marbled murrelet habitat exist within the listed range of the species (Table 2); 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 ac (809,000 ha) of suitable habitat likely overestimates the amount of actual occupied marbled murrelet habitat (Service 2003). For example, about 100,000 ac (40,468 ac) of late-seral forests occur on the Siskiyou and Rogue River National Forests and the Medford District of the BLM. 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 (Service 2003).

Approximately 68,000 ac (27,519 ha) of occupied marbled murrelet habitat occur in the California portion of Zone 4 (Table 2). 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 ac (145,687 ha) of potentially suitable habitat far exceeds the estimated 68,000 ac (27,519 ha) of occupied habitat (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 *at 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 ac (174 ha) of habitat in Zone 5 and 7,250 ac (2,934 ha) 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 (Service 1997). In the early to mid-1800s, Western Washington and Oregon contained 14 to 20 million ac (6 to 8 million ha) of old-growth forest, compared to about 3.4 million ac (1.4 million ha) in 1991. This loss of habitat represents a reduction of 82 percent (Service 1997). About 1.3 million to 3.2 million ac (526 thousand to 1.3 million ha) of old-growth Douglas-fir/mixed conifer and 2.7 million ac (1.1 million ha) of old-growth redwood forests occurred in northwestern California during the early to mid-1800s (Service and NMFS 1999).

Table 2. Estimated acreage of potentially occupied marbled murrelet nesting habitat at various landscape scales within the species' listed range (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.

Between 1992 and 2003, the loss of suitable murrelet habitat totaled 22,398 ac (9,064 ha) over the three-state area, of which 5,364 ac (2,171 ha) resulted from timber harvest and 17,034 ac (6,893 ha) 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 murrelets are not currently distributed continuously throughout the forested portions of Washington, Oregon, and California. A gap of 100 mi (161 km) in the north/south distribution of suitable habitat exists in southwestern Washington and northwestern Oregon, and a north/south gap of 300 mi (483 km) 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 murrelets occur in low numbers. The inland distribution is greatest in Washington at about 50 mi (80 km) from the marine environment; it narrows down in Oregon; and it declines to as close as 10 to 15 mi (16 km to 24 km) from the coast in California.

Habitat Quality. Overall, the quality of existing murrelet habitat has diminished, compared to conditions which existed prior to logging (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 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 (Service 1997).

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; Peery and Henry 2010; G. Falxa, personal communication 2011) (Table 3). 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: 18,571 birds (year 2000); 22,180 birds (2001); 23,673 birds (2002); 22,217 birds (2003); 20,578 birds (2004); 20,223 birds (2005); 18,622 birds (2006, excluding Zone 5); 17,354 birds (2007); 17,790 birds (2008); 17,630 birds (2009); and 16,570 (2010) (Table 3).

The NWFP Interagency Regional Monitoring Program consists of personnel from several Federal agencies and nonfederal entities, and has evaluated the trends for zones 1-5 with all data (2000-2007) and a separate analysis evaluating the trend but 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 murrelet population, both in the short- and long-term (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 (Hébert *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 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 M/V Kure spill was “probably fifteen times higher than the known mortality of ten murrelets” (Ford *et al.* 2001). The M/V Kure oil spill occurred in September 1997 in Humboldt Bay, spilling approximately 4,500 gallons of intermediate fuel oil, and killing an estimated 130 marbled murrelets (CDFG 2008). The Stuyvesant Oil Spill occurred in September 1999 at the entrance to Humboldt Bay, spilling at least 2,100 gallons of intermediate fuel oil and killing an estimated 135 marbled murrelets (CDFG 2007). 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 (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 (Peery and Henry 2010). 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, and that this decline continued in 2008 (Peery and Henry 2010). However, surveys conducted in 2009 suggest that local abundance was similar 1999-2003 levels, perhaps due to immigration of marbled murrelets from other areas (Peery and Henry 2010). Although Zone 6 is highly vulnerable, it was expected to contribute to recovery of the species in the short-term (*i.e.*, 50-100 years) (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 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* 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

Table 3. Marbled murrelet population estimates and associated 95 percent confidence intervals, based on at-sea surveys conducted in Conservation Zones within the listed range of the species. Confidence intervals are shown in brackets. Dashes indicate no data collected.

	Conservation Zone							
Year	1	2	3	4	5	6	1-5	1-6
2000	5,637 [2,998-17,596]	1,252 [727-15,959]	6,724 [3,955-14,631]	4,880 [3,535-9,299]	79 [11-259]	496 [ND]	18,572 [13,410-21,205]	NA
2001	8,936 [5,536-12,583]	1,738 [575-3,888]	7,538 [5,341-9,292]	3,851 [2,919-6,532]	117 [14-259]	661 [556-786]	22,180 [17,596-24,518]	22,841 [NA]
2002	9,717 [6,075-14,027]	2,619 [565-3,784]	6,271 [3,957-10,060]	4,816 [3,608-6,247]	250 [30-412]	683 [561-832]	23,673 [18,063-26,390]	24,354
2003	8,495 [5,740-11,708]	3,314 [1,959-5,039]	5,866 [3,895-7,550]	4,495 [3,437-6,710]	48 [0-88]	699 [567-860]	22,218 [18,063-24,337]	22,917 [NA]
2004	5,473 [2,959-7,438]	3,071 [1,742-4,596]	7,781 [5,885-9,763]	4,952 [3,813-9,360]	88 [19-208]	---	21,366 [16,989-23,599]	---
2005	7,956 [4,784-11,589]	2,492 [1,629-3,642]	5,843 [3,618-7,309]	3,642 [2,680-5,955]	289 [117-453]	---	20,222 [15,959-24,487]	---
2006	5,899 [4,013-8,208]	2,381 [1,672-3,430]	6,375 [4,569-7,429]	3,968 [3,168-5,467]	---	---	18,623 [15,681-21,563]	---
2007	6,985 [4,105-10,382]	2,525 [1,271-3,811]	3,996 [2,714-5,929]	3,791 [2,687-7,342]	57 [26-105]	378 [238-518]	17,354 [12,800-19,678]	17,732 [NA]
2008	4,699 [3,132-6,201]	1,944 [1,187-2,843]	6,176 [4,175-7,903]	4,850 [3,688-7,325]	121 [0-242]	174 [91-256]	17,790 [14,631-20,952]	17,964 [NA]
2009	5,623 [3,922-8,352]	1,266 [751-1,881]	5,890 [3,847-7,969]	4,851 [3,575-7,153]	---	631 [449-885]	17,630 [14,204-21,298]	18,261 [NA]
2010	4,393 [2,689-6,367]	1,286 [650-1,946]	7,223 [4,605-9,520]	3,668 [2,196-6,140]	---	ND	16,570 [13,075-20,307]	

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 4 lists the four latest murrelet Leslie Matrix models and the values for common demographic parameters used in each.

Table 4. The estimated values for demographic parameters used in four population models for the marbled 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

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* 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 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 (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 mi (161 km).

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 (483-km) 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 (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 marbled 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 murrelets to disturbance stimuli may reduce productivity of the nesting pair, as well as the entire population (Service 1997).

Disease

Though little is known about the potential impact of diseases and biotoxins on murrelets, there is a possibility that 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).

ENVIRONMENTAL BASELINE

Regulations implementing the Act (50 CFR 402.02) define the environmental baseline as the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed State or Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation process.

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

Conservation Strategy

The Parks are located in marbled murrelet 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 (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 (Service 1997). It also recommends considering the need to maintain high quality marbled murrelet habitat when planning recreational projects in the Parks. Recreational facilities may present threats to murrelets through loss of habitat, nest disturbance, and/or increased predation from corvids (Service 1997).

The Parks’ conservation strategy identifies the following management goals for marbled murrelets (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 marbled murrelet recovery goals (Parks 2003): 1) implement short-term actions that protect and restore habitat; 2)

coordinate research to increase knowledge of marbled murrelets; and 3) treat the Parks' greater than 50,000 ac (greater than 20,234 ha) of second-growth forest to increase the amount, quality, and distribution of nesting habitat.

Current Condition

Habitat: Amount, Distribution, and Quality

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

The old-growth forests in the Parks are fragmented with only three stands containing more than 5,000 ac (2,023 ha). The majority (83 percent) of the old-growth stands are 100 ac (40 ha) or smaller in size with 31 percent of the stands less than 5 acres in size. In 2001 and 2002, 25 marbled murrelet nests were located in the Parks' contiguous old-growth stands (Hébert *et al.* 2003a). All of the known marbled murrelet nests are located in contiguous stands of old-growth (Hébert *et al.* 2003a).

The Parks also contain over 50,000 ac (20,234 ha) of second-growth coniferous forest that are currently unsuitable nesting habitat. Over 90 percent of these stands were clearcut after 1940; therefore, it is unlikely even under the most optimistic scenario that these stands will provide additional nesting habitat for more than a century.

Population: Numbers, Distribution, and Reproduction

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 (Hébert *et al.* 2003b). In 2000, the marbled 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).

Project-specific surveys have not been conducted in the action area. However, 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, marbled 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 a radio-telemetry study of marbled murrelets in the Parks, in 2001-2003, Hébert and Golightly (2006) reported breeding success (fledglings that depart from the nest site per egg-laying pair per year) values of 6.6 to 20 percent, for 30 nests not exposed to experimental noise disturbance. Reduced reproductive success in their study was influenced primarily by failures during incubation, and predation by corvids (*i.e.*, Steller's jays, common ravens) was implicated as a major source of nest failure. In central California, from 2001 through 2002, Peery *et al.* (2004) reported complete reproductive failure for seven marbled murrelet nests in the Santa Cruz Mountains. In their study, five of these nests failed during incubation and avian predation was the known or suspected cause of failure for six nests. In addition, from 1989 through 2002, Peery *et al.* (2004) reported three successful marbled murrelet nests (years 1991, 1992 and 1996) and nine unsuccessful nests in the Santa Cruz mountains; avian predation was the known or suspected cause of failure for all of the unsuccessful nests. In a radio-telemetry study of marbled murrelets in Desolation Sound, British Columbia, Canada (not part of the listed distinct population segment), from 1998 through 2001, Bradley *et al.* (2004) estimated overall breeding success of 46 percent, assuming 95 percent of adults bred, and reproductive success of 38 percent, assuming 80 percent of adults bred.

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

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

Previous Federal Actions near the Action Area

From 1995 through 2010, the Service issued 28 non-jeopardy biological opinions, including amendments, to the Parks that evaluated the effects upon the marbled murrelet of various activities in the action area (Table 5). The Service is not aware that any marbled murrelets were harmed as a result of these projects.

EFFECTS OF THE ACTION

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

In past consultations, we have determined that noise disturbance, human activity or presence, and/or habitat loss or degradation may adversely affect the marbled murrelet. The effects analysis detailed below discusses the manner in which the proposed action may affect the marbled murrelet.

1. Habitat Removal or Degradation

The proposed action has the potential to degrade suitable marbled murrelet habitat. Rotor wash is defined as the air turbulence caused by the rotating main rotor(s) of a helicopter, and could potentially damage branches and trunk reiterations in the redwood canopy that form horizontal platforms that could be used for nesting by marbled murrelets. Rotor wash spreads outward in all directions approximately three times the diameter of the main rotor of a helicopter, and the velocity of the downwash reaches a maximum about two rotor-diameters below the rotor disc (wikiRFM 2009; Phelps 2010). The type of helicopter that might hover during marijuana eradication activities (*i.e.*, Pave Hawk helicopter) is equipped with a main rotor approximately 54 ft (16 m) in diameter, and rotor wash velocities of 100 mi per hour (161 km per hour) have been reported for hovercraft of this size. Suter (2005) reported that a UH 60 Black Hawk helicopter (similar in size to a Pave Hawk) hovering at 160 ft (49 m) altitude would produce a vertical down wash of air measuring about 30 mi per hour (48 km per hour), as measured from the ground. Based on an analysis of air velocities associated with rotor wash from helicopters of the types likely to be used in the Parks, Redwood National and State Parks (2011) estimates that approximately 16 ac of potentially occupied marbled murrelet habitat could be affected (*i.e.*, broken tree tops, broken limbs) by rotor wash in each year, from 2011 through 2020, as a result of helicopter hovering activities.

According to climatological data for Eureka, California (located approximately 30 mi [48 km] south-southwest of the Parks), peak wind gusts over 60 mi per hour (97 km per hour) have been recorded during each month from November to April over the course of an 83-year period (Lorimer *et al.* 2009). Severe winter storms are common in the Parks and contribute to the complexity of redwood canopies by snapping tops and branches (Lorimer *et al.* 2009).

Table 5. Twenty-eight formal consultations between the Service and the Parks that evaluated effects upon the marbled murrelet of various activities in the Parks, from 1995 through 2010.

	Date Issued	Consultation #	Subject
1	06/26/1995	1-1-95-F-78	Howland Hill Road Annual Maintenance Project, Jedediah Smith Redwoods State Park.
2	02/07/1996	1-1-95-F-147	“Jammin’ at Jed” Jazz Concert, Jedediah Smith Redwoods State Park.
3	05/09/1997	1-14-97-F-7	Repair of the Mill Creek Road and Campground
4	06/06/1997	1-14-97-F-8	Repair of the Tall Trees Access Road (C-line east side)
5	07/07/1997	1-14-97-F-10	Repair of the A-9 and B-5 Roads and the 6-Hour Loop Horse and Tall Trees Trails
6	05/19/1998	1-14-98-112	Howland Hill Road Annual Maintenance Project, Jedediah Smith Redwoods State Park: Amendment to Biological Opinion #1-1-95-F-78
	06/18/1998	1-14-98-133	Redwood National and State Parks’ Trail Maintenance Projects
7	06/24/1998	1-14-98-24	Redwood National and State Parks’ Annual Maintenance Activities
8	07/20/1998	1-14-98-134	Redwood National and State Parks’ Watershed Restoration Program
9	07/21/1998	1-14-98-145	Construction of the Skunk Cabbage Memorial Groves Trail
10	03/23/1999	1-14-98-208	Emergency Formal Consultation on Redwood National and State Parks’ Rescue of a Front-end Loader on Howland Hill Road, April 13, 1998.
11	05/10/1999	1-14-98-112	Annual Grading and Re-engineering/Re-profiling Along the Howland Hill Road in Jedediah Smith Redwoods State Park
12	06/10/1999	1-14-99-76	Hazard Tree Removal in Jedediah Smith Redwoods State Park
13	07/01/1999	1-14-99-133	Stream Restoration and Trailhead Development Project at the Old B-Mill Deck Site in Redwood National Park
14	04/02/2001	1-14-2001-888	Helicopter Use in Redwood National and State Parks
15	07/12/2001	1-14-1998-134	Redwood National and State Parks’ Watershed Restoration Program
16	08/02/2001	1-14-2001-1010	Watershed Restoration Program in Portions of Lost Man Creek Watershed
17	07/08/2003	1-14-2001-1010	Amendment to Biological Opinion Issued on the Watershed Restoration Program in Portions of Lost Man Creek Watershed
18	07/19/2004	1-14-2004-2083	Emergency Redwood Complex Wildland Fire Suppression
19	07/11/2005	8-14-2005-2558	Formal Consultation on the Mill Creek and Lost Man Creek Trails Culvert Replacement Projects
20	10/17/2005	8-14-1998-0134	Three Year Extension Watershed Restoration Program
21	03/24/2006	8-14-2006-2836	Lost Man Creek Erosion Control and Disturbed Land Restoration Plan
22	04/02/2006	8-14-2006-2836	Amendment to the Biological Opinion Issued for the Lost Man Creek Erosion Control and Disturbed Land Restoration Plan
23	01/29/2007	8-14-2003-1517	Trail and Backcountry Management Plan, Redwood National and State Parks
24	05/29/2007	8-14-2006-2836	Second Amendment to the Biological Opinion Issued for the Lost Man Creek Erosion Control and Disturbed Land Restoration Plan

Table 5. (continued)

	Date Issued	Consultation #	Subject
25	05/31/2007	8-14-2003-1517	Trail and Backcountry Management Plan, Humboldt and Del Norte Counties: Amendment to Biological Opinion
26	10/25/2007	8-14-2004-2133	South Fork of Lost Man Creek Second Growth Forest Management Plan
27	06/18/2009	81331-2008-F-0130	Maintenance Program in Redwood National and State Parks
28	12/04/2010	81331-2010-F-0008	Third Amendment to the Biological Opinion Issued for the Lost Man Creek Erosion Control and Disturbed Land Restoration Plan

Gale-force (35 to 45 mi per hour) (56 to 72 km per hour) winds in the redwood canopy cause major trunk reiterations to sway substantially (Sillett and Van Pelt 2000). Based on these observations of frequent natural wind events in redwood forests, infrequent (twice per year and over a 10-year period) rotor wash events less than 30 mi per hour (48 km per hour) are not likely to not cause significant damage to old-growth tree tops and branches in the redwood canopy.

2. Disturbance of Breeding Activity

Disturbance is defined as noise in excess of ambient levels in or near (generally within 0.25 mi [0.40 km]) suitable nesting habitat or as the reaction of nesting birds to human presence or activity, resulting in disruption of essential breeding behaviors or predation. Disturbance during the breeding season (defined as March 24 through September 15 for marbled murrelets) may potentially disrupt the species' essential breeding behaviors by: 1) causing abandonment of the breeding effort by failure to initiate nesting or to complete incubation; 2) disrupting nesting activity such as feeding young; and 3) causing premature dispersal of juveniles. In addition, disturbance may result in increased predation of young or adults.

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

Data on breeding phenology dates have shown that marbled murrelets in California have the longest breeding period in North America with incubation commencing on March 24, incubation ending on August 13, and the nestling period beginning April 23 and ending September 9

(Hamer and Nelson 1995). For marbled murrelet populations throughout North America, data show that approximately 84 percent of young have fledged from their nests by August 18 (Hamer and Nelson 1995). The proposed marijuana spotting and eradication activities may involve helicopters flying and hovering below 500 ft (152 m) above the canopy, so rangers can obtain a better view. The need to hover below 500 ft (152 m) and/or land for marijuana eradication would take place after 1 August in each year, near the time when most of the young have fledged.

Flying or hovering within 500 ft (152 m) of suitable marbled murrelet habitat will not occur on more than two occasions per year during the marbled murrelet breeding season and will only occur if no other ways exist to effectively handle the situation. The flights will take place from May through October. Eradication activities may also require landing of a helicopter at one of the known landing sites or other safe locations during August through November; however, this will only occur if no alternative ways exist to conduct the operation from the ground. Two of the known landing sites are located within 0.25 mi (0.40 km) of suitable marbled murrelet habitat (South Operations Center - 30 ac [12 ha]; fields at Aubell - 15 ac [6 ha]).

Helicopters flying near and over old-growth forests during hours of peak inland flight activity of marbled murrelets (*i.e.*, dawn and dusk) have the potential to collide with marbled murrelets. Limiting the hours of flight-time for helicopters used to detect marijuana grow operations in Redwood National Park to the time period of 2 hours after sunrise to 2 hours before sunset would minimize this risk. If this measure were applied across the Parks (*i.e.* also over State Park lands) and pertained to all types of helicopter flights, then potential effects to marbled murrelets would be further minimized.

Helicopters produce visual, acoustic, and air disturbances that may negatively affect marbled murrelet nesting success. Helicopters may result in greater disturbance impacts to marbled murrelets than other management activities, such as the use of chainsaws and heavy equipment, because low-flying helicopters are seldom screened from nesting areas, and to the marbled murrelet, they may resemble a flying predator (Hamer and Nelson 1998). Disturbance to nesting marbled murrelets would most likely be a one-time, relatively short-duration event resulting from helicopters hovering over or near occupied habitat. However, we assume that this type of impact has the potential to flush nesting adults or significantly disturb young for the following reasons: 1) the proposed project may occur above marbled murrelet nesting habitat; 2) high probability that marbled murrelets are nesting in habitat; 3) possibility that some marbled murrelet nests may still contain eggs/or fledglings; 4) noise-generating activities will exceed background noise levels; and 5) possibility of air and canopy disturbance due to rotor wash.

There are different height restrictions for hovering helicopters in the Parks, based on whether the helicopters occur over federally- or State-owned land in the Parks. Consequently, the potential effects of helicopters on marbled murrelets in the Parks would likely differ, based on whether the helicopters occur over federally- or State-owned land in the Parks. Within the boundaries of Federal lands in the Parks, if, during the marbled murrelet breeding season, a large helicopter descends to elevations that are below 500 ft (152 m) above the ground or forest canopy, marbled murrelets occurring within a 1,665-ft (507 m; approximately 0.3 mile) radius of the location of helicopter descent could be disturbed. This equates to an area of potential disturbance of

approximately 200 ac (81 ha) around the location of helicopter descent. Within the boundaries of State lands in the Parks, helicopters would not be used for marijuana eradication purposes if old-growth habitat occurs within 0.25 mi (0.40 km) of a marijuana garden. Consequently, within the boundaries of State lands in the Parks, marbled murrelets using habitat that occurs greater than 0.25 mi (0.40 km) but less than 0.3 mi (0.48 km) of a grow site (74 ac; 30 ha) could be disturbed by hovering or landing activities. Helicopter-related eradication activities (*i.e.*, hovering or landing) in the Parks could occur twice during each marbled murrelet breeding season. Therefore, we anticipate that marbled murrelets associated with as much as 548 ac (Federal lands: [2 x 200 ac] + State lands: [2 x 74 ac]) of old-growth habitat in the Parks could be disturbed each year as a result of the proposed action.

In California, the marbled murrelet breeding season lasts 175 days, from March 24 through September 15. From 2011 through 2020, during each marbled murrelet breeding season, helicopter hovering activities in the Parks could occur twice (*i.e.*, maximum of 2 days) from August 1 through September. The timing of helicopter hovering activities corresponds approximately to the last 2 weeks within the breeding season of incubation activities of adults, and the last six weeks within the breeding season of the presence of nestling marbled murrelets and attending adults.

Summary of Effects

Habitat

Habitat suitable for nesting by marbled murrelets would not be removed. However, based on an analysis of air velocities associated with rotor wash from helicopters of the types likely to be used in the Parks, Redwood National and State Parks (2011) estimates that approximately 16 ac of potentially occupied marbled murrelet habitat could be affected by rotor wash in each year, from 2011 through 2020, as a result of helicopter hovering activities. This represents approximately 0.04 percent of the available marbled murrelet nesting habitat (41,400 ac) (16,754 ha) in the Parks.

Disturbance to Marbled Murrelets

The proposed activity could result in disturbance of and subsequent harm to an unknown number of marbled murrelets associated with as much as 548 ac (222 ha) of suitable nesting habitat from August 1 through September 15, in each year from 2011 through 2020. If landing or hovering by helicopters occurred twice per breeding season and in different locations, then marbled murrelets associated with as much as 1.3 percent of the available nesting habitat in the Parks (41,400 ac) (16,754 ha) could be disturbed in each year. However, disturbance would be confined to a maximum of 2 days during the latter quarter of each breeding season; this equates to disturbance during approximately 1 percent of each breeding season.

Conservation needs of the marbled murrelet over the short-term focus on protection of occupied habitat and minimizing disturbance and reducing predation at nest sites. The proposed action minimizes disturbance from the Parks' activities by requiring the majority of the Parks' helicopter flights to remain higher than 500 ft (152 m) above the canopy during the breeding season and only allowing a maximum of two flights per year to drop below this level. Over the

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

Interrelated and Interdependent Activities

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

CUMULATIVE EFFECTS

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

The CDFG has listed the marbled murrelet as endangered in California. Logging of surrounding private lands outside the action area can exacerbate the previously described adverse effects; however, logging on private land is currently reviewed by the CDFG to ensure that no take of marbled murrelets will occur. The majority of private forest lands are used for timber production, and very little habitat on these lands is suitable for nesting by marbled murrelets.

CONCLUSION

After reviewing the current status of the marbled murrelet, the environmental baseline for the action area, the effects of the proposed helicopter use and the cumulative effects, it is the Service's biological opinion that the helicopter use in Redwood National and State Parks, Humboldt and Del Norte counties, California, as proposed, is not likely to jeopardize the continued existence of the marbled murrelet.

We have reached this conclusion for the following reasons:

1. From 2011 through 2020, approximately 160 or fewer acres (16 ac per year) of habitat for the marbled murrelet could be affected by rotor wash, which represents a small portion of habitat available for the species throughout the Parks, and throughout the range of the taxon.
2. In each year during the 2011-2020 time period, marbled murrelets associated with as much as 1.3 percent of the available nesting habitat in the Parks could be disturbed and subsequently harmed, which represents a small portion of marbled murrelets likely nesting in the Parks, and throughout the range of the taxon, based on the availability of old-growth habitat.

3. In each year during the 2011-2020 time period, marbled murrelets could be disturbed and subsequently harmed on as many as 2 days during the latter portion of each breeding season, which represents a small proportion of each marbled murrelet breeding season, and thus a small portion of marbled murrelets nesting in the Parks, and throughout the range of the taxon.

INCIDENTAL TAKE STATEMENT

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

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

AMOUNT OR EXTENT OF INCIDENTAL TAKE

The Service anticipates that an undetermined number of marbled murrelets could be taken as a result of this proposed action. The incidental take is expected to in the form of disturbance and subsequent harm from project-related noise due to the use of helicopters within 0.25 mi of suitable nesting habitat during the marbled murrelet breeding seasons from 2011 through 2020. Incidental take of marbled murrelets will be difficult to quantify for the following reasons: 1) marbled murrelets occur in habitat that makes detection difficult; 2) marbled murrelets are behaviorally secretive; and 3) project-specific surveys of suitable marbled murrelet habitat are lacking in the proposed project area.

Because the precise number of marbled murrelets that may be taken cannot be determined, anticipated take is best measured in terms of the number of acres of suitable habitat that are disturbed as a result of the proposed action. Therefore, the Service authorizes incidental take in

the form of loss of marbled murrelet reproduction associated with 548 acres of suitable nesting habitat from August 1 through September 15 annually for 10 breeding seasons during the period from 2011 through 2020, resulting in a total of 5,480 acres. Incidental take is expected to be in the form of harm as a result of disturbance associated with the use of helicopters. The Service will not refer the incidental take of any migratory bird for prosecution under the Migratory Bird Treaty Act of 1918, as amended (16 U.S.C. §§ 703-712), if such take is in compliance with the terms and conditions (including amount and/or number) specified herein.

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 destruction or adverse modification of critical habitat.

REASONABLE AND PRUDENT MEASURE

The Service believes the following reasonable and prudent measure is necessary and appropriate to minimize impacts of incidental take of the marbled murrelets:

Minimize harm of marbled murrelets during the nesting season.

TERMS AND CONDITIONS

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

1. From March 24 through September 15, helicopter flights used for *all* purposes (exception, wildland fire suppression) in the Parks (including the State Parks) will occur between 2 hours after sunrise and 2 hours before sunset.
2. If a marijuana garden or grow operation is found to occur within 0.25 mi of a known marbled murrelet nest tree in the Parks, helicopter eradication activities (*i.e.*, hovering or landing) will not occur at this marijuana grow location until after 15 September in the year that the grow operation is found.
3. If a helicopter larger than a “Pave Hawk,” or similarly-sized helicopter, is used for eradication purposes, helicopter eradication activities (*i.e.*, hovering or landing) within 0.25 mi of old-growth will not occur until after September 15 in the year that the grow operation is found.

The Service concludes that marbled murrelets occurring within no more than 548 ac of suitable nesting habitat will be subject to disturbance due to harm from August 1 through September 15, annually for ten breeding seasons (a total of 5,480 ac) during the period from 2011 through 2020 as a result of the proposed action. In addition, the Service concludes that no more than 160 ac of

suitable nesting habitat will be degraded as a result of the proposed action. The reasonable and prudent measure, with its implementing terms and conditions, is designed to minimize the impact of incidental take that might otherwise result from the proposed action. If during the course of the action, this level of incidental take is exceeded; such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measure provided. For example, the level of incidental take will be exceeded if more than two flights occur during the marbled murrelet breeding season and lower than 500 feet above the canopy of suitable nesting habitat. The Federal agency must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measure.

REPORTING REQUIREMENTS

The Parks will submit a report to the Arcata Fish and Wildlife Office by 31 December of each year from 2011 through 2020. For that year's activities, the report will detail the following for all helicopter flights: (1) dates, times of day and purposes of flights; (2) specific locations of hovering activities or landings; (3) duration, in minutes or hours, of each hovering activity; and (4) number of acres of the suitable murrelet habitat within 0.25 mi of the flights and landings.

DISPOSITION OF DEAD OR INJURED SPECIMENS

Any dead or injured listed species must be reported to the Service's Law Enforcement Division (916-414-6660) or the Arcata Fish and Wildlife Office as soon as possible, and turned over to the Law Enforcement Division or a game warden or biologist of the California Department of Fish and 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 listed species during implementation of the proposed action. Notification must include the date, time, and location of the incident or discovery of the dead or injured animal, as well as any pertinent information on the circumstances surrounding

the incident or discovery. The Service contact for this written information is the Field Supervisor for the Arcata Field Office at (707) 822-7201.

CONSERVATION RECOMMENDATIONS

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

Northern Spotted Owl

1. Coordinate with the Service to conduct limited research on removal of barred owls from northern spotted owl activity centers in the Park, to evaluate subsequent responses by northern spotted owls and interactions between these species as a result of barred owl removal efforts.

2. Coordinate with the Service and others to conduct a vocalization study of northern spotted owls using automated acoustic sensors. The study would test the efficacy of automated acoustic sensors for use as a tool of characterizing northern spotted owl calling behaviors in the presence of barred owls, and could inform land managers regarding future management activities for northern spotted owls and barred owls.
3. Coordinate with the Service and others to test the efficacy of the use of artificial nest boxes for use by northern spotted owls. It is likely that some northern spotted owls that formerly nested in the Parks are still present, but are utilizing second-growth habitat that generally does not provide suitable nesting habitat. It is possible that the deployment of artificial nest boxes could supplement habitat currently suitable only as foraging habitat, and enable nesting by northern spotted owls; nesting that otherwise would likely be suppressed or prevented by barred owls.

Marbled Murrelet

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

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

REINITIATION NOTICE

This concludes formal consultation on the action outlined in your March 15, 2011, request. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an

extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this opinion; or (4) a new species is listed or critical habitat is designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

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

cc:

Redwood National and State Parks, Orick, CA (Attn: Kristin Schmidt)

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

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

LITERATURE CITED

- 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.
- 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. Report submitted 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.
- 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.
- 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.
- 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.
- 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., 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.
- 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.
- 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.
- 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.
- 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.

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.

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.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.

Hébert, P.N., R.T. Golightly, H.R. Carter, and D.L. 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.

Hébert, P.N., R.T. Golightly, H.R. Carter, and D.L. 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.

Hébert, P. N. and R. T. Golightly. 2006. Movements, nesting, and response to anthropogenic disturbance of Marbled Murrelets (*Brachyramphus marmoratus*) in Redwood National and State Parks, California. Unpublished report, Department of Wildlife, Humboldt State University, Arcata, California and California Department of Fish and Game Report 2006-02, Sacramento, California.

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.
- Lorimer, C.G., D.J. Porter, M.A. Madej, J.D. Stuart, S.D. Veirs, Jr., S.P. Norman, K.L. O'Hara, and W.J. Libby. 2009. Presettlement and modern disturbance regimes in coast redwood forests: implications for the conservation of old-growth stands. *Forest Ecology and Management* 258: 1038–1054.
- 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.
- 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.
- 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 U.S. Fish and Wildlife Service, Region 1, Portland Oregon.
- 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, 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.

- 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.
- Paton, P.W.C. 1995. Marbled murrelet inland patterns of activity: defining detections and behavior. Pages 113-116 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.
- Peery, M.Z., and R.W. Henry. 2010. Abundance and productivity of marbled murrelets of central California during the 2009 breeding season. Final report submitted to California State Parks, Half Moon Bay, California. 16p.
- 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.
- Phelps, M. 2010. Helicopter rotor wash can spoil all your plans. www.flyingmag.com/pilot-technique/tip-week/
- 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.
- Redwood National and State Parks. 2011. Biological assessment of impacts to terrestrial threatened and endangered species from helicopter use in Redwood National and State Parks. Biological assessment, dated March 15, 2010. 35p.
- Sillett, S.C., and R. Van Pelt. 2000. A redwood tree whose crown is a forest canopy. *Northwest Science* 74: 34-43.
- 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.

- Suter, A. 2005. Rotor Wash. Aerial Delivery Systems – User Information. United States Department of Agriculture.
- 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.
- U.S. Forest Service (USFS), and Bureau of Land Management (BLM). 1994. 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.
- U.S. Fish and Wildlife Service (Service). 1992. 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. 57 Federal Register 45328; October 1, 1992.
- U.S. Fish and Wildlife Service (Service). 1994. Final biological opinion for the preferred alternative of the 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. *In*: USDA Forest Service, and USDI Bureau of Land Management. 1994. 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: Appendix G. Portland, Oregon, USA.
- U.S. Fish and Wildlife Service (Service). 1996. Endangered and threatened wildlife and plants; Final designation of critical habitat for the marbled murrelet; final rule. Fish and Wildlife Service. 61 Federal Register 26256; May 24, 1996.
- U.S. Fish and Wildlife Service (Service). 1997. Recovery plan for the threatened marbled murrelet (*Brachyramphus marmoratus*) in Washington, Oregon, and California. Portland, Oregon. 203 pp.
- U.S. Fish and Wildlife Service (Service). 2003. Current estimates of marbled murrelet in 2003. Compiled for the 5-year review. Portland, Oregon.
- U.S. Fish and Wildlife Service (Service). 2004. Marbled murrelet 5-year review process: overview. Portland, Oregon. 28 pp.
- U.S. Fish and Wildlife Service (Service). 2008. 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. 73 Federal Register 57314; October 2, 1998.

U.S. Fish and Wildlife Service (Service). 2010. Endangered and threatened wildlife and plants; 12-Month finding on a petition to remove the marbled murrelet (*Brachyramphus marmoratus*) from the list of endangered and threatened wildlife. Fish and Wildlife Service. 75 Federal Register 3424; January 21, 2010.

U.S. Fish and Wildlife Service (Service) and National Marine Fisheries Service (NMFS). 1998. Final Consultation Handbook--Procedures for Conducting Consultation and Conference Activities Under Section 7 of the Endangered Species Act.

U.S. Fish and Wildlife Service (Service) and National Marine Fisheries Service (NMFS). 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.

Wagner, F.F., E.C. Meslow, G.M. Bennett, C.J. Larson, S.M. Small, and S. DeStefano. 1996. Demography of northern spotted owls in the southern Cascades and Siskiyou, Mountains, Oregon. Pages: 67-76 In: 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.

Ward, J. W. Jr. 1990. Spotted owl reproduction, diet and prey abundance in northwest California. M.S. Thesis. Humboldt State University, Arcata, California.

Ward, J. W. Jr., R.J. Gutiérrez, and B.R. Noon. 1998. Habitat selection by northern spotted owls: the consequences of prey selection and distribution. The Condor 100:79-92.

wikiRotocraftFlightManual 2009. <http://wikirfm.cyclicandcollective.net/ground-lessons/downwash/>. Website accessed April 21, 2011.



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

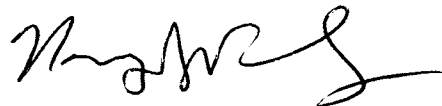


In Reply Refer To:
AFWO-11B0077-11F0138

MAY 25 2011

Memorandum

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

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

Subject: Helicopter Use in Redwood National and State Parks (2011-2020), Humboldt and
Del Norte Counties, California: Amendment to Biological Opinion

This memorandum constitutes an amendment to the Fish and Wildlife Service's (Service) May 13, 2011, Biological Opinion on Helicopter Use in Redwood National State Parks (Parks), Humboldt and Del Norte Counties, California (File No: 11B0077-11F0076). On May 17 and 18, 2011, Parks biologist Kristin Schmidt requested clarification and provided recommendations to Bill McIver (Service biologist) regarding the following items addressed in the biological opinion and associated concurrence determination: 1) the distance at which marbled murrelets (*Brachyramphus marmoratus*) might be disturbed by noise generated by hovering helicopters; 2) the permitted dates, within each year, when helicopters would be permitted to hover over suitable marbled murrelet nesting habitat that occurs on Federal lands in the Parks; and 3) status of activity centers of northern spotted owls (*Strix occidentalis caurina*) in the Parks.

The following item describes an amendment to the concurrence determination:

1. Northern Spotted Owls Determination. Northern spotted owls have been detected at a minimum of two historic activity centers originally located during surveys from 1993 through 1995. Accordingly, the following sentence replaces the 3rd sentence in the 2nd paragraph of this section, located on page 2 of the biological opinion:

As of 2010, northern spotted owls were relocated in five of these historic sites.



The following items describe amendments to the biological opinion:

1. Description of the Proposed Action. Routine helicopter patrols would occur over State-owned and Federal lands in the Parks. Accordingly, the following sentence replaces the last sentence of the 2nd-to-last paragraph on page 4 of the biological opinion:

Routine patrols of the National and State Parks would occur with the frequency of one flight per month in May, June, July, August, and September (Table 1).

2. Description of the Proposed Action - Timing of Helicopter Hovering in the Parks. In the aforementioned telephone discussion, Ms. Schmidt clarified that, based on a previous discussion between herself and Mr. McIver at a recent Interagency Consultation Team Meeting hosted by the Parks, and text in the Parks' biological assessment for the project, it was her understanding that hovering activities by helicopters, for the purpose of marijuana eradication, and occurring within 0.25 mile of suitable nesting habitat (*i.e.* old-growth redwood [*Sequoia sempervirens*] forest) for the marbled murrelet, would not occur until September 1, or later, in each year from 2011 through 2020. Ms. Schmidt pointed out that this September 1 date restriction is also referenced on page 5 of our biological opinion. However, in our analysis, we referenced Table 1 on page 6 of the biological opinion, which states that helicopter hovering activities for marijuana eradication purposes could begin in August of each year.

During the telephone discussion on May 17, 2011, Ms. Schmidt clarified that an August 1 start date for helicopter hovering activities would be acceptable within 0.25 mile of non-nesting habitat for the marbled murrelet, but that hovering activities within 0.25 mile of old-growth redwood forest on Federal lands in the Parks should not occur until after August 31 of each year, from 2011 through 2020. Accordingly, the following paragraph amends and supercedes the project description in the biological opinion to describe the timing of hovering activities, as follows:

For the purpose of marijuana eradication activities, helicopter hovering activities over Federal lands in the Parks may begin as early as August 1 in each year from 2011 through 2020, only if old-growth redwood forest does not occur within 0.25 mile (mi) of the hovering activities. If old-growth redwood forest occurs within 0.25 mi of a location of proposed helicopter hovering activities, then hovering activities cannot begin until after August 31 in each year, from 2011 through 2020.

3. Description of the Proposed Action – Visitor Services and Resources Protection Within the National Park. Based on the amendment described in item 2 above, the following sentence amends and supercedes (specific changes are shown in *italics*) the 5th sentence in the 3rd paragraph of this section:

The need to hover below 500 feet and/or land for marijuana eradication *adjacent to suitable marbled murrelet habitat* would take place *on or* after September 1st (Table 1).

4. Effects of the Action – Disturbance of Breeding Activity. Based on the amendment described in item 2 above, the following sentence amends and supercedes (specific changes are shown in italics) the last sentence in the 3rd paragraph of this section, which begins on the bottom of page 29 and continues to the top of page 30:

The need to hover below 500 ft (152 m) and/or land for marijuana eradication *adjacent to suitable marbled murrelet habitat on Federal lands in the Parks* would take place *on or* after 1 *September* in each year, near the time when most of the young have fledged.

5. Effects of the Action Section – Disturbance of Breeding Activity (Analysis of Noise Effects). There were discrepancies between separate analyses conducted by the Parks and the Service, regarding the estimated area of potential noise disturbance upon marbled murrelets, as a result of helicopter hovering activities. In the Parks' biological assessment, dated March 7, 2011, the Parks analyzed potential noise disturbance based on the area potentially impacted by helicopter hovering activities in the vicinity of two previously known locations in the Parks, activities that were covered under the previous biological opinion (1-14-2001-888) on helicopter use in the Parks.

In the Parks' Geographic Information System analysis, a 200-acre (ac) area of potential disturbance due to noise was estimated, based on buffering around and averaging mapped areas (*i.e.*, polygons) around known marijuana grow eradication sites. The Park also used a 0.25-mi distance in their analysis of potential effects of noise disturbance. In our analysis in the biological opinion, we converted the Parks' estimated area of potential disturbance (200 ac) to a radius around a fixed point, and derived a distance of 1,665 feet (about 0.3 mi) of the distance of possible disturbance due to noise generated by helicopter hovering activities. However, on July 31, 2006, the Service's issued the following guidance, *Estimating the Effects of Auditory and Visual Disturbance to Northern Spotted Owls and Marbled Murrelets in Northern California*, in which 0.25 mi was the estimated distance at which noise generated by a helicopter might disturb and possibly harm a marbled murrelet.

Therefore, consistent with recommendations contained in the Service's aforementioned "Noise Guidance," the following paragraph amends and supercedes our analysis in this section of our May 2011 biological opinion (*i.e.* the 7th paragraph of this section, located on page 30, extending to page 31) to describe the possible effects upon marbled murrelets of noise generated by hovering helicopters, as follows:

There are different height restrictions for hovering helicopters in the Parks, based on whether the helicopters occur over federally- or State-owned land in the Parks. Over state-owned lands in the Parks, helicopters would be restricted from hovering closer than 0.25 mi (0.40 km) from suitable marbled murrelet habitat (*i.e.*, old-growth redwood forest). Over Federal lands in the Parks, helicopters could hover within 0.25 mi of suitable marbled murrelet habitat, but only twice after September 1 in each year, from 2011 through 2020. Within the boundaries of Federal lands in the Parks, if, during the marbled murrelet breeding season, a large helicopter descends to

elevations that are below 500 ft (152 m) above the ground or forest canopy, marbled murrelets occurring within a 0.25-mi radius of the location of helicopter descent could be disturbed. This equates to an area of potential disturbance of approximately 126 ac (51 ha) around the location of helicopter descent. Therefore, we anticipate that marbled murrelets associated with as much as 252 ac (Federal lands: [2 x 126 ac]) in the Parks could be disturbed each year as a result of the proposed action.

6. Effects of the Action – Disturbance of Breeding Activity (Timing of Helicopter Hovering in the Parks). Based on the amendment of the project description (see item 1) regarding timing of helicopter hovering in the Parks, the following paragraph amends and supercedes (specific changes shown in italics) our analysis in this section of our May 2011 biological opinion (*i.e.* the 8th paragraph of this section on page 31), to describe the possible effects upon marbled murrelets of the timing and frequency, within year, of hovering helicopters, as follows:

In California, the marbled murrelet breeding season lasts 175 days, from March 24 through September 15. From 2011 through 2020, during each marbled murrelet breeding season, helicopter hovering activities within 0.25 mi of suitable marbled murrelet habitat that occurs on Federal lands in the Parks could occur twice (i.e., maximum of 2 days) from September 1 through September 15. The timing of helicopter hovering activities corresponds approximately to the last 2 weeks within the breeding season when nestling marbled murrelets and attending adults may be present. The presence of incubating adults is not likely. Restricting helicopter hovering activities to a maximum of two days during the last 2 weeks of each breeding season would minimize effects to adult and nestling marbled murrelets in the Parks; on or after September 1 in each year the majority of young marbled murrelets likely will have fledged from their nests.

7. Summary of Effects – Disturbance to Marbled Murrelets. Based on the amendment of the project description regarding potential effects upon marbled murrelets of noise generated by hovering helicopters in the Parks, and timing and frequency within each of hovering activities, the following paragraph amends and supercedes our summary of the effect of hovering upon marbled murrelets (*i.e.*, Page 31, Summary of Effects section, 2nd paragraph), as follows:

The proposed activity could result in disturbance of, and subsequent harm to, an unknown number of marbled murrelets associated with as much as 252 ac (51 ha) of suitable nesting habitat from September 1 through September 15, in each year from 2011 through 2020. If landing or hovering by helicopters occurred twice per breeding season, and in different locations, then marbled murrelets associated with as much as 0.6 percent of the available nesting habitat in the Parks (41,400 ac) (16,754 ha) could be affected by noise disturbance in each year. However, disturbance would be confined to a maximum of 2 days during the latter 2 weeks of each breeding season; this equates to disturbance during as much as 8 percent (*i.e.*, 14 days) of each breeding season.

8. Conclusion – Disturbance and Subsequent Harm of Marbled Murrelets. Based on the amendment of the biological opinion regarding potential effects upon marbled murrelets from noise generated by hovering helicopters in the Parks, the following paragraph amends and supercedes item 2 in the “Conclusion” section of the biological opinion (at the end of page 32), as follows:

In each year during the 2011-2020 time period, marbled murrelets associated with as much as 0.6 percent of the available nesting habitat in the Parks could be disturbed and subsequently harmed, which represents a small portion of marbled murrelets likely nesting in the Parks, and throughout the range of the taxon, based on the availability of old-growth habitat.

9. Amount or Extent of Incidental Take. Based on the amendment of the biological opinion regarding potential effects upon marbled murrelets of noise generated by hovering helicopters in the Parks, and timing and frequency of hovering activities in each year, the following paragraph amends and supercedes the 2nd paragraph of the “Amount or Extent of Incidental Take” section (at the end of page 33 and top of page 34), as follows:

Because the precise number of marbled murrelets that may be taken cannot be determined, anticipated take is best measured in terms of the number of acres of suitable habitat that are disturbed as a result of the proposed action. Therefore, the Service authorizes incidental take in the form of harm, due to loss of marbled murrelet reproduction associated with noise disturbance to 252 ac (51 ha) of suitable nesting habitat from September 1 through September 15 annually, for 10 breeding seasons, during the period from 2011 through 2020. In the unlikely occurrence that hovering activities occur twice annually and at different locations over this 10-year period, loss of marbled murrelet reproduction associated with as much 2,520 ac (510 ha) of suitable habitat (from September 1 through September 15 in each year) could occur. Incidental take is expected to be in the form of harm as a result of noise disturbance associated with the use of hovering helicopters. The Service will not refer the incidental take of any migratory bird for prosecution under the Migratory Bird Treaty Act of 1918, as amended (16 U.S.C. §§ 703-712), if such take is in compliance with the terms and conditions (including amount and/or number) specified herein.

10. Terms and Conditions. Based on the amendment of the biological opinion regarding potential effects upon marbled murrelets of noise generated by hovering helicopters in the Parks, and timing and frequency of hovering activities in each year, the following paragraph amends and supercedes the 1st sentence of the 2nd paragraph of the “Terms and Conditions” section (at the end of page 34 and top of page 35), as follows:

The Service concludes that marbled murrelets occurring within no more than 252 ac (51 ha) of suitable nesting habitat will be subject to harm due to noise disturbance from September 1 through September 15, annually for ten breeding seasons (an upper limit of 2,520 ac [510 ha]) during the period from 2011 through 2020, as a result of the proposed action.

The amendments described above represent slight changes to the analyses, but not substantial changes to conclusions reached in our May 13, 2011, biological opinion. Based on the aforementioned amendments, adverse effects to marbled murrelets are likely to be less than those as analyzed in the May 13, 2011, biological opinion.

If you have any questions regarding this consultation or the amendment to this biological opinion, please contact Mr. Bill McIver of my staff at (707) 822-7201.

cc:

Redwood National and State Parks, Orick, CA (Attn: Kristin Schmidt)

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

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