.;/ 

A CONSERVATION STRATEGY FOR MANAGING THREATENED AND ENDANGERED SPECIES IN REDWOOD NATIONAL AND STATE PARKS

Approved By:

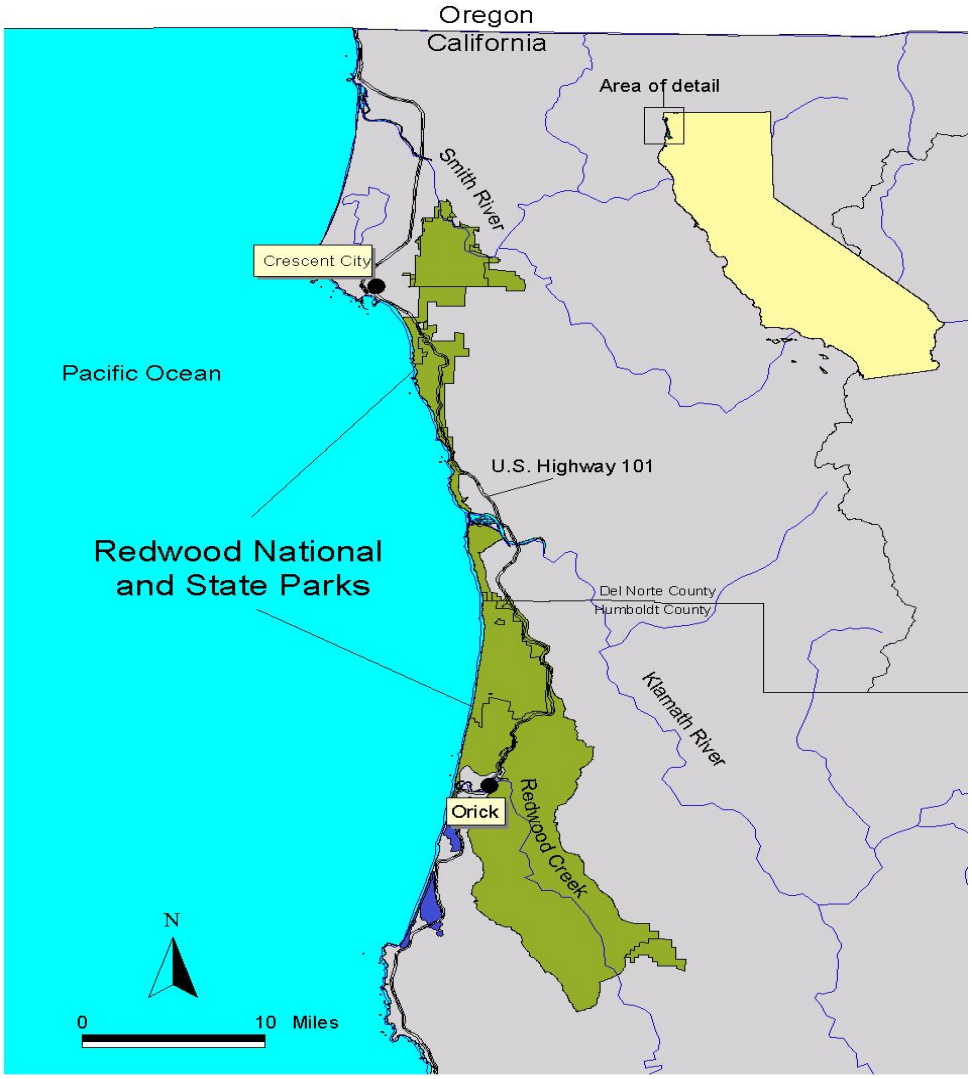
_____	_____	_____	_____
Andrew T. Ringgold	Date	Richard C. Sermon	Date
NPS Superintendent		State Park Superintendent	

Table of Contents

I. INTRODUCTION

Redwood National and State Parks (RNSP) are located in Humboldt and Del Norte Counties in northwestern California (Figure 1). Four units encompassing about 105,516 acres comprise RNSP. These four units are Redwood National Park (RNP), established in 1968 and expanded in 1978; Prairie Creek Redwoods State Park established in 1923; Del Norte Coast Redwoods State Park established in 1925; and Jedediah Smith Redwoods State Park established in 1929. RNSP is about 50 miles in length with 35 miles of coastline, and varies in width from 0.5 mile to 8 miles. Three major river systems (Redwood Creek and the Smith and Klamath Rivers) and numerous coastal streams traverse RNSP.

Figure 1. Redwood National and State Parks location in northern California.



RNSP are managed by the National Park Service (NPS) and the California Department of Parks and Recreation (CDPR) pursuant to a partnership agreement originally signed in 1994 and a General Management Plan/General Plan (GMP/GP) completed by the agencies and approved in 2000.

The purpose of the RNSP conservation strategy is to provide park staff with a guideline for conducting management activities and programs so that they are compatible with management and recovery goals established for the conservation of threatened and endangered (T&E) species and/or their critical habitats. Park management and recovery goals are intended to reduce the likelihood of conflicts between proposed park actions and listed species or critical habitat in pursuance of furthering the conservation of listed species as required under Section 7(a)1 of the federal Endangered Species Act, and Section 2055 of the Fish and Game Code (also known as the California Endangered Species Act).

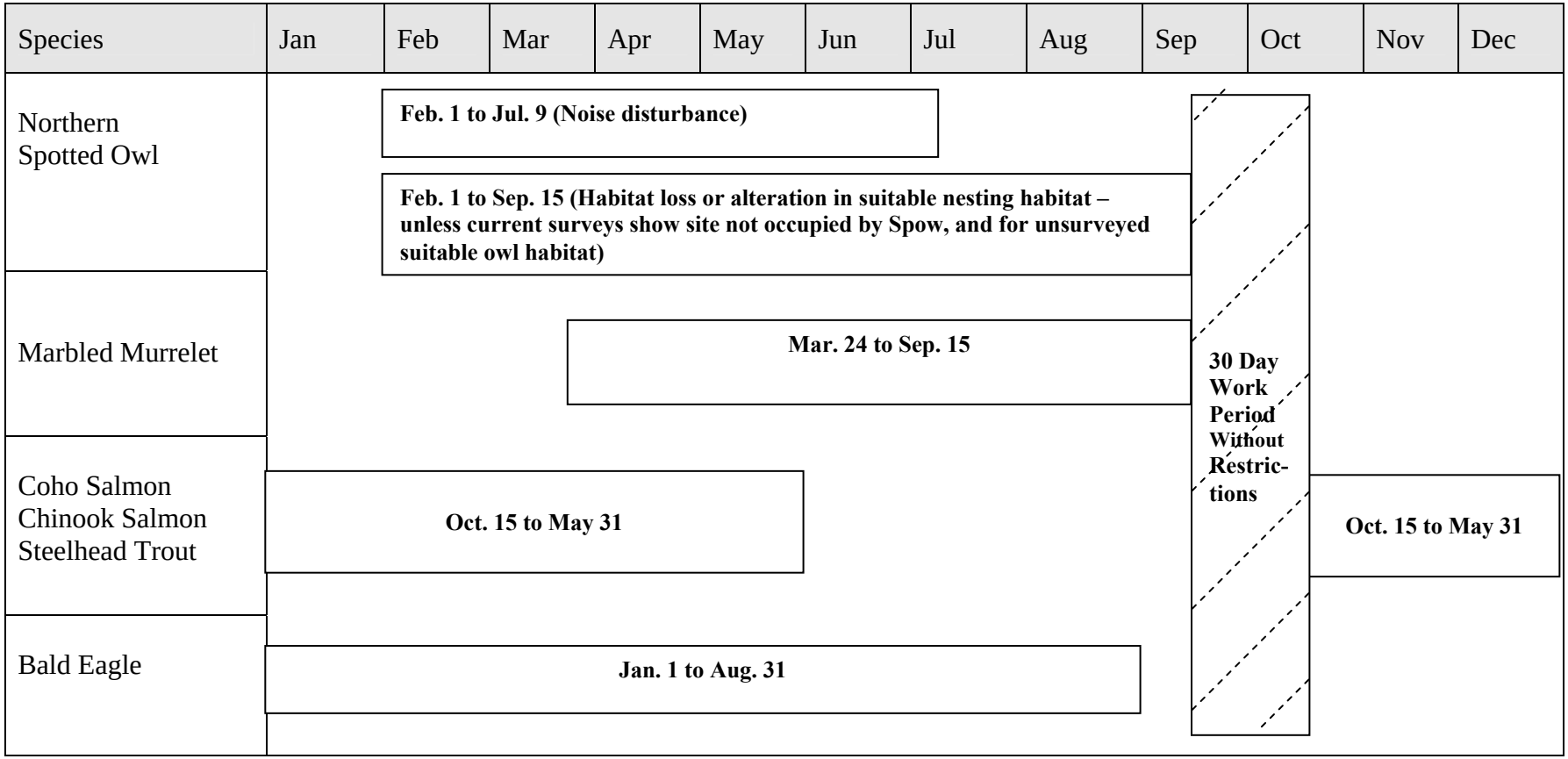
The goals of the RNSP conservation strategy are to minimize potential incidental take associated with noise disturbance, habitat loss and/or degradation, and corvid predation of T&E species nests caused by park actions; and to implement habitat improvement actions on previously disturbed lands to provide for greater protection and recovery of listed species throughout RNSP. RNSP staff will manage its operations to reduce the likelihood of causing adverse effects to listed species by not exceeding the established parkwide targeted threshold limits for potential incidental take as described in this strategy. As stated in RNSP's GMP/GP, "RNSP staff will attempt to avoid, minimize, rectify, reduce, compensate, or otherwise mitigate any potential adverse impacts on state and federally listed or proposed or candidate threatened or endangered species". Examples of RNSP actions for protection and recovery of listed species include habitat improvement programs such as removal of old logging roads, removal of unnecessary or obsolete trails, and initiating programs designed to improve second-growth forest conditions. These programs will improve habitat quality by closing gaps, stabilizing forested slopes, and providing structural habitat features important to northern spotted owls, bald eagles and marbled murrelets, and reducing sedimentation in fish bearing streams. RNSP's bear management strategies that include bear-proofing many existing frontcountry public facilities (i.e., campgrounds, trailheads, and picnic areas) may also have some side benefits of keeping corvid (i.e., ravens, crows, and jays – potential marbled murrelet predators) numbers in check, as a result of improved food storage.

II. EFFECTS OF T&E RESTRICTION ON RNSP MANAGEMENT ACTIVITIES

Redwood National Park (RNP) staff, starting in 1992 before the partnership between the NPS and CDPR in 1994, attempted to manage park operations so that no adverse effects to T&E species occurred during the critical nesting and breeding seasons. However, since then, these limited operating periods have restricted RNSP staff from effectively performing certain operations including annual maintenance of trails, campgrounds, and roads; Howland Hill road maintenance; and repair and removal of roads and trails following a catastrophic winter storm in 1996/1997. RNSP staff could not complete all the necessary noise-generating maintenance operations during the non-breeding season of the spotted owl and marbled murrelet. Furthermore, to reduce the potential threat of sediment entering watercourses containing listed fish (i.e., coho and chinook salmon, and steelhead trout), the National Marine Fisheries Service (NMFS) recommended that RNSP undertake road removal and repair during drier periods, which

unfortunately coincide with the breeding season of terrestrial T&E species. Climatic factors and potential impacts to listed fish restrict many RNSP management activities to a one-month work period (i.e., 16 September to 15 October), if additional consultation to expand the period beyond 15 October is not pursued. Pursuance of work beyond 15 October is weather dependent and only for completing an on-going operation (e.g., stream crossing or road section) that favors winterization of the site. The one-month work period is the time specifically outside of NMFS and U. S. Fish and Wildlife Service (USFWS) recommended work restriction period (Figure 2).

Figure 2. A Summary of RNSP's operational work window based on recommended terrestrial and aquatic Threatened and Endangered Species breeding season restrictions.



III. POLICIES AND LAWS

Applicable park policies and laws are discussed in the GMP/GP. The GMP/GP provides the overall vision and direction for RNSP and identifies future planning needs. Under the GMP/GP, RNSP 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. RNSP staff 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 important recreational opportunities available to people who visit RNSP.

The GMP/GP identifies individual action plans needed to address specific park management actions such as estuary, second-growth forest, trail, fire and fuels, vegetation, backcountry visitor use, and transportation. Relative to management of listed threatened and endangered species the GMP/GP 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/GP p. 37). These actions will be achieved primarily by restricting work temporally and spatially so as not to disturb T&E species and by designating almost one-third of RNSP as "primitive" zones where disturbance to all species from human activities would be limited to those "…necessary to restore and maintain ecosystem function" (GMP/GP p. 38). Any park action or proposed project that has the potential to adversely affect listed or proposed species will require consultation with the appropriate federal or state regulatory agency under Section 7 of the Endangered Species Act (ESA) or Section 2053 of the California Endangered Species Act (CESA).

RNSP are managed using an ecosystem management approach, similar to the strategy presented in the Northwest Forest Plan ROD (USDA and USDI 1994). Implementation of RNSP operations consistent with federal and state enabling legislation (i.e., to preserve, and restore where needed, the old-growth forest ecosystem) will augment the lands designated as Riparian and Late Successional Reserves on other nearby federal lands. RNSP's policies and guidelines relative to watershed restoration are similar to those outlined by the Aquatic Conservation Strategy in the Northwest Forest Plan ROD.

Section 7(a)1 of the ESA, as amended, and Section 2055 of the CESA require that both federal and state agencies utilize their authorities in furtherance of the purposes of the Acts 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, ensure that any action it authorizes, funds, or carries out is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of critical habitat. 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." Similar language is contained in Section 2053 of the

CESA, which also states "that reasonable and prudent alternatives shall be developed by the department [of Fish and Game], together with the project proponent and the state lead agency, consistent with conserving the species, while at the same time maintaining the project purpose to the greatest extent possible."

NPS and CDPR are committed to the recovery of listed species. Recovery actions are focused on preventing or decreasing sedimentation of streams, preventing the loss of occupied nesting habitat and managing vegetation to increase nesting habitat for marbled murrelets and spotted owls throughout the park complex. Recovery of marbled murrelets and other listed species supports the intent of RNSP's legislation of preserving and restoring significant examples of the primeval coastal redwood forests. Species such as marbled murrelets, spotted owls, coho and chinook salmon, steelhead trout and other listed species are unique components of the parks ecosystem.

IV. LIST OF FEDERAL AND STATE ENDANGERED AND THREATENED SPECIES, CANDIDATE FOR PROPOSED LISTING, AND SPECIES OF SPECIAL CONCERN

RNSP regularly receive lists from the USFWS and the California Department of Fish and Game, identifying federal and state endangered, threatened species, candidate proposed for listing, and species of special concern that may be present or may be affected by park activities. The most recent USFWS list is dated 13 January 2003 (Reference Number 1-14-2003-1493) and the California State list is dated January 2003 for threatened and endangered species and 5 June 2002 for species of special concern (SSC). The federal list includes 24 species currently listed as threatened or endangered and three candidate species in Humboldt and Del Norte Counties (Table 1). Six terrestrial and five aquatic species on the USFWS list currently occupy or are known to have historically occupied habitat within the boundaries of RNSP. These species include California brown pelican (*Pelecanus occidentalis californicus*), bald eagle (*Haliaeetus leucocephalus*), western snowy plover (*Charadrius alexandrinus*), marbled murrelet (*Brachyramphus marmoratus*), northern spotted owl (*Strix occidentalis caurina*), beach layia (*Layia carnosa)*, tidewater goby (*Eucyclogobius newberryi*), southern Oregon/northern California coasts coho salmon (*Oncorhynchus kisutch*), California coastal chinook salmon (*Oncorhynchus tshawytscha*), northern California steelhead(*Oncorhynchus mykiss*), and Steller sea lion (*Eumetopias jubatus*).

The state list includes 6 terrestrial species currently listed as threatened or endangered and 38 SSC terrestrial and aquatic faunal species (refer to website www.dfg.ca.gov/hcpb/species/species.shtml for a current state listing of all T&E plants and animals). Two state listed endangered plants, beach layia (*Layia carnosa)* and McDonald's rock-cress (*Arabis macdonaldiana*), are on the federal list (refer to Appendix I, Table 2 of GMP/GP, USDI and CDPR 1999). Three (marbled murrelet, California brown pelican, bald eagle) of the six state listed threatened or endangered fauna are on the federal list (refer to Appendix I, Table 1of GMP/GP, USDI and CDPR 1999). The remaining three species, American peregrine falcon (*Falco peregrinus anatum*), great gray owl (*Strix nebulosa*), and bank swallow (*Riparia riparia*), are state listed only (refer to Appendix I, Tables 1-2 of GMP/GP, USDI and CDPR 1999). The peregrine falcon and great gray owl are state listed as endangered, and the bank swallow listed as threatened. Of these species, only the peregrine falcon is found in RNSP and covered under this strategy. In addition, the NPS and

CDPR consider as "Special Plants" those inventoried by the California Department of Fish and Game's Natural Diversity Base and listed by the California Native Plant Society (refer to Appendix I, Table 3 of GMP/GP, USDI and CDPR 1999). Animal species of concern, fully protected wildlife species, and plants listed by the California Native Plant Society are taken into consideration during the California Environmental Quality Act (CEQA) and/or National Environmental Policy Act (NEPA) reviews of projects to ensure that impacts are avoided or minimized. Therefore, these non-state listed species groups are considered lower priority species by the state and are not discussed further in this conservation strategy.

Table 1. USFWS endangered, threatened, and candidate species list for Humboldt and Del Norte Counties (January 2003).

Endangered	Threatened	Candidate
McDonald's rock-cress (*Arabis macdonaldiana*)	Oregon silverspot butterfly (*Speyeria zerene hippolyta*)	Black abalone (*Haliotis cracherodii)*
Western lily (*Lilium occidentale*)	California coastal chinook salmon (*Oncorhynchus tshawytscha*)	Mardon skipper (*Polites mardon*)
Beach layia (*Layia carnosa*)	Northern California steelhead (*Oncorhynchus mykiss*)	Bocaccio (*Sebastes paucispinis*)
Tidewater goby (*Eucyclobius newberryi*)	Southern Oregon/ Northern California coasts coho salmon (*Oncorhynchus kisutch*)	
Leatherback sea turtle (*Dermochelys coriacea*)	Green sea turtle (*Chelonia mydas*)	
California brown pelican (*Pelecanus occidentalis californicus*)	Olive Ridley sea turtle (*Lepidochelys olivacea*)	
Short-tailed albatross (*Phoebastris albatrus*)	Loggerhead sea turtle (*Caretta caretta*)	
Sperm whale (*Physeter macrocephalus*)	Northern spotted owl (*Strix occidentalis caurina*)	
Blue whale (*Balaenoptera musculus*)	Bald eagle (*Haliaeetus leucocephalus*)	
Humpback whale (*Megaptera novaengliae*)	Marbled murrelet (*Brachyramphus marmoratus*)	
Fin whale *(Balaenoptera physalius*)	Western snowy plover (*Charadrius alexandrinus nivosus*)	
Sei whale (*Balaenoptera borealis*)	Steller sea lion (*Eumetopias jubatus*)	

Critical habitat has been designated for eight species on the federal list, but was recently withdrawn for one species (chinook). Critical habitat for coho salmon and the marbled murrelet occurs within RNSP. Marbled murrelet critical habitat occurs in two units; unit CA-02-a includes Jedediah Smith Redwoods and Del Norte Coast Redwoods State Parks and unit CA-02-b includes Prairie Creek Redwoods State Park. Critical habitat for the marbled murrelet does not

occur on federal parklands. Critical habitat for the tidewater goby, leatherback turtle, northern spotted owl, western snowy plover, and Steller sea lion has not been designated within RNSP.

V. LISTED SPECIES THAT OCCUR INFREQUENTLY, HISTORICALLY OCCURRED, OR HAVE POTENTIALLY SUITABLE HABITAT WITHIN RNSP

1. McDonald's rock-cress (*Arabis macdonaldiana*), state and federal endangered

A. Species Account

McDonald's rock-cress, a member of the Brassicaceae, is known from three disjunct populations, one near Laytonville in Mendocino County, another in the Smith River watershed in Del Norte County, and one from Preston Peak in Siskiyou County. Surveys in the High Plateau area of the North Fork Smith River located approximately 4,200 plants (Newton 1987), however, the actual number of individuals is difficult to assess because reproduction is asexual, via rhizome production. Populations are patchily distributed due to the species' association with ultramafic barrens, which are a naturally fragmented habitat type. Elevation of known sites varies from 1200-5200 ft (366-1585 m).

Plant surveys have been conducted in suitable habitat for this species within RNSP with negative results (L. Arguello pers. comm.). If the species is located in the future, RNSP staff will take actions to protect the plants and enter into consultation with USFWS. Activities that potentially could impact McDonald's rock-cress if it were to occur in the park include fire suppression resulting in encroachment by woody vegetation and other plant competitors into suitable habitat.

B. Habitat Status

Rock crevices and bare, steep slopes (40-90%), dry ridges, and serpentine soils characterize habitat for this species. Populations also are known from Jeffrey pine (*Pinus jeffreyi*) grasslands on relatively flat topography. Vegetation cover is very sparse, with overhead cover typically less than 5%. Common associates include Jeffrey pine, incense cedar (*Libocedrus decurrens*), knobcone pine (*P. attenuata*), huckleberry oak (*Quercus vaccinifolia*), Siskiyou mat (Ceanothus pumilus), and Idaho fescue (*Festuca idahoensis*) (Imper 1983, Newton 1987, Jimerson et al. 1995). In RNSP, suitable habitat for McDonald's rock-cress is limited to the Little Bald Hills where the only extensive serpentine soils in the parks occur.

2. Western lily (*Lilium occidentale*), federal endangered

A. Species Account

The western lily is a California and Oregon state listed endangered plant and a federally listed endangered plant in the Liliaceae. It has an extremely restricted distribution within two miles of the coast from Hauser, Coos County, Oregon to Loleta, Humboldt County, California. The plant is currently known from seven widely separated regions along the coast, and occurs in 31 small isolated, densely clumped populations.

RNSP are located within the current range of the western lily and may have historically sustained populations of this plant in its coastal zone. Although a systematic survey of RNSP's coastal scrub and grasslands has not been conducted for the lily, a substantial amount of potential habitat, especially in the northern half of the parks, has been surveyed in association with

projects (L. Arguello pers. comm.). As of this date, this species has not been documented in RNSP. All projects initiated in the parks coastal zone are reviewed for possible impacts to threatened and endangered plants, including a ground survey in the project area. If the species is located in a project area, RNSP staff will take actions to protect the plants and enter into consultation with USFWS.

B. Habitat Status

This lily grows at the edges of sphagnum bogs and on forest or thicket openings along the margins of ephemeral ponds and small channels. It also grows in coastal prairies and scrub near the ocean where fog is common. In this coastal zone, associates include Pacific reed grass (*Calamagrostis nutkaensis*), salal (Gaultheria shallon), evergreen huckleberry *(Vaccinium ovatum*), and Sitka spruce (*Picea sitchensis*). It is believed that the current habitat in RNSP's coastal scrub and grasslands is not suitable to sustain populations of western lily, due primarily to meadow encroachment by spruce and shrubs (L. Arguello pers. comm.).

3. Green sea turtle (*Chelonia mydas*), federal threatened

A. Species Account

Historically, the east Pacific green turtle (*C.m. agassizii*) was abundant from Baja California to Peru and west to the Galapagos Islands. In the eastern north Pacific green turtles have been sighted from Baja California to southern Alaska. They have been reported from gillnets and beach strandings from the Washington Coast (NMFS and USFWS 1998a).

No green turtle nesting occurs on beaches on the west coast of the United States. The main nesting sites are located in the state of Michoacan, Mexico and the Galapagos Islands. After leaving the breeding grounds in Mexico, it is unknown whether green turtles migrate to specific areas along the North American coast, or whether turtles observed here are vagrants that occasionally stray into more northern waters, perhaps using the warmer El Nino currents. In any case, in a review of sea turtle sighting records from northern Baja to Alaska, Stinson (1984) determined the east Pacific green turtle was the most commonly observed hard-shelled turtle along the U.S. Pacific coast. Hatchling dispersal has not been studied but it is assumed that hatchlings are passively transported by ocean currents over vast distances (NMFS and USFWS 1998a).

The greatest cause of decline in green turtle populations is commercial harvest of adults, juveniles, and eggs for food and leather. After industrialization of the green turtle industry in 1964, more than 165,000 green turtles were harvested by 1977 as they arrived on nesting beaches in Mexico. The Mexican government took action to protect Green turtles by banning the fishery and protecting nesting beaches from poachers. However, smuggling for meat consumption still occurs. Other threats to green turtles along the U.S. west coast include incidental capture by fisheries, impacts with boats, and ingestion of marine pollutants (NMFS and USFWS 1998a).

There are no records of green turtles within RNSP. However, an individual came ashore on the Samoa peninsula near Eureka, about 30 mi south of RNSP, in January 2001.

B. Habitat Status

There is a general lack of information on foraging areas and migratory habits of this species. Likewise it is not known whether the coastal waters within the boundary of RNSP provide suitable habitat, or are ever used by green turtles at any life stage.

4. Leatherback sea turtle (*Dermochelys coriacea*), federal endangered

A. Species Account

Leatherback turtles are circumglobal. In the Pacific they range from the waters off New Zealand, north through Indochina, China, and the east coast of Russia, and south along the west coast of North America, Central America and south as far as Chile (NMFS and USFWS 1998b).

The leatherback is the largest living turtle. Adults may grow to 3.0 m in length and weigh 200-700 kg. The carapace is thick, tough, oil-saturated connective tissue raised into seven prominent ridges. The front flippers are longer than in other sea turtles, spanning up to 270 cm in adults (NMFS and USFWS 1998b).

No nesting occurs on beaches under U.S. jurisdiction in the Pacific. Until very recently the largest known population, with perhaps nearly half the known number of adult females, nested on the Pacific coast of Mexico. Today this population has declined substantially. Still, the Pacific coast of Mexico is considered to be the most important leatherback breeding ground in the world. After nesting, leatherbacks range widely throughout the Pacific and are believed to travel through "migratory corridors" in the eastern Pacific. Sightings along the coast of California peak in August, which may be reflective of adults' moving southward for winter breeding in Mexico. Monterey Bay is one of the rare areas where the species is routinely encountered. Nothing is known of hatchling dispersal in this species (NMFS and USFWS 1998b).

The greatest cause of decline in leatherback turtle populations is believed to be harvest of turtles and eggs for food. Increased human presence on beaches, including recreational and commercial use of beaches, and coastal construction, are also threats to nesting turtles. Incidental catch by commercial fisheries, entanglements in nets, and ingestion of marine pollutants constitute threats in foraging areas and migratory routes (NMFS and USFWS 1998b).

There are no records of this species occurring in RNSP.

B. Habitat Status

The leatherback is associated with continental shelf habitats and pelagic environments. The oceanic distribution of leatherbacks may reflect the distribution and abundance of macroplanktonic prey. For example, the jellyfish *Aurelia* (locally common off our coast) is a known prey item (NMFS and USFWS 1998b).

5. Loggerhead sea turtle (*Caretta caretta*), federal threatened

A. Species Account

Loggerhead sea turtles are circumglobal, inhabiting continental shelves, bays, estuaries, and lagoons in temperate, subtropical, and tropical waters. Major nesting grounds are in warm temperate and subtropical regions. Nesting in the Pacific basin is restricted to Japan and Australia. Loggerheads do not nest in the eastern Pacific or anywhere in the Pacific under U.S. jurisdiction and are regarded as rare throughout this area (NMFS and USFWS 1998c).

Adult loggerhead turtles may grow to 0.92 m in length and weigh up to 150 kg. The carapace is bony, reddish-brown in color, and the scutes often are bordered with yellow (NMFS and USFWS 1998c).

Hatchling dispersal has not been studied. The species appears to be highly pelagic; loggerhead juveniles are abundant near the southwest coast of Baja California even though the nearest nesting grounds are in Australia or Japan. Similar juvenile disperal has been reported for loggerheads in the Atlantic; young turtles appear to ride currents on a wide trans-Atlantic arc before returning to natal beaches in Florida (NMFS and USFWS 1998c).

In the eastern Pacific loggerheads have been reported as far north as Alaska and as far south as Chile. They have been documented only occasionally at sea, but most notably off California. Most of the sightings in northern U.S. waters are of juveniles off southern California, but there are a few sightings from Washington (NFMS and USFWS 1998c).

Primary threats to loggerhead turtle populations along the U.S. west coast include “cold-water strandings” and incidental take by commercial fisheries (NMFS and USFWS 1998c).

There are no records of loggerhead turtles within RNSP.

B. Habitat Status

Waters off California are used principally by loggerhead turtles for foraging and/or migration corridors. Sightings peak in July- September off southern California (Stinson 1984). Given the propensity of this species to use pelagic, warm ocean areas for foraging, it is unlikely that the waters of RNSP would provide suitable habitat for this species.

6. Olive Ridley sea turtle (*Lepidochelys olivacea*), federal threatened

A. Species Account

The Olive Ridley sea turtle occurs world-wide in tropical and warm temperate waters along continental margins and rarely off oceanic islands. It is regarded as the most abundant sea turtle in the world. Important nesting areas occur on the northeast coast of India and along the west coast of Mexico and Central America. Olive Ridleys are not easily distinguished in the field from loggerhead turtles (*Caretta caretta*). It is the smallest living sea turtle with adult carapace length between 60-70 cm, and weight rarely over 50 kg. The carapace is hard with high vertebral and costal scutes (NMFS and USFWS 1998d).

In some places the breeding population is huge (600,000 Olive Ridley turtles nested in one week in 1991 on the west coast of India) (Mrosovsky 1993). These large breeding colonies are called "arribadas" and are unique to this species. However, most nesting areas support much smaller aggregations of about 1,000 females (Groombridge 1982). In some places, population declines are occurring; many beaches in Mexico no longer have arribadas where they formerly occurred. No nesting occurs anywhere in the United States or territories under U.S. jurisdiction (NMFS and USFWS 1998d).

As with other species of sea turtle, very little is known about post-hatching dispersal and post-breeding movements at sea. Satellite monitoring has indicated that rather than migrating to one specific foraging area after nesting, Olive Ridleys are nomadic and exploit multiple feeding areas. Sightings of large aggregations of Ridleys at sea have led to unconfirmed speculation that turtles travel in large flotillas between nesting beaches and feeding areas (Marquez 1990).

At sea in the eastern tropical Pacific, Olive Ridleys readily associate with objects floating in the water and often bask at the surface. They are highly pelagic and are commonly observed in the open ocean (NMFS and USFWS 1998d).

The greatest cause of egg loss in Olive Ridley sea turtle populations in the eastern Pacific comes from nesting activity of conspecifics at arribadas. Eggs of others are frequently disturbed by nesting females in the process of digging and laying eggs. Predators, including snakes, iguanas, vultures, coyotes, and raccoons decimate hatchlings. Off the U.S. west coast the primary threats are incidental take associated with commercial fisheries, boat collisions, gillnet entanglement and "cold stunning" in more northern waters (NMFS and USFWS 1998d).

There is one record of an Olive Ridley sea turtle from RNSP. This animal appeared on a beach near the mouth of Redwood Creek in October 1999 and was subsequently transported to Sea World in San Diego. Personnel at Sea World stated they received Olive Ridleys from as far north as Alaska that year, and suspected that individuals of this tropical species were being transported north in "warm water gyres" (J. Wheeler pers. comm.).

B. Habitat Status

There is a general lack of information on foraging areas and migratory habits of this species. Likewise it is not known whether the coastal waters within the boundary of RNSP provide suitable habitat, but given the propensity of this species to use warm, tropical ocean areas, it is unlikely.

7. Sperm whale (*Physeter macrocephalus*), federal endangered

A. Species Account

The sperm whale ranges throughout the world's oceans. Populations in the North Pacific will range as far as the southern Bering Sea in summer but appear to stay south of 40 degrees north (just south of RNSP) in winter. Non-breeding males range into high latitude waters. Northern and southern hemisphere populations are apparently reproductively isolated from each other (IUCN 1991). In the mid-1980s, one population estimate indicated there were about 275,000 sperm whales in the eastern Pacific; however, another estimate put the entire world's population

at a few hundred thousand. The IUCN (1991) cautioned that all population estimates should probably be regarded as somewhat unreliable. The most widely accepted recent population estimate for the waters off California, Oregon and Washington is 1,407 individuals (CV=0.39) (Barlow and Taylor 2001). Other estimates for this region vary widely (Carretta et al. 2001a).

Births occur from May- September in the northern hemisphere; a single young is produced every 3-6 yrs. The basic social unit is a mixed school of about 20-40 individuals consisting of adult females plus their calves and juveniles. Males leave this group as they mature and form bachelor schools of about 50 individuals. The largest males tend to be solitary. Diet is primarily large squids, octopuses, and fishes.

Sperm whale populations were reduced by intensive whaling; the harvest peaked in the 1960s. They historically were hunted for spermaceti, ambergris, and oil. Direct catching is no longer a threat. Today threats include entanglement in fishing gear, ocean pollution, and the ingestion of plastics.

B. Habitat Status

The sperm whale inhabits abyssal plains and pelagic, deep waters but may sometimes be found around islands or shallow shelf waters (~70 m deep). Depths in the 0.25 mi-wide nearshore marine environment within RNSP boundaries range from 10 ft (~ 3 m) to 60 ft (~19 m). Therefore, it is highly unlikely that sperm whales use the ocean habitat within RNSP with any regularity. There are only two records of this species in the RNSP wildlife observations database, both from 1969; it is unknown if the sightings occurred within the Park's 0.25 mile marine boundary. Dead sperm whales have come ashore along the north coast in the last 20 years, one at Patrick's Point (Dave Anderson, pers. comm.).

8. Blue whale (*Balaenoptera musculus*), federal endangered

A. Species Account

The blue whale ranges throughout the world's oceans. Populations in the North Pacific are considered to be of one stock by the International Whaling Commission (Donovan 1991). Recent studies, however, indicate that blue whales found off the coast of California are a distinct population which feed off state waters in the summer and fall and migrate to Mexico or Costa Rica in the winter and spring (Stafford 1999). This population appears to be concentrated off the central and southern California coast with only sporadic sightings north of Cape Mendocino (i.e. south of RNSP) (Mate et al. 1999). Another population or stock is believed to also spend some time off central and southern California and Mexico but migrates north to Alaskan waters during summer (Gregr et al. 2000). The most recent NOAA Fisheries estimate for the number of blue whales off the coast of California, Oregon and Washington is 1,940 (CV=0.15). The population off California appears to be increasing (Carretta et al. 2001b).

Females are larger than males. Sexual maturity is reached around age 10. Gestation takes one year. Births occur in winter/spring; a single young is produced every 2-3 years. Blue whales can be found alone or in small groups of 2 to 4 individuals. Krill (small shrimp) makes up the majority of the blue whale diet.

Blue whale populations were reduced by intensive whaling; the harvest peaked in the North Pacific in the first half of the 1900s. Historically, they were hunted for the large amounts of oil supplied by their enormous size. Direct catching is no longer a threat. Gill net entanglement does not appear to be a threat for this species (Carretta et al. 2001b). The main threats appear to be the limits of small population dynamics and underwater acoustic pollution (Croll 2001).

B. Habitat Status

The blue whale inhabits open ocean areas well offshore where it feeds primarily within 620 ft (200 m) of the surface where krill are concentrated, particularly where cold water upwellings occur (Fiedler 1998). Migrating blue whales stay well offshore (Gregr et al. 2000) and little feeding appears to occur off the north coast of California near RNSP (Mate et al. 1999). Depths in the 0.25 mi-wide nearshore marine environment within RNSP boundaries range from 10 ft (~ 3 m) to 60 ft (~19 m). Therefore, it is unlikely that Blue whales use the ocean habitat within RNSP with any regularity. There are no records of this species in RNSP.

9. Humpback whale (*Megaptera novaengliae*), federal endangered

A. Species Account

Humpback whales are found throughout the world's oceans. The International Whaling Commission considers all the humpbacks in the north Pacific to be of one stock (Donovan 1991) but it is now believed that the individuals seen off California, Oregon and Washington constitute a separate stock. These whales winter/calve/mate off the coasts of Mexico and Central America and migrate past California to southern British Columbia where extensive feeding takes place (Steiger et al. 1991). Recent estimates of this stock range from 1,177 (CV=0.28) (Barlow and Taylor 2001) to 856 (CV=0.12) (Calambokidis et al. 2001).

Humpbacks are sexually mature between four to six years and physically mature at age 10. Single calves are born every two to three years in shallow tropical wintering areas. Rarely, single young will be born on consecutive years. Prey consists mainly of small schooling fish and large zooplankton such as krill. Small, unstable social groups of one to five individuals will form, while in northern feeding areas larger feeding aggregations can form. Humpbacks engage in cooperative feeding behaviors and are known for their complex vocalizations.

Humpbacks were more heavily hunted for oil in the early years of commercial whale hunting because of their use of more coastal habits. Current populations are a small fraction of original pre-hunting levels. Hunting is no longer considered a widespread threat because of international protections and some stocks are increasing. Due to their preference for coastal habit, humpbacks are currently vulnerable to many activities in the near-shore zone such as collisions with vessels, habitat degradation, pollution and entanglement in fishing gear Carretta et al. 2002).

B. Habitat Status

Humpback whales inhabit coastal, continental shelf waters. During migration humpbacks stay in waters deeper than 200 m whereas at northern feeding and southern breeding grounds much shallower areas are frequented. Most humpback whales seen off the coast of northern California are most likely migrating through, though some feeding may occur here. Depths in the 0.25 mi-wide nearshore marine environment within RNSP boundaries range from 10 ft (~ 3 m) to 60 ft

(~19 m). This area is most likely too shallow for migrating humpbacks but may be very rarely used for feeding. There are six records of humpbacks in the RNSP wildlife observations database, distributed throughout the entire marine section of the parks.

10. Fin whale (*Balaenoptera physalius*), federal endangered

A. Species Account

Fin whales are widespread throughout the world's oceans with larger populations existing in the Southern Ocean. Populations in the north Pacific are divided into two stocks by the International Whaling Commission, with the northeast Pacific being considered all one stock (Donovan 1991). Fin whales which occur off the coast of California appear to be concentrated in southern and central California and may be non-migratory. Other fin whales appear off the northern California and Oregon coasts in summer and then appear in the Gulf of Alaska in late summer/fall with a greater number appearing in the Gulf of California in winter and spring indicating a migratory pattern. It is unknown, however, if this is all one migrating population or separate populations (Carretta et al. 2001c). Surveys conducted off California, Oregon and Washington in the late 1990's estimated a total population of 1,851 (CV=0.19) (Barlow and Taylor 2001).

Females are larger than males. Sexual maturity is reached around age 10 with physical maturity reached at around age 20. Gestation takes one year. Births occur in winter/spring; a single young is produced every 2.5-3 years. Fin whales can be found alone but may be found in groups of 3 to 20 individuals, which indicates larger social groupings than have been observed in other rorquals. In the northern Pacific shoaling small fish, squid, euphausiids and copepods make up the majority of the fin whale diet (Seed 1972).

Fin whale populations were reduced by intensive whaling; the harvest peaked in the North Pacific in the 1950s and 1960s when the larger blue whale became rarer and whalers turned to fin whales. As with the other large baleen whale species, Fin whales were hunted primarily for oil. Direct catching is no longer a threat. Gill net entanglement does not appear to be a threat for this species (Carretta et al. 2001b). The main threats appear to be the bioaccumulation of toxins (Hernandez et al. 2000) and underwater acoustic pollution (Croll et al. 2001).

B. Habitat Status

Fin whales inhabit open ocean areas that are relatively shallow and that have a topographically varied bottom. Fin whales often feed where cold water upwellings occur. Migrating fin whales, like all other rorquals, stay well offshore. Depths in the 0.25 mi-wide nearshore marine environment within RNSP boundaries range from 10 ft (~ 3 m) to 60 ft (~19 m). Therefore, it is unlikely that fin whales use the ocean habitat within RNSP with any regularity. There are no records of this species in RNSP.

11. Sei whale (*Balaenoptera borealis*), federal endangered

A. Species Account

Sei whales are not well known due to their widespread but patchy distribution throughout the world's oceans and their propensity to stay well away from continental coasts. Sei whales were

successfully hunted off the west coast of the United States but extensive ship and aerial surveys of the region conducted in the late 1990's reported only one confirmed sighting; the individual whale was spotted over 300 miles off the coast of northern California. No population estimates have been made for this region (Carretta et al. 2001d).

Sexual maturity is reached around age 6-8. Gestation takes approximately one year. Births occur in winter; a single young is produced every 2-3 years. Sei whales can be found alone or in groups of 2-5. Euphausiids and copepods make up the majority of the sei whale diet but they also feed on a variety of other near surface plankton (Seed 1972).

Sei whale populations were reduced by intensive whaling. As with the other large baleen whale species, sei whales were hunted primarily for oil. Direct catching is no longer a threat. It is not known what the potential threats to this species are because so little is known about them.

A. Habitat Status

Sei whales are found far from shore in open ocean more than any other rorqual and appear to avoid coastal features. Depths in the 0.25 mi-wide nearshore marine environment within RNSP boundaries ranges from 10 ft (~ 3 m) to 60 ft (~19 m). Due to the sei whales' deep sea habits, it is extremely unlikely that they use the ocean habitat within RNSP with any regularity. There are no records of this species in RNSP.

12. Short-tailed albatross (*Phoebastria albatrus*), federal endangered

A. Species Account

The short-tailed albatross is distributed widely throughout its historical foraging range in the temperate and subarctic North Pacific ocean and is sometimes found close to the west coast of the United States. From December through April, birds are concentrated near the breeding colonies on two Japanese islands, Torishima and Minami-kojima. In summer (the non-breeding season), individuals appear to disperse widely throughout the historical range, with the bulk of observations from the northern Gulf of Alaska, Aleutian Islands, and Bering Sea. Individuals have been recorded along the west coast of North America as far south as the Baja Peninsula, Mexico. The closest terrestrial area to the west coast known to be used by the short-tailed albatross is Midway atoll, where a few birds return and attempt (so far unsuccessfully) to breed every year. These individuals were banded as chicks on the Japanese islands (USFWS 2000 and citations therein).

Short-tailed albatrosses have a reputation for visiting near shore waters. However, it is unknown if this simply represents more boats, thus observations, in near shore waters relative to the open ocean. The USFWS at-sea sightings database contains "many" observations of this species within 10 km (6 mi) of shore, and "several" records of birds within 5 km (3 mi) of shore. Additionally, Native American middens dating back to 4,000 years ago, from California north to St. Lawrence island, contain many short-tailed albatross skulls indicating that the birds were hunted from kayaks close to shore. However there is no "objective" data indicating this species used coastal areas more heavily than offshore (USFWS 2000 and citations therein).

Despite the large range of this species, the breeding population is estimated at 600 birds. The total population is estimated to be around 1,200 birds. Historically, this species bred on many islands of Japan and Taiwan, where, between 1885 and 1903 an estimated 5 million short-tailed albatrosses were harvested. Harvesting continued and by 1949 there were no birds breeding at any of the known colonies and the species was thought to be extinct (USFWS 2000 and citations therein).

The primary threat to the short-tailed albatross is a random stochastic event, such as a volcanic eruption near a breeding colony, that could catastrophically destroy a substantial number of the existing population. Other threats to the species include plastics consumption, longline fisheries, and genetic bottlenecks (USFWS 2000 and citations therein).

There are no records of this species from within RNSP.

B. Habitat Status

There is a general lack of information on foraging areas and migratory habits of this species. Likewise it is not known whether the coastal waters within the ¼ mile bounday of RNSP provide suitable habitat, but given the propensity of this species wide ranging ability and reputation for visiting near shore waters, it is likely that RNSP's offshore waters offer suitable foraging habitat for the species. There are approximately 5,600 ac (2,240 ha) of coastal waters within the jurisdictional boundary of RNSP that may provide suitable foraging habitat.

13. Tidewater goby (*Eucyclogobius newberryi*), federal endangered

A. Species Account

Historically, the tidewater goby occurred in coastal brackish water habitats from Tillas Slough at the mouth of the Smith River in Del Norte County to Agua Hedionda Lagoon in San Diego County, but is believed now to occupy less than 5% of habitat along the California Coast (USDI 2002). Suitable habitat for this species includes brackish water at the upper edge of tidal bays near the transitional zones of freshwater tributaries and coastal lagoons. These small (50 mm (2 in)) fishes are typically found in shallow water (usually less than 1 m deep) in loose aggregations of a few to several hundred individuals. Males dig vertical nesting burrows 10-20 cm deep in clean, coarse sand starting in late April- early May when water temperatures reach 18-22 degrees Celsius and salinity reaches 5-10 parts per thousand. Females roam widely, displaying aggressive behavior, and court individual males that remain close to a nesting burrow. Males occupy an enlarged area of their burrows, where eggs hang from the ceiling and walls. Larvae hatch in 9-10 days, are 5-7 mm long, and live in midwater in vegetative cover until they reach 15-18 mm. At this size they become benthic. Juvenile and adult fish feed from the substrate on a variety of invertebrates, including ostracods, amphipods, snails, and chironomids (Swift et al. 1989).

The tidewater goby was listed as endangered in 1994 when it was believed that the species had disappeared from nearly 50% of the coastal lagoons within its historic range in California (USDI 1994). At that time, the state had recently experienced five years of drought, and it was thought that populations throughout the range were threatened by a variety of factors. These included modification or loss of habitat due to coastal development, channelization, alteration of water flows, exotic fish introductions, and increased sedimentation and effluent caused by grazing.

In 1999, the USFWS proposed to remove tidewater goby populations north of Orange County, California from the list of threatened and endangered wildlife (USDI 1999a). Recently, this proposal was withdrawn and the species will remain listed as endangered throughout its range. Reasons cited for the decision to withdraw the proposed rule included recognition that impacts from coastal development projects and urban development, combined with the effects of drought, could lead to populations not recovering from drought as was originally predicted. Information presented by species experts suggested that the tidewater goby's ability to recolonize a site is limited where populations are more widely separated (dispersal distances of 6 mi (10 km) or less are known), are separated by geographic barriers, or where there is no nearby population to the north. Also, nonnative predators are once again considered a threat to gobies throughout the range, based on the disappearance of gobies from several sites soon after introductions of centrarchid fishes (USDI 2002).

Locally, tidewater gobies are known to occur in Stone Lagoon State Park just south of the RNSP boundary. The status and distribution of the species throughout all of RNSP are currently unknown. However, surveys are conducted annually in the Redwood Creek estuary, and presence/absence sampling was conducted in 1998 in Espa Lagoon (RNSP 1998, Anderson 2000). There are historic records of gobies at Freshwater Lagoon from the early 1950s prior to highway construction over the spit (Swift et al. 1989), and five gobies were collected from the Redwood Creek estuary in the early 1980's (T. Hofstra pers. comm.). The Redwood Creek specimens are the last known captures of this species in RNSP. It is unlikely that the species will return to the Redwood Creek estuary without reintroduction and restoration of the estuary to its historical configuration (RNSP 1998).

Threats to the tidewater goby, if any exist within RNSP, are discussed in the following section on major threats.

B. Habitat Status

A local researcher familiar with habitat requirements of this species speculated that marshy coastal creeks within the parks, especially if associated with a lagoon that is on occasion brackish, would provide good quality habitat for this species (C. Chamberlain pers. comm.). Sites matching this description occur at Boat and Home Creeks near Fern Canyon, where Butler, Ossagon, and Johnson Creeks enter Gold Bluffs Beach, and the Klamath River estuary. However, the amount of potential habitat occurring at these sites is unknown.

Due to its altered condition, Freshwater Lagoon appears to no longer provide suitable habitat for the tidewater goby. The increased elevation of the spit (five to fifteen feet higher than the original dune crest) precludes salt water from entering the lagoon, even during storm surges with occasional overwash onto the dunes. In addition to the change in salinity of the lagoon, it has been stocked with predatory fish species such as largemouth bass and rainbow trout. Fishery classes from Humboldt State University periodically electrofish the lagoon, and over the years have never documented capture of a goby (unpub. data on file at RNSP).

Habitat status of Redwood Creek estuary is presumed to no longer be suitable because of sedimentation of sloughs and expansion of exotic reed canary grass (D. Anderson, pers. comm.).

14. Oregon silverspot butterfly, (*Speyeria zerene hippolyta),* federal threatened

A. Species Account

In California, the Oregon silverspot butterfly is known only from Lake Earl and Lake Tolowa in Del Norte County. It is associated with coastal grasslands (marine terraces and "salt spray" meadows) that contain the larval host plant, early blue violet (Viola adunca), nectar sources, and adult courtship areas. Habitat for this species was historically maintained by wildfire, salt-laden winds, grazing, and controlled burning and is believed that the open vegetation preferred by this butterfly has always had a patchy distribution (USFWS 2001a). This butterfly differs from related subspecies in physiology and larval development rates, which appear to be specific adaptations to a harsh, coastal environment characterized by fog and cold wind. A slow caterpillar development rate ensures that adult flight takes place during the time of mildest weather, usually in late August and September (McCorkle and Hammond 1988).

Meadow habitats must have sufficient numbers of early blue violets to provide adequate food for the caterpillars. Such habitats tend to be relatively open and low-growing grasslands. Small numbers of violets found in small forest clearings isolated from open grasslands are not adequate to support Oregon silverspot butterflies (Hammond and McCorkle 1984). Distribution, abundance, and temporal availability of nectar sources also may affect the stability of butterfly populations. A broad array of nectar species reduces the risk of local extinctions. Native nectar sources include dune goldenrod (*Solidago canadensis*), California aster (*Aster chilensis*), pearly everlasting (*Anaphalis magaritacea*), dune thistle (*Cirsium edule*) and yarrow (*Achillea millefolium*). Introduced species that are known nectar sources are tansy ragwort (Senecio jacobea) and false dandelion (*Hypochaeris radicata*). Tansy ragwort and California aster are the dominant nectar species used by the Lake Earl population (USFWS 2001a).

Microclimate conditions at Lake Earl north to Brookings, Oregon create an environment that is warmer than the surrounding area. It was hypothesized that these warmer conditions may render the habitat more ideally suitable for this butterfly in the vicinity of Lake Earl (S. Mattoon, pers. comm.). Habitat with the greatest likelihood of supporting Oregon silverspots in RNSP was surveyed at various times in the early 1990s but this species was not detected (S. Mattoon pers. comm.). The revised recovery plan (USFWS 2001a) recommends that additional surveys be conducted throughout coastal Del Norte County, which would include portions of RNSP.

Threats to this species include residential and commercial development in suitable habitat, invasion of exotic species, overgrazing, and lack of fire (USFWS 2001a). It is unknown whether this species has ever occurred in RNSP.

B. Habitat Status

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

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

15. Western snowy plover (*Charadrius alexandrinus nivosus*), federal threatened

A. Species Account

The western snowy plover is one of twelve subspecies of snowy plover. The Pacific Coast population was federally listed as threatened in 1993 and includes all nesting colonies on the mainland coast peninsulas, offshore islands, and adjacent bays and estuaries from southern Washington to southern Baja California.

Historical records indicate that western snowy plovers were previously more widely distributed and abundant along the U.S. west coast than at present. By 1980, numbers of breeding sites declined by 40, 69, and 62 per cent in Washington, Oregon, and California, respectively (USFWS 2001b, USDI 1993). In California, coast wide surveys (e.g., in 1989 and 1991) continued to document downward trends in breeding numbers. The coast wide survey in 1995 indicated an additional 21 per cent decline in breeders since 1980 (USFWS 2001b). Accordingly, numbers of breeding adults in Mendocino, Humboldt, and Del Norte counties declined from 80 in 1977 to 19 in 1995. Adult numbers were estimated at 60 in 2001 and 63 in 2002, which may reflect an increase in survey effort (Colwell et al. 2002), but this number remains well below the recovery goal of 150 birds in the three northern California counties. Although the number of nesting attempts was higher this year than in previous years, the number of chicks fledged was low at 30% (Colwell et al. 2002).

Currently, the largest concentrations of coastal breeding birds within the range occur from San Francisco Bay south to southern Baja California (Page and Stenzel 1981, Palacios et al. 1994). In California, the area between San Francisco Bay and the Channel Islands accounts for over 75% of California breeding colonies (Page et al. 1991). Locally, breeding in the last few years has been restricted to a few beaches and river gravel bars in Humboldt County. Historically, snowy plovers bred at Stone Lagoon State Park, located adjacent to the southern boundary of RNSP. Another historic breeding area, Big Lagoon County Park, is located about five miles south of the RNSP. These two beaches have been designated by the USFWS as critical habitat. North of RNSP there are historic breeding records from Lake Tolowa and the mouth of the Smith River in Del Norte County (USDI 1993).

RNSP beaches were surveyed in 1977 under the coast wide suitable habitat survey (Page and Stenzel 1981). Those surveys did not detect snowy plovers on any RNSP beaches. Winter surveys were done along the California coast between 1979 and 1985 and during this effort a few plovers were detected on Gold Bluffs Beach in two out of three winters (Page et al. 1986). However, results of these surveys indicated the majority of snowy plovers winter from Sonoma County southward. Surveys since that time have failed to detect western snowy plovers on any RNSP beaches. In 1993, the year the species was listed, RNSP staff undertook a limited breeding season survey of all accessible beach habitat in RNSP. California Department of Fish

and Game surveyed RNSP in 1995. Beginning in the winter of 1996/97, RNSP staff resumed a thorough survey of potential habitat in winter and during the breeding season. Surveys currently are being conducted during seven months in the breeding season and two months in winter on all accessible beaches within RNSP except Klamath Beach. This constitutes surveys on approximately 858 ac (83%) of potentially suitable habitat in RNSP. The surveys and the months in which they are conducted are summarized in the following table:

BEACH	2 Surveys per Month	1 Survey per Month
Freshwater	March- August	September, Dec.– Jan.
Mussel	None	March- September
Gold Bluffs n. of Major Creek	March- August	September, Dec.– Jan.
Gold Bluffs s. of Major Creek	None	March- September
Crescent	None	March- September

There are 11 records of western snowy plovers in the RNSP wildlife observation database, none of which includes observations inside RNSP. Eight observations were recorded north of Crescent City (all in 1975 and 1977). Approximately half of the database records (all from 1977) noted nests with eggs or chicks at Lake Tolowa, the mouth of the Smith River, and Big Lagoon spit; some of these records probably overlap with nest numbers reported in Page and Stenzel (1981). The most recent record in the database was from November 1993, from the "north end" of Stone Lagoon. Winter window surveys in 2001 recorded six birds at Big Lagoon and one at the Smith River mouth (USFWS unpub. data). These records represent the most recent, proximate snowy plover occurrences relative to RNSP. Historic records of snowy plovers from within RNSP are limited. Dr. Stan Harris (pers. comm.) has two records from Gold Bluffs Beach for June 1960. Additionally, a former park ranger at Gold Bluffs Beach stated that in the early 1980s he observed snowy plovers on that beach, in the vicinity of Ossagon, on numerous occasions in both winter and summer. However, no nest was ever found at Gold Bluffs Beach (G. Strachan pers. comm.) These observations are not in RNSP' wildlife observation database.

Threats to the western snowy plover within RNSP are discussed in the following section on major threats.

B. Habitat Status

Although RNSP contains approximately 1,029 ac of beach habitat that are currently considered potentially suitable for snowy plovers the draft recovery plan identified only Gold Bluffs Beach as providing potential wintering and migration habitat important to the recovery of the species (USFWS 2001b). No other RNSP beaches were identified in the draft plan as providing habitat of any sort that should be managed for the population's recovery.

Beach habitat in RNSP appears to be of variable quality depending on the location. The highest quality habitat probably occurs along certain sections of Gold Bluffs Beach, particularly in the northern half, where the beach is wide and open and European beach grass has not stabilized the dunes to the same degree it has elsewhere along this beach. Freshwater Spit and the adjacent beach to the north also appear to provide good quality habitat. In this area the dune mat community has been restored through exotic plant management efforts, including the removal of European beach grass. However, this beach receives a high amount of public use along its entire stretch, which may deter plover use. Together Gold Bluffs Beach and Freshwater Spit/Beach account for approximately 669 ac, or 65% of the available beach habitat in RNSP.

On the lower end of the quality spectrum are 189 ac (18%) of beach habitat that are narrow and bluff-backed (i.e., Mussel Beach north of Redwood Creek and Crescent Beach). These beaches disappear in the winter months, and in summer high tides may inundate the entire beach to the bluffs. Also of low quality are sections of Gold Bluffs beach with European beach grass "thickets" of nearly 100% cover. However, due to the lack of recent and historic snowy plover observations in RNSP it is difficult to assess what constitutes the most suitable (or least) beach habitat in RNSP. One might assume that Gold Bluffs Beach would be the most likely place in the parks for snowy plovers to occur. However, since the early 1980s the beach profile, as well as the plant community, has undergone changes that may have rendered this beach no longer suitable for snowy plover use (G. Strachan pers. comm., P. Rovai pers. comm.).

16. Bocaccio (*Sebastes paucispinis*), federal candidate

A. Species Account

Bocaccio is a common rockfish occurring in coastal waters of the northeastern Pacific from Alaska to Mexico (Miller and Lea 1972). It is a long-lived fish with recorded ages in the 30-40 year range. Maturity is reached at five years and the mean generation time is 12 years. Juvenile recruitment is characterized by rare, large events that result in most of the population being from a very few years. For example, in the past 25 years there have been only three large recruitments (1977, 1984, and 1988). However, recruitment is highly variable; in just 10 years (between 1969 and 1979) there were four large recruitments into the population. This variability appears to be caused by long-term ocean climatic patterns (MacCall and He 2002).

Historically, bocaccio sustained the greatest harvest of any rockfish species in California, but the stock has declined to a relatively low level of abundance in recent years (MacCall 2002). The species is one of several stocks off California, Oregon, and Washington that has been formally declared overfished by the Pacific Fishery Management Council and National Marine Fisheries Service. Currently there is a gap in species distribution off northern California and southern Oregon (MacCall and He 2002).

The primary threat to the species is intentional and unintentional (i.e., "bycatch") harvest. A secondary threat was identified as habitat modification due to the effects of bottom trawling, pollution of juvenile habitat, and shifts in oceanographic conditions (MacCall and He 2002).

Between July 1974 and June 1976 inter- and subtidal areas were sampled for marine plants and animals at six locations in or near RNSP. During that inventory a species related to the bocaccio, black rockfish (*Sebastes melanops*), was caught in dip nets at Endert's Beach cove (Boyd and DeMartini 1977). However, those authors acknowledged the difficulty of rockfish identification. The status of the Bocaccio in waters off RNSP is unknown.

B. Habitat Status

Adult bocaccio are found singly or in schools in association with rocky areas, from near-surface to depths exceeding 600 ft. Juvenile Bocaccio often form dense schools in nearshore areas (MacCall and He 2002). It is not known what proportion of the 5,727 ac (2,291 ha) of ocean area within the park's boundary is potentially suitable for this species.

17. Black abalone (*Haliotis cracherodii*), federal candidate

A. Species Account

The black abalone occurs from the Oregon border to Baja California. It is a resident of tidepools and other rocky intertidal coastline habitats, and shows a tolerance for areas impacted by heavy surf. Unlike its relative, the red abalone (*Haliotis rufescens*) that inhabits the underside of rock ledges, the black abalone is often found in vertical crevices in rocks; perhaps because it derives much of its nourishment from plankton (Ricketts and Calvin 1952).

The black abalone was once a commercially important species. However, in many areas, especially southern and central California, commercial and sport harvesting have decimated abalone populations (Sea Grant 2001). In addition to over-harvesting, some black abalone populations suffer from "withering syndrome", a condition caused by a bacterial pathogen (Friedman et al. 2000), and possibly exacerbated by thermal stress due to warm water discharges (e.g., from power plants) or El Nino events (Steinbeck et al. 1992). Withering syndrome has caused mass mortality in certain populations (e.g., Channel Islands) and is expected to spread throughout populations along the entire coastline (Tissot 1995, Raimondi et al. 2002). The disease affects all size classes of individuals and prognosis for rapid, natural recovery of black abalone populations along central and southern California is not good (Raimondi et al. 2002). Withering syndrome has recently been recorded in black abalone populations near Crescent City and in Mendocino County. It was speculated that these populations may have been infected by cultured abalone that were released at these sites for stock enhancement. Aquaculture farms now known to harbor the infection have supplied abalone to farms in the Crescent City area (Sea Grant 2001).

Between July 1974 and June 1976 inter- and subtidal areas were sampled for marine plants and animals at six locations in or near RNSP. During that inventory a few red abalone were observed in the vicinity of Crescent City, but none were observed south of Endert's Beach (Boyd and DeMartini 1977). There are no known records of black abalone from RNSP.

B. Habitat Status

Black abalone are known to inhabit surf-swept rocky areas including rocky tidepools and headlands. They are found from the intertidal zone to a depth of about 50 ft (Ricketts and Calvin 1952, Sea Grant 2001). Within RNSP, there are an estimated 1,742 ac (697 ha) of potentially suitable black abalone habitat. This area includes tidal flats, rocky headlands, tidepool areas, and the adjacent submerged land to a depth of 30 ft. All the potentially suitable habitat identified occurs between High Bluff and Endert's Beach (roughly).

18. Mardon skipper (*Polites mardon*), federal candidate

A. Species Account

The mardon skipper is a small sedentary butterfly species that inhabits low growing grassland plant communities. It is currently known from only four widely separated locations. A single population is known from California. This population occurs in northwestern Del Norte County, on the first inland ridge southeast of the town of Smith River, in a Jeffrey pine/fescue community

(S. Mattoon pers. comm.). This site is approximately four miles north of RNSP on U.S. Forest Service land.

Mardon skipper larvae feed on Festuca spp. for approximately three months (Dornfeld 1980) before pupating in cocoons in the bunch grass (Newcomer 1966). Adults feed on a variety of nectar sources depending on the locale. At one site *Viola adunca* was the preferred nectar source; other preferred sources include *Vicia* spp., *Penstemo*n spp., and *Calochortus* spp. Site conditions where mardon skippers have occurred range from dry, open ridge tops to places associated with wetlands or riparian habitats. The Del Norte County population is on a ridge that intercepts coastal fog and is cool and moist in the summer when adult butterflies are present (S. Mattoon pers. comm.). Some searches for this species have been done for new populations in northwest California, specifically in serpentine habitats on U.S. Forest Service land east of the known population (USFWS 1999, S. Mattoon pers. comm).

Threats to the species include recreational activities including walking, horseback riding, and off-road vehicle use that may kill skippers directly or degrade habitat. The California population is currently threatened by these activities (USFWS 1999). Grassland habitats required by this species have been severely reduced by development, fire suppression, and invasion by plants not suitable for the species including non-natives (Potter et al. 1999). Scotch broom has been identified as a particular threat due to its ability to form dense stands and exclude native grassland species. Parker et al. (1997) found an inverse relationship between Scotch broom and Idaho fescue, a larval host species.

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

B. Habitat Status

Potentially suitable habitat for the mardon skipper may occur in RNSP in the Little Bald Hills where serpentine Jeffrey pine/fescue grasslands occur. This habitat area is approximately eight miles south of the known site in Del Norte County, but is two miles farther inland from the coast than the known site. It is unlikely that other potential habitat occurs within RNSP, as the serpentine soils that create this type of habitat are absent elsewhere in RNSP.

VI. LISTED SPECIES KNOWN TO OCCUR REGULARLY IN RNSP

1. Beach layia (*Layia carnosa)*, state and federal endangered

A. Species Account

The beach layia is a succulent annual herb, less than 15 cm (6 in) tall, belonging to the sunflower family (Asteraceae). It is a winter annual that germinates during the rainy season from fall to mid-winter, blooms in the spring, and sets seed before the dry season. It tends to grow in patches, and population numbers vary annually, both spatially and temporally. The species occupies sparsely vegetated open areas in semi-stabilized foredune and coastal scrub

communities. The habitat where it is located experiences some drifting sand and has low-growing herbaceous, perennial native species. Associated plant species, such as beach silver top (*Glehnia leiocarpa*), beach pea (*Lathyrus japonicus* and L. littoralis), dunegrass (*Leymus mollis*), sand verbena (*Abronia latifolia*), beach strawberry (*Fragaria chiloensis*) and beach-bur (*Ambrosia chamissonis*) provide protection from sand movement and erosion. The beach layia was state listed as endangered in 1991, and federally listed as endangered in 1992 (USDI 1992a).

Historically, beach layia was restricted to widely scattered, isolated populations within eight dune systems in California, from the mouth of the Little River in Humboldt County to the San Francisco peninsula (USDI 1992a). More recently it is known to occur in seven dune systems from Humboldt County to Santa Barbara County. The species occurs in 19 extant populations with 300,000 individuals; the largest populations are known from Humboldt County (USFWS 1998). Extirpated populations at the mouth of the Little River were thought to represent the northernmost occurrence of the species until a population was discovered on Freshwater Spit in RNSP in July of 1999.

After the Freshwater population was discovered, additional surveys for beach layia were conducted in all potentially suitable habitat in RNSP. No additional populations have been detected to date. Projects proposed in suitable beach layia habitat are surveyed entirely prior to project implementation.

The known population on Freshwater Spit is monitored and mapped annually. After four years (since its discovery) the population at Freshwater Spit appears to be stable, or slightly increasing, and currently consists of four or five clusters of plants with individual plants scattered in between. As of 2002, the Beach Layia was not found close to existing facilities on the spit. Although the plant clusters shift slightly from year to year, there have not been any significant changes in location of this population on the spit since its initial discovery.

Threats to the beach layia within RNSP are discussed in the following section on major threats.

B. Habitat Status

In RNSP those beaches that remain year round, are not likely to be inundated during high tides, and have a dune complex provide beach layia habitat. The parks currently contain an estimated 669 ac (267 ha) of beach habitat that meet these criteria. Freshwater Spit and the beach north to the Redwood Creek estuary constitute approximately 79 ac (31 ha) of this habitat. The remaining potentially suitable habitat occurs north of Major Creek to Carruther's Cove along Gold Bluffs Beach, with the most suitable potential habitat at the north end of Gold Bluffs Beach from Ossagon to Carruther's Cove. However, the widespread occurrence of European beach grass on this beach has reduced the quality of the habitat for beach layia. In places where the exotic beach grass has been removed from Freshwater spit, beach layia populations have responded favorably by occupying restored areas of the beach (L. Arguello pers. comm.).

2. California brown pelican (*Pelecanus occidentalis californicus*), state and federal endangered

A. Species Account

California brown pelicans are found in estuarine, marine subtidal, and marine pelagic waters along the west coast from Mexico to Washington (Jaques et al. 1994). They breed on offshore islands from southern California to the Pacific coast of southern Mexico and in the Gulf of California. The largest breeding colony in the United States is found on Anacapa Island in southern California. This is currently the northern-most breeding colony along the west coast.

Since the mid-1970s brown pelicans have expanded their range dramatically. By 1985, thousands of brown pelicans were migrating as far as the Washington coast (Jaques et al. 1994). The range expansion from southern areas into the north has occurred along with the combination of greater reproductive success since 1985, El Nino events, and generally warmer water in the north Pacific ocean (Jaques et al. 1994). Those authors noted that the increase in numbers in areas north of California rose from approximately 4,200 pelicans in 1987 to more than 10,000 in 1991. During that same time, fall counts of brown pelicans in northern California decreased.

Briggs et al. (1983) identified the coastline between Trinidad and the Klamath River as having the largest numbers of brown pelicans north of Pt. Arena during the summer. In fall, this area of use expanded to the Oregon border. Now, in summer and fall, brown pelicans are commonly observed along the entire RNSP coastline. Brown pelicans can be seen in the parks from April until January; however, the highest numbers of pelicans are observed from late June through October.

Offshore rocks, estuaries, and open beaches are used by brown pelicans for resting during the day ("loafing"); off shore rocks and estuaries are the most often preferred loafing sites. Groups of 100 or more individuals have been observed with some regularity at the Klamath and Smith River estuaries (Jaques and Strong unpub. data) and the mouth of Redwood Creek (RNSP unpub. data). The largest number of pelicans recorded in one group by RNSP surveyors (an estimated 1,000 individuals) was on the Klamath River spit (RNSP unpub. data).

California Department of Fish and Game coastal water bird aerial surveys indicated a relatively low level of beach use by pelicans along the northern California coast. Aerial surveys in 2001 showed that pelicans observed on mainland beaches or sand spits constituted less than 10% of all pelicans observed loafing during those surveys (CDFG unpub. data). However, despite the observed preference for offshore rocks and estuaries, pelicans are known to loaf on open beaches in RNSP with some regularity. Data collected by Jaques and Strong (unpublished), as well as RNSP staff, indicate that pelicans repeatedly use the same approximate locations on beaches. In RNSP these loafing sites include the beach near the mouth of Redwood Creek, the beach in the vicinity of Home and Boat Creeks near Fern Canyon, and open stretches of beach in the vicinity of Ossagon and Squashan Creeks (RNSP unpub. data).

The following table summarizes information on pelican use of mainland beaches as loafing sites (collected by snowy plover and beach carcass surveyors) in 2002:

Beach	Number of Surveys Where Pelicans Were Observed Loafing on Beaches	Mean Number of Pelicans Loafing in a Group (Range)	Range of Dates When Pelicans Groups Were Observed
Redwood Ck Estuary	3	16 (6-30)	15 May – 18 Sept
Mussel	0	0	N/A
Gold Bluffs	5	46 (2-100)*	12 June – 28 Aug
Crescent	0	0	N/A
TOTAL	8	24.5 $\pm$ 23.3 (SD)	15 May – 18 Sept

* Numbers and locations were as follows: 65 near Home and Boat Cr. mouths (Fern Canyon), 22 on open beach north of Fern Canyon, 100^{+} at Ossagon (includes incidental observations outside of a survey), 3 at Carruther's Cove .

In RNSP, pelicans have been observed foraging in the surf and in the Klamath River and Redwood Creek estuaries, as well as farther out in the ocean. Foraging locations often appear coincidental with adjacent loafing sites (Jaques et al. 1994, RNSP unpub. data).

Night roosts essential to the brown pelican are believed to require three elements: 1) they must occur within energetically efficient distances from foraging areas, 2) they must be buffered from mammalian predators and human disturbances, and 3) they must provide shelter from strong winds and surf spray (USFWS 1983). Night roosts inland from the coast characteristically consist of some type of island surrounded by shallow water in which pelicans can stand, or deeper water in which they float (Jaques and Anderson 1988, Jaques et al. 1996). Indeed, Jaques and Anderson (1988) claim "being surrounded by water at night is…an important adaptation for secure roosting for this species…" At coastal lagoons and other coastal habitats, pelicans are known to leave the mainland at dusk and fly to offshore islands for roosting. In California, most of the documented night roosts occur on dry substrates completely surrounded by deep ocean water, including offshore rocks, islands, and breakwaters (Jaques and Anderson 1988, Jaques et al. 1996). Although it has never been documented, it is suspected that pelicans in RNSP follow the same pattern of movement from the mainland to offshore rocks for night roosting. However, pelicans on Gold Bluffs Beach were observed standing in quiet surf adjacent to the wave slope into the late evening and may have remained on the beach after nightfall. RNSP staff will continue to investigate this further in the years to come.

Threats to the brown pelican within RNSP are discussed in the following section on major threats.

B. Habitat Status

Brown pelican habitat is found along the entire 35 mile coastline of the parks. There are approximately 1,631 ac (652 ha) of beach and other coastal mainland habitat available for use by pelicans in RNSP. Off shore rocks large enough to be used for loafing or night roosts cover approximately 27 ac (11 ha) within the RNSP boundary. Ocean area available for foraging within the park covers approximately 5,727 ac (2,291 ha). Foraging habitat also includes the Klamath River and Redwood Creek estuaries.

3. California coastal chinook salmon (*Oncorhynchus tshawytscha)*, federal threatened

A. Species Account

Chinook salmon populations have declined along the Pacific coast to the degree that certain evolutionarily significant units (ESUs) were listed as threatened by the NMFS under the ESA (USDC 1999a). Based on the best biological and commercial information available NMFS identified 19 ESUs from populations in Washington, Idaho, Oregon, and California. Genetic data were the primary evidence considered for the reproductive isolation criterion, supplemented by inferences about barriers to migration, human-induced changes resulting from artificial propagation, and harvest. Chinook salmon historically ranged as far south as the Ventura River, California, and north as far as the Russian Far East (USDC 1999a). The California Coastal ESU (Redwood Creek and south) was listed as threatened in 1999 (USDC 1999a).

Chinook typically return from the ocean to rivers, larger streams, and larger tributaries to spawn between November and early January after three to four years in the ocean, although two year old male spawners are commonly observed. Winter-run chinook constitute the main chinook runs in RNSP streams. These fish begin their upstream migration around November, if access through the Redwood Creek estuary is possible, and have spawned and died by the end of January. Adult spring-run chinook were observed in RNSP in only one season since 1981, when the NPS staff began summer steelhead surveys, but are not typically considered to use the Redwood Creek watershed. Chinook salmon spawning in the RNSP tributaries may be impeded by stream barriers, but they may be able to surmount some barriers that may impede the smaller coho salmon.

Juvenile chinook salmon in Redwood Creek do not spend time rearing in upstream areas (Anderson and Brown 1982), but instead, utilize the Redwood Creek estuary. In spring, chinook salmon fry migrate downstream to rear in the estuary before entering the ocean in the fall. Thus, the Redwood Creek estuary is important as the sole rearing habitat for this ESU in RNSP. Research shows that, if given the opportunity, the juveniles will spend an extended period (to late summer) in the estuary before entering the ocean. Reimers (1973) documented the role estuaries play in fall chinook salmon production. From scale analysis of spawning fall chinook from the Sixes River, Oregon, he determined that the majority of returning adults spent June, July, and August as juveniles within the estuary before completing their seaward migration. His investigations determined that juvenile chinook spending less than three months in the estuary seldom returned to spawn in the natal stream. He concluded that these fish did not survive as well in the ocean as the fish that had spent three months in the estuary. Apparently a survival advantage was conferred upon the fish that remained in the estuary and grew to a larger size before entering the ocean.

Prior to 1978, most young chinook salmon were released from Prairie Creek Fish Hatchery in the early spring. These were fish hatched from eggs taken only four or five months earlier. Capturing sufficient numbers of chinook to obtain their eggs was difficult because of the low numbers of returning adult fish. The low numbers of returning adult chinook are probably related in part to the conditions in the Redwood Creek estuary. Winter spawning/carcass counts in RNSP continue to indicate low numbers of returning salmon (D. Anderson pers. comm.).

Threats to the chinook salmon within RNSP are discussed in the following section on major threats.

B. Habitat Status

Chinook salmon rearing habitat was degraded when flood control levees that bisect the Redwood Creek estuary were constructed in 1968. The levees altered the physical and biological functions of the estuary and adjacent wetlands and confined the stream channel to a width of 300 ft. The flood control project reduced the amount of riparian vegetation and tree cover, reduced adjacent wetlands, altered valley drainage patterns, decreased the amount of instream woody debris, and caused decreased pool depths along lower Redwood Creek. The levees bypassed and isolated the last downstream meander of Redwood Creek, reduced circulation into the north and south sloughs, and contributed to 50% of the lower estuary between zero and four feet MSL filling with sediment or becoming isolated from the embayment (Ricks 1983). Adjacent land uses, e.g., cattle grazing on the flood plain and uncontrolled breaching of the sand berm (which forms a barrier to the ocean across the mouth), also have contributed to habitat degradation of the estuary.

C. Chinook Critical Habitat

Critical habitat is defined in Section 3(5)A of the Endangered Species Act as "…the specific areas within the geographical area occupied by the species… on which are found those physical or biological features (a) essential to the conservation of the species and (b) which may require special management considerations or protection". In designating critical habitat, NMFS considers habitat elements and conditions required for all life stages of the species. In addition, NMFS also focuses on the known physical and biological features (primary constituent elements) within the designated area that are essential to the conservation the species. These essential features may include, but are not limited to, spawning sites, food resources, water quality and quantity, and riparian vegetation. Structurally complex streams containing stones, logs, brush, and aquatic macrophytes support larger numbers of rearing coho juveniles (Scrivener and Andersen 1982) than do streams that lack these structural features.

Designated critical habitat for California Coastal ESU chinook salmon was withdrawn per the Consent Order in the case of National Association of Home Builders v. Evans (April 30, 2002). Potentially suitable habitat for this ESU in RNSP occurs in the Redwood Creek basin and includes all stream and estuarine reaches accessible to the species. Accessible reaches are those within the historical range of the ESU that can still be occupied by any life stage of the species.

4. Northern California steelhead trout (*Oncorhynchus mykiss*), federal threatened

A. Species Account

Steelhead were distributed historically throughout the North Pacific Ocean from the Kamchatka Peninsula in Asia to the northern Baja peninsula. Presently, the distribution extends from the Kamchatka Peninsula, east and south along the Pacific Coast of North America, to at least Malibu Creek in southern California. Steelhead likely inhabited most coastal streams in Washington, Oregon and California as well as many inland streams in these states and Idaho.

During this century, over 23 naturally reproducing stocks of steelhead are believed to have been extirpated, and many more are thought to be in decline in numerous coastal and inland streams in

Washington, Oregon, California, and Idaho. Forty-three stocks have been identified as being at moderate or high risk of extinction. For these reasons, steelhead were listed as endangered in two environmentally significant units (ESUs) and threatened in four ESUs. The Northern California ESU from Redwood Creek south, falls within the boundaries of RNSP; it was listed as threatened on June 7, 2000.

Steelhead are found in most small order, high gradient tributaries to Redwood Creek. They are able to leap above barriers that might impede coho salmon (D. Anderson pers. comm.). Whether logjams are barriers to movement depends upon stream dynamics such as the size of the logjam and the stream discharge as well as the timing and duration of the steelhead migration. These events change from year to year.

Steelhead spawners are the last of the anadromous salmonid species to return to freshwater in the annual cycle, generally between January and April. Juveniles rear in the streams for one to four years before their downstream migration to the ocean. The majority of juvenile steelhead in Redwood Creek spend their second year of life in the estuary and lower part of Redwood Creek (Anderson 1988). They reside in marine waters typically for two or three years prior to returning to the natal stream to spawn. Unlike other Pacific salmon, steelhead are capable of spawning more than once before they die.

Summer steelhead surveys began in the RNSP in 1981 and survey data have indicated a continuous decline since that time. Forty-four is the highest total number of adult fish observed during summer surveys of portions of the mainstem of Redwood Creek. No adult fish were seen in 1989. The number counted in 1990 was 14, in 1995 five steelhead were counted, and in 2001 the number again was zero. No other park streams in the Redwood Creek basin have been surveyed for summer steelhead; the smaller streams do not have pools large enough to support fish during the warm summer months.

Winter run steelhead numbers are higher than summer steelhead numbers. Juvenile winter run steelhead are the most common and widely distributed fish in the Redwood Creek basin. During sampling efforts in the summers of 1980 and 1981, steelhead trout occurred in 57 of the 111 tributaries surveyed (Anderson 1988, Brown 1988). In recent years winter stream surveys have been conducted along the mainstem of Redwood Creek (flows permitting), Lost Man Creek, Little Lost Man Creek, Prairie Creek, Mill Creek, and Bridge Creek. In the winter of 2000-2001 ten live winter steelhead were observed in Redwood Creek (Holden 2002).

Threats to the steelhead within RNSP are discussed in the following section on major threats.

B. Habitat Status

Steelhead habitat requirements change as they go through different life phases. Adult steelhead need to have access to their natal streams. Therefore, it is important that streams are free of barriers to migration, as the majority of spawning occurs in the upper reaches of tributaries. Adults also need access to spawning gravel in areas free of heavy sedimentation with adequate flow and cool, clear water. Steelhead utilize gravel that is 0.5-6 inches in diameter, dominated by 2 to 3 inch gravel. Escape cover for spawning adults also is important.

Steelhead eggs and pre-emergent fry require cool water with adequate dissolved oxygen. Fine sediment smothers developing eggs, so the area must be free of silt and the water clear. During their first summer, juvenile steelhead are typically found in relatively shallow areas with cobble and boulder bottoms. They reside at the downstream end of shallow places or in riffles less than two feet deep in areas with woody debris accumulation (logs or tree roots). Cover structures such as boulder clusters and root wads provide both summer and winter rearing habit. Surface turbulence (or white water) provides another source of cover during the summer months. As juvenile steelhead grow, pools become an important habitat component. The most desirable pools for habitat are those with abundant escape cover in the form of large woody debris, undercut banks, root masses, and large boulders.

Many of the small order, high gradient tributaries to Redwood Creek provide suitable habitat for steelhead in RNSP. Within the designated ESUs, there presently is no designated critical habitat for steelhead.

5. Southern Oregon/Northern California coho salmon (*Onchorynchis kisutch),* federal threatened and state candidate

A. Species Account

Coho or "silver" salmon are found in streams and rivers throughout much of the Pacific Rim, from central California to Korea and northern Japan. Coho are anadromous and have a life history similar to chinook. However, the time they spend in fresh and salt water is relatively fixed, compared to the more variable life history of chinook. North of central British Columbia, coho tend to spend two years in freshwater, while south of this point they spend only one year in freshwater. Unlike chinook, where most production comes from mainstem spawning areas, coho tend to use smaller streams and tributaries. North American coho spawn in tributaries from the San Lorenzo River in Monterey Bay, California to Point Hope, Alaska, and throughout the Aleutian Islands. They are most abundant in coastal areas from central Oregon to southeast Alaska.

Coho salmon have shown substantial decreases throughout their range (Konkel and McIntyre 1987). In the U.S. Pacific Northwest, they are now extinct in the eastern half of their former range, and badly depleted over most of the western half (Frissell 1993). At least 33 populations have been identified by agencies and conservation groups for being at moderate or high risk of extinction. Overall, a geographic trend for west coast coho salmon stocks has developed with the southernmost and easternmost stocks in the worst condition. In California, including hatchery stocks, current abundance could be less than 6% of estimates for the period 1940 to 1949. Populations now are at least 70% lower than during the 1960s (CDFG 1994). The Southern Oregon/Northern California Coasts ESU for coho salmon, where RNSP is located, was designated as threatened in 1997 (USDI 1997).

The anadromous fish populations of Redwood Creek have experienced a substantial reduction during the last 30 years, in part due to severe flood events that moved large amounts of sediment from highly eroded hill slopes to the stream channels of the Redwood Creek basin. Current fish runs are far below those that occurred 70-80 years ago. News accounts and recollections of longtime residents of the Redwood Creek watershed suggest that both the size and numbers of salmonids have declined in recent decades (Van Kirk 1994). The total population in the

Redwood Creek system may have numbered more than 2,000 adult coho; most occurred in the Prairie Creek drainage and probably originated from the Prairie Creek Hatchery (D. Anderson field notes). Since the closure of the hatchery in 1992 the number of coho are probably much lower. However, Bell (2001) determined a two-year freshwater life history component, 28%, in Prairie Creek smolts.

After hatching, juvenile coho salmon generally spend one full year rearing in freshwater before entering the ocean. Downstream migration of coho to the ocean from upstream Redwood Creek rearing areas occurs in early spring (March-April). Survey data from RNSP indicate that these young salmon move directly into the ocean, spending a minimal amount of time in the Redwood Creek estuary (Anderson 1995). Migration through the Redwood Creek estuary is dependent upon the estuary mouth being open to the ocean. Adult coho typically run upstream to spawn from late October to early March, depending on access through the estuary (Anderson 1995). The conditions at the mouth depend on a combination of wave action on the sand berm, the volume of water in the estuary, and the flow of water in the stream.

Coho salmon distribution in the Redwood Creek basin is limited to the mainstem and the larger low gradient tributaries. The NPS staff conducted general stream surveys of the basin in 1980 and 1981 to describe and characterize the salmonid rearing habitat and distribution of juvenile salmonids (Anderson 1988, Brown 1988). Migrational barriers were identified during those electrosurveys; no coho were found above the barriers. However, subsequent surveys in the 1990s have detected coho in streams that did not have coho in 1980-81.

Threats to the coho salmon within RNSP are discussed in the following section on major threats.

B. Habitat Status

Based on data collected by RNSP fishery biologists, it is estimated that coho can be found occupying 26 miles of stream within the Lower Redwood Creek Basin (RNSP unpub. data).

C. Coho Critical Habitat

In southern Oregon and northern California, NMFS has designated critical habitat for this ESU between Cape Blanco, Oregon and Punta Gorda, California. The critical habitat unit is all stream and estuarine reaches accessible to the species and includes water, substrate, and the adjacent riparian zone. Accessible reaches are those within the historical range of the ESU that can still be occupied by any life stage of coho. The adjacent riparian zone is the area that provides shade, sediment transport, nutrient or chemical regulation, streambank stability, and input of large woody debris or organic matter. Habitat quality in this zone is related to the quality of riparian areas, upland areas, and inaccessible or headwater or intermittent streams that provide key habitat elements, such as large woody debris and gravel, that are crucial for coho in downstream reaches (USDC 1999b). Thus, the width of the riparian zone included as critical habitat is variable depending upon consideration of these factors.

6. Steller sea lion (*Eumetopias jubatus*), federal threatened

A. Species Account

The Steller sea lion (also known as the “northern sea lion”) is the largest member of the family Otariidae, or eared seals. The species ranges throughout the North Pacific from northern

Hokkaido, Japan, around the North Pacific Rim and south to the Channel Islands off the southern California Coast. The species was listed as threatened under an emergency rule on April 5, 1990. The final listing became effective in December 1990. The emergency rule was the result of a petition that showed a major, rapid decline in Steller sea lion numbers throughout most of Alaska since 1960. A range-wide survey in 1989 revealed the decline observed in Alaska was widespread. Statewide in California, adults and juveniles have declined by over 50% between 1927 and 1990 (from 5,000-7,000 to 2,000- 2,500) (NMFS 1992). Reasons for the decline are unclear, but substantial threats to the species include incidental catch by fisheries, competition with humans for food due to expansion of rockfish, hake, and herring commercial fishing, organochlorine pollutants, and disturbance of rookeries by humans that causes pup abandonment or entire rookeries to be permanently abandoned (NMFS 1992).

Steller sea lions are sexually dimorphic with male weights averaging 1,223 lbs (566 kg), and females averaging 579 lbs (263 kg). However, weights of 2,500 lbs (1,120 kg) and 770 lbs (350 kg) have been recorded for males and females, respectively. Adult males have long, coarse hair on the chest, shoulders, and back; the chest and neck are massive (NMFS 1992). Both sexes are light buff to reddish brown with slightly darker chest and abdomen; the naked parts of the skin are black. Pups are dark brown until 6 months when they molt to a lighter brown (Ingles 1965).

The diet of Steller sea lions is variable and in California and Oregon is known to include rockfish, hake, squid, octopus, and lamprey as well as an occasional marine mammal (e.g. harbor seal) (Jameson and Kenyon 1977, Bowlby 1981).

Steller sea lions are not known to migrate but do disperse widely during the non-breeding season. Breeding takes place at rookeries, usually places that are remote and not readily accessible by humans such as secluded beaches, islands, and large rocks. Females are known to return to the same site to pup in successive years; this site is often the rookery where the female was born, or a rookery nearby (Sandegren 1970). Males are known to occupy the same territories for up to seven consecutive breeding seasons (Gisiner 1985). Pups are born from late May through early July.

Major rookery sites in the U.S. outside of Alaska occur in Oregon at Pyramid Rock (Rogue Reef) and Long Brown Rock and Seal Rocks (Orford Reef), and in California at Cape Mendocino, Sugarloaf Island, Southeast Farallon, and Ano Nuevo Island (the southernmost breeding site). All of these sites are designated critical habitat. Pup production in the 1980s at California rookeries was in the range of 100-300 pups per site, with the exception of the Farallon rookery where pup production dropped to a few individuals each year from 1988-1990. In addition to the critical habitat units, there is a rookery at St. George Reef (north of RNSP near Crescent City) that produced 10-25 pups between 1980-1982 and 124 pups in 1990 (NMFS 1992).

de Blois (1986) studied what he termed an “emerging” breeding colony of Stellers on Ship Rock near Trinidad over the months of May through September during 1983 and 1984. There he observed territorial behavior by adult males, as well as numerous females and yearlings, but no breeding or pups were observed.

In RNSP a small colony of Steller sea lions has been regularly present on a few flat-topped rocks located about 1 mi north of the Klamath River at Klamath Cove. Stack (1981) studied the

Klamath Cove colony in the months of March through June in 1978 and1979 and indicated the Steller sea lions were using the area for hauling out during "spring migration to the breeding grounds." Griswold (1985) conducted "biweekly" counts of pinnipeds in Humboldt and Del Norte Counties between May 1975 and February 1978. The Steller sea lions at Klamath Cove were present in highest numbers in April and May (averaging 50 and 52 animals in each month, respectively). Stellers at this site declined in June and were absent from July through March. In contrast, during those same months animals were present at Castle Rock near Crescent City, where breeding occurred. Both Griswold (1985) and Stack (1981) surmised that Stellers were absent from this area in the fall when Klamath River runs of Pacific lamprey (*Entosphenus tridentatus*) and eulachon (*Thaleichthys pacificus*) diminished. However, given the wide variety of prey taken by Steller sea lions (NMFS 1992) this appears to be a questionable assumption. In addition to the Klamath Cove site, Griswold (1985) reported that "Redwood Creek Rock", just north of the mouth of Redwood Creek, was used by Steller sea lions for hauling out.

It now appears that the Steller sea lions at Klamath Cove constitute a breeding colony. No complete census or regular surveys of this site have taken place in recent years, but in 2002 RNSP staff believe this colony consisted of three territorial males (bulls), and approximately 30 females, plus a number of immature animals (K. Schmidt et al. pers. obs.). Roughly the same number of animals were present when the site was observed in April, June, and September of 2002. In September, RNSP staff documented four females nursing young pups (evidenced from the black coats of the pups). The only reference alluding to possible breeding at this site in the past was in Sullivan (1980). He reported that "fresh placentas were observed in 1980 on hauling grounds near Klamath Cove…" What is interesting to note is that in other rookeries including Ano Nuevo and in Oregon, territorial bulls appear to be gone by mid-late August (Orr and Poulter 1965, Mate 1982). However, in September RNSP staff noted what appeared to be territorial behavior on the part of the bulls at the Klamath Cove rookery. This colony warrants increased observation in the future.

B. Habitat Status

Terrestrial habitat for Steller sea lions in RNSP may be limited to the area between the Klamath River mouth and False Klamath Cove, a distance of about 4 miles. Numerous small, secluded beaches adjacent to large off shore rocks occur in this area. RNSP staff have yet to confirm hauling out by Stellers on the Redwood Creek Rock. A complete assessment of all potentially available habitat (e.g., secluded beaches where human disturbance is minimal) in RNSP has not been conducted.

7. Bald eagle (*Haliaeetus leucocephalus),* federal threatened and state endangered

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.

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).

Historic information indicates that, prior to the last few years, successful nesting of bald eagles was not documented in RNSP. Detrich and Garcelon (1986) noted historic nest sites on the Trinity River, along the Mad River, on Rowdy Creek (lower Smith River watershed), and near Lake Earl, all within 30 km of park lands. Those authors performed a survey 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. Areas within RNSP where bald eagles are annually observed include Redwood Creek, Freshwater Lagoon, along the Smith River, coastal areas near the mouth of the Klamath River, along the entire coastline of Del Norte Coast Redwood State Park, and along Gold Bluffs Beach in Prairie Creek Redwoods State Park.

The Pacific bald eagle recovery plan goals for the California/Oregon coast zone include increasing the number of breeding pairs from zero to three along the Del Norte coast (USFWS 1986). No territories are currently known along this segment of the coast. However, throughout the California portion of this management zone, territory occupancy has increased from 6 to 10 since the recovery plan was first completed.

On July 6, 1999 the USFWS published a proposal to remove the bald eagle from the list of endangered and threatened wildlife in the lower 48 states (USDI 1999b). The proposed rule stated that bald eagle recovery goals had generally been met or exceeded for the species on a range wide basis. The Service concluded that a widespread reduction in the use of organochlorine pesticides, lack of other threats to the species of sufficient magnitude, knowledge gained through the recovery process to properly manage the bald eagle, and widespread trends in population increase were all reasons to remove this species from the endangered species list (USDI 1999b).

Field surveys to identify potential nesting activities within RNSP during the breeding season were begun in 1997 and have continued to the present. A nest was found along the Klamath River in 1996 outside the park boundary, but close enough for the pair to forage in RNSP. A nest was found in 1997 that produced two young in 1999, one young in 2000 and 2001, and two young in 2002. This nest will continue to be monitored annually. It is located approximately 1.25 mi inland from Freshwater Lagoon. The lagoon provides suitable foraging habitat and, indeed, is used for foraging by the eagles, most likely including those from the known nest territory.

Threats to the bald eagle within RNSP are discussed in the following section on major threats.

B. Habitat Status

RNSP were identified primarily as winter habitat in the Recovery Plan for the Pacific bald eagle (USFWS 1986), which forms the basis for management direction and provides recovery goals. Approximately 12,900 ac (5,220 ha) of potential habitat are located within 200 m of streams,

lagoons and the ocean. Large trees providing nest sites are located throughout many areas of RNSP.

8. Northern spotted owl (*Strix occidentalis caurina),* federal 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 1992b,c). No RNSP lands were designated as critical habitat for the northern spotted owl. A recovery plan for the northern spotted owl was drafted in 1992 (USFWS 1992) but was never issued in a final format. The draft recovery plan states that RNSP should be managing for a goal of 24 territories in Prairie Creek Redwoods State Park and Redwood National Park south of Prairie Creek, and three territories north of Prairie Creek Redwoods State Park (USFWS 1992). These draft recovery goals currently are not being met. As of 2002, survey data indicate that only one territory is occupied north of Prairie Creek Redwoods State Park and 17 territories are occupied (i.e., with one or more owls within the last three years) in the southern recovery zone.

The first park-wide inventory of suitable habitat was conducted between 1993 and 1995 (Tanner 1999). Thirty-seven spotted owl territories were identified in RNSP during that original inventory. RNSP staff currently track activity centers at 36 of these territories. Since 1995 park staff have monitored between 75 and 100% of these 36 activity centers, annually. Since 1993 the number of territories occupied by one or more owls has ranged from a high of 30 in 1995, to a low of 11 in 2000. One to seven territories fledged young per year during that same period. Surveys of suitable habitat in the vicinity of annual maintenance projects also have been conducted annually since 1998. These surveys have detected a few "floaters", individuals that could not be relocated during daytime follow up visits. In 2002, inventories of "inactive" territories (activity centers where no owls have been detected in $\geq$3 consecutive years) were begun. Inventories included a thorough survey of all suitable habitat within 1.0 mi of the historic activity center in seven territories. After the first year of surveys RNSP staff succeeded in locating spotted owls in a new location in one of these territories.

Since inventory and monitoring by RNSP contractors Tanner and Gutierrez began in 1993 much of the suitable spotted owl habitat in RNSP has been surveyed. In 2001 a total of 29,600 ac (12,000 ha) or 49% of the suitable spotted owl nesting and roosting habitat in RNSP was surveyed by park staff. Of the total, 20,400 ac (8,200 ha) surveyed were in old-growth redwood and 9,200 ac (3,700 ha) surveyed were in suitable second-growth habitat.

A cause for concern exists relative to the increasing occurrence of the barred owl (*Strix varia*) within RNSP. Although barred owl records in RNSP pre-date 1993, the initial spotted owl inventory began documenting barred owls in RNSP with regularity. By 1995 ten of the original spotted owl territories also had a barred owl at or near the spotted owl activity center (Tanner unpub. data). To date, barred owls have been observed in 18 (50%) of the known spotted owl territories within RNSP, ten of which no longer appear to be occupied by spotted owls (Table 2). An additional 19 barred owl sites have been located outside of spotted owl core areas (e.g., > 0.7 mi distant). As of 2002, RNSP staff have documented barred owl pairs with two young each at five of the sites, four of which were at, or close to, a historic spotted owl activity center.

Threats to the northern spotted owl within RNSP are discussed in the following section on major threats.

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.

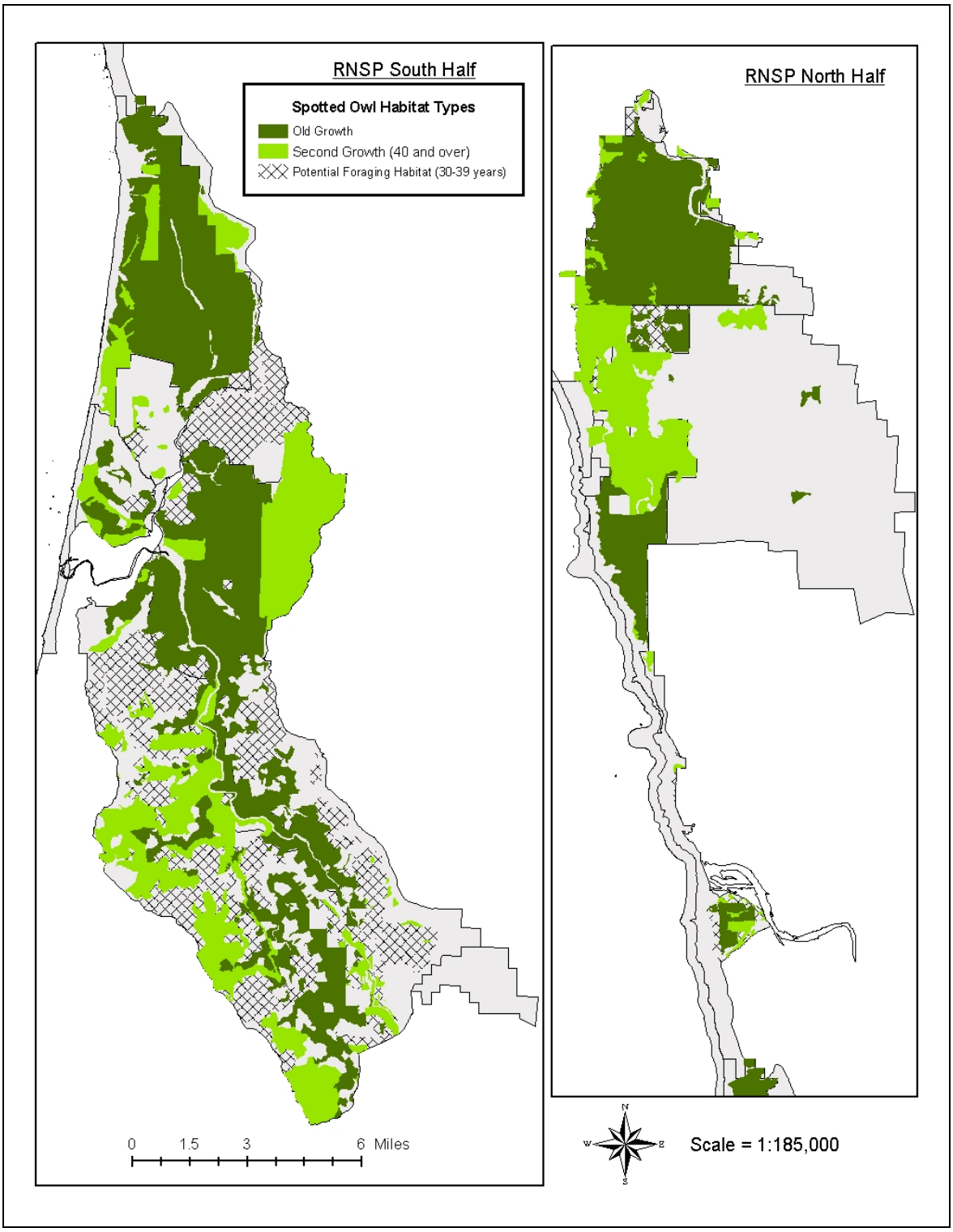
In the coast redwood (*Sequoia sempervirens*) forests of northern California spotted owls show a similar pattern of using mature and old forests. The RNSP GMP defined suitable spotted owl nesting and roosting habitat as old-growth forested stands with canopy closures $\geq$ 70%, with at least 40% of the canopy contributed by trees $\geq$21 inches diameter at breast height (dbh). Stands with conifers $\geq$18 inches dbh or with less than 40% overstory canopy may be suitable if large hardwoods fill in the canopy to 60% total closure (USDI and CDPR 1999). Second-growth stands >40 years of age are considered suitable habitat, especially if large residual trees occur in the stand.

Table 2. Annual Nesting chronology survey results for 36 northern spotted owl activity centers located throughout RNSP from 1993 to 2002. Acronyms are: NS – not surveyed. V – surveyed but vacant. SM – single male. SF – single female. PR – pair. UNK – unknown/undetermined reproductive status. NN – confirmed non-nesting. NF – nest failed. #Y – number of young fledged. B – barred owl present in Activity Center. BB – barred owl pair in Activity Center. BB#Y – barred owl pair and number of young in Activity Center. I – Inactive territory based on previous concurrent three years of survey. A – Active territory. *Pair killed, Barred Owl only since then.

AC NAME	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	STATUS
Cedar Creek	NS	NS	PR-NN-B	V	V	V	V	V	V	V-BB2Y	I
Mill Creek	NS	SM	PR-UNK	?PR-UNK	SM	PR	V	SM	V	PR-2Y	A
Damnation Creek	NS	NS	SF-B	V	V	V-B	NS	NS	V	V-B	I
Richardson Creek	NS	NS	PR-NF	V	V	V	V	NS	V	V	I
Brown Creek	NS	NS	PR-UNK-B	NS	NS	NS	NS	NS	V	NS	I
Home Creek	NS	NS	PR-UNK	PR-1Y	PR-NN	V	V	V	V	NS	I
Prairie Creek	NS	V	SM	V	V	V	V	V	SM-BB2Y	V-B	A
Hatchery Hill	PR-NN-B	V-B	V	V	V	V	NS	V	V-B	NS	I
Lost Man Creek	PR-NN-B	PR-NN	PR-NN	SM	V	V	SM	SM	PR-NF	SM-B	A
Skunk Cabbage Creek	PR-NN-B	PR-UNK	SM	SF	V	SF-B	?PR-?Y	V-B	V-B	NS	I*
Little Lost Man Creek	PR-1Y-B	PR-2Y	PR-UNK	PR-UNK	PR-NN	PR-2Y	SM-B	PR-NN-B	V-B	SM	A
S.F. L. Lost Man Creek	PR-1Y	PR-1Y	PR-UNK	PR-NF-B	PR-NN-B	PR-1Y	V-B	V	V	PR	A
McArthur Creek 1	NS	PR-NN-B	PR-NN	PR-UNK	V-B	V-B	SM-B	V	V-B	V	I
McArthur Creek 2	NS	PR-NN	PR-NN	PR-UNK	V	V	V	V	SM	V	A
McArthur Creek 3	NS	PR-1Y	SM	PR-UNK	V	V	V	V-B	V	V	I
Leah Creek	PR-UNK-B	V	NS	V	V	V	NS	V	V-B	V-B	I
Elam Creek	NS	2SM	V	V	V	V-B	NS	V	V	V	I
Cloquet Creek	PR-UNK	PR-UNK	PR-1Y-B	SF	V	PR-UNK	PR-NN	V	PR-2Y	PR-2Y	A
Bond Creek	NS	PR-NN	SM	V	V	V	NS	NS	SM	V	A
Miller Creek	PR-NN	PR-NN	SM	PR-1Y	V	PR-1Y	V-B	V-B	V	NS	I
Cole Creek	PR-NN	SM	V	V	SM	SM	PR-NN	V	V	V	I
Forty-Four Creek	NS	PR-NN	PR-NF	V	SM	V	V	V	V	NS	I
Emerald Creek	PR-1Y	PR-UNK	PR-NN	SM	SM	PR-NN	PR-2Y	V-BB	V-BB2Y	PR-BB	A
Tom McDonald Creek	NS	PR-NN	SM	SF	V	SM	V	V	V	NS	I
Bridge Creek 1	PR-UNK	PR-1Y	PR-UNK	PR-NN	PR-NN	PR-NN	SF	V	V	V	I
Bridge Creek 2	NS	PR-UNK	PR-NN	PR-UNK	SM	PR-UNK	PR-NN	SM	SM	V	A
Bridge Creek 3	NS	PR-1Y	PR-NN	PR-UNK	PR-UNK	PR-UNK	SM	V	V	SM	A
East Side Trail	PR-NN	PR-NN	PR-UNK	PR-UNK	PR-NN-B	V	V	PR-NN-B	PR-UNK	SF	A
Bobcat	PR-NF	SM	SM	PR-UNK	PR-2Y	PR-NN	PR-1Y	PR-NN	PR-1Y	V-BB2Y	A
Elf Creek	PR-?Y	PR-1Y	PR-1Y	PR-UNK	V	V	V	NS	V	NS	I
Maneze	SM	SM	NS	SM	V	V	V	V	V	NS	I
Devil's Creek 1	PR-UNK	PR-NN	NS	PR-UNK	V	SF	SM	PR-UNK	PR-NN	PR	A
Devil's Creek 2	NS	PR-NN	SF	PR-UNK	PR-NN	PR-NN	PR-NN	PR-UNK	PR-UNK	PR	A
Devil's Creek 3	NS	PR-NN	PR-2Y	PR-1Y	PR-1Y	PR-UNK	SM	PR-NN	SM	PR-2Y	A
Coyote Rock	PR-NF	PR-1Y	PR-NN	PR-NN	PR-NN	PR-NN	PR-1Y	PR-2Y	PR-NN	PR	A
Coyote Creek	PR-UNK	PR-UNK	PR-2Y	PR-UNK	PR-NN	PR-2Y	PR-NN	SF	PR-1Y	SM, SF	A

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 approximately 41,000 ac (16,600 ha) of old-growth forest, all of which is considered suitable nesting, roosting, and foraging habitat (Figure 3). An additional 23,700 ac (9,400 ha) of second-growth forest is now >40 yrs old and may be suitable nesting, roosting, and foraging habitat (Figure 3). Three hundred eleven acres (126 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 32,000 ac of second-growth <40 yrs of age may become suitable for spotted owl foraging and nesting habitat. For example, RNSP staff projects that within the next five years roughly 10,700 ac may become potential suitable spotted owl nesting habitat as younger-aged second-growth forests mature into 40 year old stands.

Figure 3. Suitable spotted owl nesting, roosting, and potential foraging habitat in Redwood National and State Parks.



It should be noted that spotted owls also are known to nest successfully 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 Simpson Timber Company (STC) 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 STC stands were usually dominant trees in the canopy or residual trees that were very large and older than the surrounding stand (Foliard 1993). In contrast, spotted owls are not known to use second-growth stands for nesting in RNSP. Second-growth in RNSP differs from that on STC land in that almost none of the previously harvested stands have been thinned. Many of the second-growth redwood stands in RNSP appear to be 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 36 RNSP owl territories have >1,336 ac and >500 ac ("threshold") of suitable habitat within the 1.3 mi and 0.7 mi radius home range circles, respectively. An additional seven (17%) 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. Twelve of the 27 territories above threshold are currently active, although over half are now sharing territories with barred owls, in three cases with reproductive barred owl pairs. Five of the 27 territories above threshold now appear to be occupied solely by barred owls. Five territories below threshold are currently active, and none of these have had barred owls detected within the territory to date. Two territories that have few or no acres of habitat meeting the definition of suitable nesting and roosting habitat have successfully reproduced and fledged young in years past. It may be that the amount of suitable habitat within the home range does not influence occupancy or productivity of owl pairs in RNSP.

9. Marbled murrelet (*Brachyramphus marmoratus*), federal Threatened and state Endangered

A. Species Account

The marbled murrelet is a small sea bird in the family Alcidae with a disjunct distribution from Alaska through central California, with some birds also wintering in southern California (USDI 1992d). Marbled murrelets nest primarily in large coniferous trees located within 60 km of the coast. In California, the species is restricted to old-growth forests in Del Norte, Humboldt, San Mateo, and Santa Cruz Counties and the associated offshore waters. Large geographic gaps in the historic range now occur along 300 mi (480 km) of coastline between central and northwest California (USDI 1992d). Mostly in response to loss of nesting habitat, the marbled murrelet was federally listed as threatened in 1992 in California, Oregon, and Washington, and listed by the state of California as endangered the same year. Critical habitat for the species was designated on May 24, 1996 (USDI 1996). A recovery plan was completed in 1997.

The murrelet breeding season is protracted and occurs from late March through late September (Hamer and Nelson 1995). The majority of hatching occurs by the end of June (Carter and Stein 1995, Hamer and Nelson 1995). Clutch size is one egg, with one clutch laid per year. Eggs are laid on large limbs and crooks of trees covered with moss, lichen and canopy litter. Incubation shifts of 24 hours each are alternated between both parents (Sealy 1972). Parents make daily trips to the nest site to feed young. Primary food sources for marbled murrelets in California are not well documented but appear to consist of small near shore fish species such as sand lance (*Ammodytes hexapterus*), Pacific herring (*Clupea harengus*), smelt (Osmeridae), and anchovy (*Engraulis spp*.) (USFWS 1997).

Based on offshore surveys, the number of murrelets in California has been estimated to be in the range of 1,650 to 6,500 individuals depending upon the source of the data. Recent surveys conducted by a joint Federal agency team monitoring the effectiveness of the Northwest Forest Plan estimated in 2000 and 2001 that 4,876 (95% CI = 4,135 – 8,100) and 3,888 (95% CI = 2,901 – 6,567) murrelets, respectively, are found in the survey zone that encompasses RNSP (Coos Bay, OR to just south of Cape Mendocino, CA) (Bentivoglio et al. 2002, Jodice 2002). The vast majority of the offshore California population (approximately 60%) occurs between the Oregon border and Trinidad, which roughly corresponds to the areas directly offshore of RNSP (Strong et al. 1997, Ralph et al. 1998, Ralph et al 2002). If offshore habitat use data gathered by Golightly et al. (2002) on radio marked birds is considered, then many murrelets breeding in RNSP may range south all the way to the mouth of Humboldt Bay. If most of the murrelets found offshore from Humboldt Bay to the Oregon border do utilize RNSP forest habitats then upwards of 70% of the murrelets in California could potentially inhabit the park at some point in their life cycle.

Populations throughout the marbled murrelet's range are declining at an estimated rate of at least 4-6% per year (Beissinger 1995). There are some indications, however, that the density of murrelets occurring off the coast of RNSP is increasing. This apparent increase has tentatively been attributed to habitat loss in other parts of northern California that may be causing murrelets to concentrate breeding efforts within RNSP (Ralph et al. 1998, Ralph et al. 2002). Current estimated recruitment rates, however, are probably insufficient to maintain murrelet populations. In one study only 28% of documented breeding attempts successfully fledged young (Nelson and Hamer 1995). In addition, at-sea surveys noted that only 1-5% of the observed population were juveniles in any given year (Nelson and Hardin 1993, Strong et al. 1997, Ralph et al. 2002). Speculation is that some adults may not be breeding due to lack of suitable habitat. Based on information about other closely related species, not all adults may be nesting every year (Carter 1984). Further compounding the low recruitment rate are oil spills that have occurred in the past and may be expected to occur in the future.

Numerous marbled murrelet surveys, including monitoring and research projects, have taken place or are ongoing in RNSP. At-sea surveys adjacent to the park also have occurred (e.g., Strong et al. 1997, Ralph et al.1998, Ralph et al. 2001, Ralph et al. 2002). An initial state-wide inventory of potentially suitable marbled murrelet nesting habitat was conducted in 1988 by Ralph et al. (1990). Included in this inventory were numerous transects with many survey stations in RNSP. Murrelets were detected at stations throughout the park, from Walker Road in northern Jedediah Smith Redwoods State Park to Devil's Creek near the southern boundary of

the national park. A transect along the James Irvine Trail in Prairie Creek Redwoods State Park recorded the highest number of murrelet detections anywhere in the state (Ralph et al. 1990). Since 1989 personnel from the USDA Forest Service's Redwood Sciences Laboratory have monitored murrelets during the breeding season at three sites as part of a long term population trend study. Two of the sites are in RNSP, one near the James Irvine Trail and the other in lower Lost Man Creek, and the third is in the Yurok Experimental Forest. The most recent analysis of these data indicates a significant downward trend in murrelet detections at all three sites. In the past 11 years, detection rates have declined by 38%, 57%, and 44% at the James Irvine Trail, Lost Man Creek, and Yurok Experimental Forest sites, respectively (S. Miller pers. comm.).

In 1999, surveys were conducted in an old-growth stand in Miller Creek, a tributary to Redwood Creek. Occupied behavior was recorded during this survey (Mad River Biologists 1999). In 1999-2001, RNSP staff contracted surveys of all suitable habitat within 0.25 mi of roads proposed for restoration in the northern portion of the Lost Man Creek drainage. The habitat surveyed included old-growth, second-growth stands with residual predominant trees that could provide nesting opportunities ("residual old-growth"), and second-growth stands without residual old-growth. The surveys confirmed occupied behaviors in all three stand types. 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). Murrelets appeared to be using residual old-growth habitat along the main tributary of Lost Man Creek as evidenced by numerous occupied behaviors recorded in this area. However, it is as yet 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 led by scientists from Humboldt State University and the U.S. Geological Survey/Biological Resources Division. The primary objective of this study is to determine the behavioral responses of murrelet adults and chicks at the nest to noise disturbance caused by trail users and maintenance activities. Five nests were located in the first year of this study (Golightly et al. 2002).

Because of the results of these and other studies within the parks, RNSP staff assume that all stands with trees providing nesting opportunities for marbled murrelets have the potential to be occupied.

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 also speak to minimizing impacts from recreational use, including nest disturbance, facility construction and use (campgrounds, picnic areas, parking lots), and trash disposal (USFWS 1997).

Threats to the marbled murrelet within RNSP are discussed in the following section on major threats.

B. Habitat Status

In RNSP there are approximately 41,100 ac (16,400 ha) of old-growth forest occurring in contiguous stands greater than 0.5 ac in size that presumably would be suitable marbled murrelet nesting habitat (Figure 4). The old-growth stands in RNSP are fragmented with only a few large contiguous blocks of nesting habitat existing. There also are an additional 300 ac (120 ha) of residual old-growth forest (i.e. stands with isolated old-growth trees surrounded by residual mature tree buffers) 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

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 harvested since 1940 utilizing a clearcut prescription. Habitat recovery rates will vary greatly from stand to stand depending on how the stand was harvested, site capacity, reseeding method, and post harvest manipulation. Unfortunately, even under the best of circumstances, it is not expected that these disturbed stands will become suitable nesting habitat for more than a century.

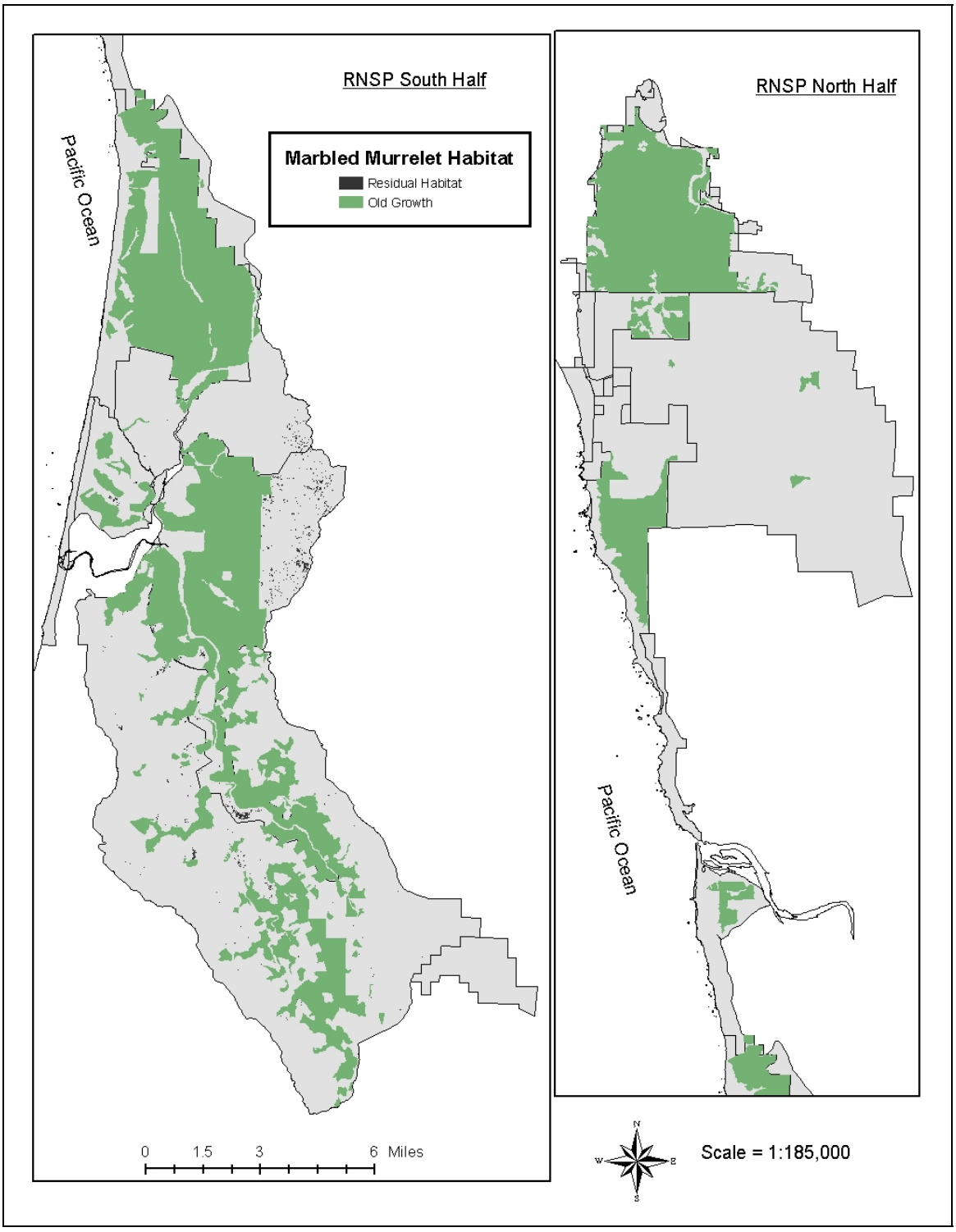
C. Marbled Murrelet Critical Habitat

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.

The primary consitutent elements include all such forests, 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).

Figure 4. Suitable marbled murrelet nesting habitat in Redwood National and State Parks. Note: Because of the smaller scale of the printed map, single or scattered residual stands may not be depicted.



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 park boundaries have been designated critical habitat by USFWS. 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.

10. American peregrine falcon (*Falco peregrinus anatum*), state endangered, federal delisted

A. Species Account

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

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

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

The recovery plan for the Pacific Coast population of the American peregrine falcon called for 185 wild self-sustaining pairs (i.e., producing 1.5 young per pair) throughout California, Oregon, Washington, and Nevada. Of those 185, there were to be 120 pairs in California (USFWS 1982). Based on data from a 1998 census there were 270 pairs meeting the productivity goal of 1.5 young per pair (USDI 1999c) throughout the four-state area.

Areas in RNSP with potential peregrine falcon nesting habitat have been surveyed by boat and on land since 1993. Although peregrines were observed at a number of locations within the park (e.g., Split Rock (Falvey 1998) and False Klamath Rock (K. Schmidt pers. obs.)), the first documented eyrie and reproduction occurred in 1998 on the bluffs above Gold Bluffs Beach

(Falvey 1998). Currently, there are two confirmed peregrine falcon territories within RNSP, with three nest sites. One territory is centered near Klamath Cove north of Requa, and the two other (most likely alternate nest sites) are near Butler and Home Creeks along Gold Bluffs Beach. The Klamath Cove site is difficult to observe due to its location, and reproduction there has only been confirmed once (Falvey 1999). However, the annual presence of adult birds during the breeding season indicates a high probability of regular nesting at this site (Holm 2002). The pair at Gold Bluffs Beach is very productive, and has produced at least one young each year between 1998 and 2002 (Holm 2002).

Peregrine falcons are regularly observed during all times of year at a wide variety of locations throughout RNSP (RNSP unpub. data).

Threats to the peregrine falcon within RNSP are discussed in the following section on major threats.

B. Habitat Status

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

In RNSP, suitable habitat occurs in many areas of the park. Sea cliffs, beach bluffs, sea stacks, and large bedrock outcrops, e.g., in the Bald Hills all may provide potentially suitable nesting habitat for peregrines. However, the only documented territories in the parks occur along the coast.

VII. MAJOR THREATS TO LISTED SPECIES THAT ARE MOST LIKELY TO RESULT FROM RNSP MANAGEMENT ACTIVITIES

A. Beach layia

Threats to beach layia within RNSP include the destruction, modification or curtailment of dune systems by off-road vehicle use, trampling by hikers and equestrians, and development of visitor use areas. Also, invasive alien plant species that have the potential to out-compete or stabilize dune systems may reduce the viability of newly established beach layia populations. For example, invasion by European beach grass (*Ammophila arenaria*) along many beaches has caused stabilization of foredunes. European beach grass also allows colonization of backdunes by native and nonnative plants that change the nature of the habitat from a dynamic, semi-stable system to a stable system occupied by shrubs such as coyote brush (*Baccharis puluaris*) and trees (e.g., Sitka spruce *Picea sitchensis*) (USDI 1992a, RNSP unpub. data). Stochastic extinction of isolated populations also is of concern (USDI 1992a).

B. Western snowy plover

Factors affecting the species' continued existence are limited primarily to those that affect habitat quality (due to the current absence of the species in the parks). Perhaps the most

extensive and notable factor is habitat alteration caused by extensive invasion of the beaches by European beach grass (*Ammophila arenoides*). Other threats include habitat degradation due to illegal vehicle use on some beaches above the wave slope. Also, winter storm events and oceanic processes have changed the beach profile along some beaches and deposited huge quantities of driftwood on others. Although the abundance of predators using beach habitat in RNSP is unknown, track and incidental wildlife observations suggest a fairly diverse group of predators inhabit the beach. Eleven of the 22 native vertebrates identified as predators of snowy plover eggs, chicks, or adults have been known to occur in beach habitats in RNSP (USFWS 2001b). Other factors that may influence plover presence or use of park beaches are people recreating (beach combing, walking, building driftwood structures, etc.), horse-back riding, commercial fishing, and oil spills adjacent to park waters. Trash accumulation on beaches provide attractants for avian and mammalian predators. American crows, common ravens, and all species of gulls are common predators of colonial nesting species (such as the snowy plover) along beaches.

C. Tidewater goby

If gobies are still present in RNSP, degradation of estuarine conditions in the Redwood Creek estuary caused by the flood control levees are the main threat to tidewater gobies. The levees have changed the historical configuration and circulation and sedimentation patterns, and negatively affected goby habitat. RNSP operations such as controlled breaching, slough channel excavation, and slough channel driftwood removal, done to retain or improve fish habitat, can negatively affect the goby in the short term. Permitted vehicle beach access via the north side of the estuary crosses over the north slough channel which is potential goby habitat when water is present.

D. California brown pelican

Threats to brown pelican include commercial fishing pressure on surface schooling species, human and vehicle disturbances at suitable daytime loafing and nighttime roost sites, and potential injury to pelicans from feeding on baited fish hooks and entanglement in monofilament fishing line.

E. Chinook & Coho salmon, and Steelhead trout

Loss of stream habitat, drought and flooding, high summer water temperature, and predation of adults and juveniles contribute to the demise of salmonids in RNSP. These threats also potentially affect salmonid recovery throughout their distributional range (Fisk et al. 1966, Reiser and Bjornn 1979, Pearcy et al. 1985, Nehlson et al. 1991, Sandercock 1991, Reeves and Sedell 1992, Wilderness Society 1993,). Unfortunately, loss of stream habitat and the impact of high summer water temperature and chronic turbidity were problems that preceded the establishment of RNSP and that persist today.

In fresh water, salmonids are subject to natural predation by many mammals, birds and fishes. However, the reduced number of deep pools and the lack of large woody debris following the 1964 flood and subsequent large flow events in RNSP have made fish more vulnerable to predation risks.

Recreational fishing, though regulated by the California Department of Fish and Game, is allowed in park streams, rivers, and ocean. Some freshwater regulations permit only catch and

release. However, even under such a program, fish are harassed and may suffer delayed mortality after release.

F. Bald eagle

In RNSP, human disturbance to bald eagles may result from pedestrian traffic directly under or within line of sight of hunting perches, and from low flying aircraft near nest trees. Human disturbance of eagle foraging and nesting activities has been documented in literature but disturbance by human activity is difficult to quantify since bald eagles show some tolerance to certain human activities (Knight and Knight 1984, Stalmaster and Newman 1978, Stalmaster 1987). Fraser et al. (1985) concluded that some human activities near nests were not detrimental to long-term reproduction. Environmental contaminants (e.g., residual DDT and oil spills) are considered threats to bald eagles along the north coast of California (USFWS 1986) but are not directly a result of RNSP management activities. Department of Fish and Game fish stocking in Freshwater Lagoon may benefit the eagle, though fish stocking in the park lagoon is not a RNSP management activity.

G. Marbled murrelet

1. Loss of Habitat and/or Degradation

On-going RNSP management activities do not reduce any acres of nesting marbled murrelet habitat but certain projects have the potential to degrade nesting habitat. For example, some RNSP management activities may alter some structural component of murrelet sized nest trees (e.g. prescribed burn in old-growth forest) or degrade potential murrelet nesting sites (e.g., hazard tree removal within state parks frontcountry facilites). The relative effects to murrelets from these types of management activities do not equate to a major loss of habitat for the species but may temporarily degrade habitat. Loss of nesting habitat is considered to be the primary reason for the decline of marbled murrelet populations from British Columbia through California. The main factor in loss of nesting habitat has been commercial logging of old-growth and mature forests (USDI 1992d). In addition, fires and windthrow have also contributed to loss of nesting habitat (e.g., large wildfires in the Oregon Coast Range in the last 150 years). Very little nesting habitat remains on privately owned lands in Washington, Oregon, and California, and what remains is subject to timber harvest. Late-successional, mature, and old-growth stands without potential nest trees but with "substantial canopy closure and canopy height of at least one-half the site-potential tree height" are important to murrelet conservation. These stands reduce the negative impacts of forest fragmentation by reducing edge effects on microclimate and wind-throw at nearby suitable nest stands (USDI 1992d). Most second-growth forests on private lands are unlikely to provide nesting habitat in the future, primarily because harvest rotation cycles are shorter than the time needed for stands to acquire characteristics suitable for murrelet use. RNSP staff recognizes the need to accelerate the development of late successional conditions in the $50{,}000^{+}$ acres of second-growth forest within RNSP to provide future marbled murrelet nesting habitat. This need is referenced in RNSP's GMP/GP and would comply with Section 7(A)1 of the ESA for meeting recovery goals established for the conservation of the species. RNSP managers intend to pursue the initial phase of this initiative through development and implementation of a second-growth forest management plan.

2. Forest Fragmentation

Forest fragmentation, an existing condition created by past logging activities that preceded the establishment of RNSP, potentially increases the edge around old-growth stands. Forest edge can lead to higher nest predation rates as compared to interior forests (Gates and Gysel 1978, Rosenberg and Raphael 1986, Yahner and Scott 1988, Andren 1992, Marzluff and Balda 1992, Marzluff et al. 1994, Paton 1994, Robinson et al. 1995, and Donovan et al. 1997). However, RNSP pre-existing harvested stands have grown back and are older than 30 years. Thus, forest fragmentation may not be a future issue within RNSP as compared to managed stands located adjacent to RNSP.

3. Predation

Understanding the impact of anthropogenic edge types on corvid populations is important in today's spatially complex forest matrix (including RNSP's). Patches of forest are commonly interspersed with human settlements, roads, trails, industry, and recreational use, yet little is known about how the juxtaposition of habitat and developments affect avian breeding success (i.e., marbled murrelet) and alter the risks of nest predation (Marzluff et al. 1998). Specific to RNSP is whether trails increase corvid predation of nesting marbled murrelets. Published studies on trail use effects and corvid impacts to nesting marbled murrelets do not exist. Recent corvid research by Dr. John Marzluff in remote campgrounds of Olympic National Park provided some knowledge into the effects of corvid predation. Dr. Marzluff designed a study using artificial dummy nests to assimilate impacts of predation on nesting marbled murrelets. Basically, his study showed that a variety of animals (mammals and corvids) were predators and that remote campgrounds provide American crows with the opportunity to colonize remote forests by providing rich anthropogenic food sources and that these campgrounds did not provide optimal conditions for reproduction by corvids. Dr. Marzluff's research also showed that rural and exurban areas fueled crow population growth that led to colonization into remote campgrounds and that American crows and common ravens responded positively to human settlement and campgrounds by having smaller home ranges and higher reproductive rates. He reported that Steller's jays were unresponsive to settlement and campground as reproduction and abundance remained unchanged. Dr. Marzluff (pers. comm.) stated that his research findings are applicable to campgrounds and that research of trail effects on corvid population dynamics is needed. However, he suggested that controlling features in the environment (e.g., restricting availability of anthropogenic food or berry producing shrubs along trails) that increase nest predator species (e.g., Steller's jays and other corvids) may be more effective than removal of predator species. Dr. Marzluff recommended a buffer width of 100-200 m either side of trails for buffering predation effects based on his simulation study of artificial murrelet nests near human activity areas (i.e., campgrounds and light settlement) (Marzluff et. al. 2000).

Steller's jays show an attraction to habitat edges and have been shown to have a higher abundance near edges than in forest interior (Salata 1982, Hile 1993, Craig 1997, Brand 1998, Sieving and Willson 1998 and1999, Masselink 1999, Brand and George 2001). Two radio-transmittered Steller's jay's in RNSP indicated a probable maximum travel distance of approximately 1 km, assuming a circular home range area (Wallen et al. 1999a). Marzluff and Neatherlin (Unpublished, manuscript in review) reported that Steller's jays exploited anthropogenic food sources when nesting within 1 km of settlement and recreation areas. Their study of 25 radio-transmittered Steller's jays showed a mean home range size of 59 ha. Marzluff

and Neatherlin also reported that American crows (*Corvus brachyrhnchos*) had the most diverse diet as compared to common ravens (*Corvus corax)* and Steller's Jays (*Cyanocitta stelleri*) and that American crows relied the most on anthropogenic food. In contrast, common ravens do not seem to favor edge habitats and have been locally designated as an "edge neutral species" (Brand and George 2001), preferring areas with some vertical relief (e.g, cliffs, trees, human-made structures) to provide nesting and foraging sites (Boarman and Heinrich 1999). Common ravens also thrive in many human-altered habitats, including agricultural areas (Engel and Young 1989), ranches (Roth et al. 1999), rangelands (Knight 1984), and near campgrounds and picnic areas (Wallen et al. 1998 and 1999a). Thus, external activities (e.g., dumps, ranching, and other land-use activities) adjacent to RNSP would most likely influence the relative abundance of American crow and common raven populations that occur within the park complex.

Information about historical predation rates on marbled murrelets is unknown, but it is believed that many murrelet breeding behaviors and characteristics (nesting in closed canopy forests, cryptic breeding plumage, crepuscular flights, etc.) are adaptations to strong predation pressures (Ralph et. al. 1995). American crows, common ravens, Steller's jays, great horned owls (*Bubo virginianus*), sharp-shinned hawks (*Accipiter striatus*), peregrine falcon (*Falco peregrinus*) and northern flying squirrels (*Glaucomys sabrinus*) have all been implicated in preying on murrelet nests (USDI 1997, Singer et al. 1991, Nasland 1993, J. Marzluff pers. comm.) and on other avian species (Angelstam 1986; Marzluff and Balda 1992; Craig 1996). From 1974-1991, 71% of known marbled murrelet nests in the Pacific NW failed, and 70% of the failures were due to predation (Nelson 1992). Documented predation rates may be biased because many nests found by researchers were near forest edges. If such nests are more visible to human observers, they may also be more visible to visually-oriented avian predators as well. Thus, predation rates at such nests may be higher than at interior nests. Marbled murrelets seem to be sensitive to edge effects, as successful nests have been found to be farther from edges than unsuccessful nests (155.4 m versus 27.4 m) (Nelson and Hamer 1995). This finding is consistent with research on songbirds in coast-redwood forests, which showed an increase in artificial nest predation at edges compared to forest interior (Brand and George 2000).

4. Noise

The effects of noise disturbance on animals are difficult to assess. Response by animals to human generated noises may result in individuals': 1) being attracted to the site of the noise, 2) becoming habituated to noise, or 3) being adversely affected by noise (Knight and Gutzwiller 1995, Grubb and King 1991, Grubb et al. 1992). Predators are often attracted to human development for an easy meal (Marzluff et al. 1994). When searching for food, animals may become more tolerant of human related noise (Bomford and O'Brien 1990). Not much is known or has been published about the effects of noise on nesting marbled murrelets. However, in consultations and biological opinions related to park projects, USFWS has asserted that noise disturbance is a threat to murrelets: "noise disturbance from heavy equipment, weedeaters, chainsaws, rifle ranges, and helicopter use has the potential to impact marbled murrelet reproduction. Some murrelet researchers suspect that disturbances within one quarter mile of nesting murrelets may cause adults to abandon eggs or young, disrupt feeding of chicks, or cause nestlings to fledge prematurely. An additional concern is that disturbance may flush incubating or brooding adults, thus exposing adults and young to predation " (USDI 1996).

Without data or corroborating evidence, it is not known if nesting marbled murrelets are, in fact, sensitive to noise disturbance. The studies that have been conducted indicate that noise from a variety of sources may affect individual animal behaviors differently (Delaney et al. 1997, Hamer and Nelson 1995, Golightly 2002). Preliminary results from the first year of a multi-year, interagency-funded research project conducted by Humboldt State Universtiy and U.S. Geological Survey researchers to evaluate human-caused disturbance of breeding marbled murrelets within RNSP showed that the chick at one manipulated nest did not exhibit overt signs of disturbance when a chainsaw was operated at the base of the nest tree (Golightly et. al. 2002). No crouching, freezing, or watching with alert behavior was observed during this one-time experiment. The chick's reaction differed from observed behavioral responses of adults attributed to human disturbance reported by Hamer and Nelson (1995). The sample size (n=1) from the first year of study was too small to make inferences regarding the effects of human disturbance on the nesting success of marbled murrelets. Adults may be more likely to show a disturbance reaction than a juvenile of the same species in response to a similar stimulus.

Naslund (1993) reported that murrelets nested successfully near campgrounds. Singer et. al. (1995) reported successful murrelet nesting near a well-traveled road and park trails used by more than 25,000 visitors annually. In addition, Singer et al. (1992) found that incubating murrelets only rarely showed behavior suggesting agitation from human presence or noise. Singer et al. (1995) noted that during many observations of incubating adults in 1989 and 1994, nesting murrelets made no visible reaction to loud talking, yelling, or passenger vehicle noise near the nest tree. In contrast, calls of the common raven always elicited an immediate and visible reaction and failed feeding attempts were noted. Singer et al. findings suggest that perhaps nesting murrelets may have habituated to high use areas although further research needs to be conducted as results are inconclusive.

5. Human Caused Visual Disturbance

Boyle and Samson (1985) noted that 81% (n = 166) of studies conducted on recreational impacts to wildlife concluded that human activities cause negative effects on wildlife. Many studies of raptors have attempted to describe and quantify human disturbances and the effects that lead to active displacement (Knight and Knight 1984, Fraser et al. 1985, Buehler et al. 1991). The precise measures of cause and effect have eluded these investigators. However, as human population increases, nesting raptor populations have decreased (Newton 1979, Craighead and Mindell 1981). Similar trends have been noted for other species as well (Terborgh 1989). Recently, Stalmaster and Kaiser (1998) documented that human disturbance through recreational activity (i.e., boat traffic, fishing from riverbank and boat, hikers) changed the feeding behavior of wintering bald eagles along the banks of the Skagit River in northwest Washington. Their study recommended a 400 m distance from feeding eagles during the first 5 hours of daylight to minimize disturbance.

Some individual animals are more tolerant of human activity than others. The effects on wildlife from human activities involve a complicated relationship between individual behavior of animals nesting in the vicinity, the timing of the human activity, the suitability of the habitat, and the frequency, magnitude and abruptness of the human activity. Tolerance of human use in an area is probably a learned behavior.

The potential for creating the greatest disturbance to bird species from visual causes occurs during egg laying and early incubation. Reproductive failures due to human caused disturbances are more likely to occur in marginal habitat than in ideal nesting, denning or foraging habitat (Knight and Gutzweiler 1995).

Assuming that all other conditions are constant, the gradient of disturbance caused by human activities visible from a nest site increases from movements that pass quickly through individual territories (i.e., motorized vehicles) to activities that focus attention directly on the animals (Wyoming Game and Fish Department 1983). In addition, wildlife often exhibit less of a disturbance reaction to human presence when there is a visual shield between the animal and the human (Knight and Gutzweiler 1995). This concept has been studied primarily by observing ungulates and how they react to encounters with humans. The important aspects of visual screening that may influence an animal's response to human interactions include the juxtaposition of the animal relative to the humans, the location of any vegetation, and the distance from the potential danger. When visual screening is near the source of potential disturbance, it may provide greater security for the animal and thus allow it to tolerate human activities in closer proximity (Batten 1977). Hamr (1988) found that chamois (*Rupricapra rupricapra*), a European ungulate living at high elevations, exhibit a disturbance reaction (running) when humans in vehicles approached to within 300-500 meters in open terrain. However, in forested habitats the chamois could be approached to within 30 meters, a ten-fold difference in disturbance distance. The behavioral response of this mammal could also be applicable to birds (i.e., marbled murrelet), as bird nests are usually situated in locations (e.g., vegetation, tree canopy, trunk, etc.) that can provide a visual shield and thus could result in a greater security for the nesting bird.

6. Development

Human activities in forests (e.g., at picnic areas and campsites) are associated with an increase in corvids attracted to human food resources by intentional feeding or unintentional supplemental feeding (e.g., garbage) and thus increase the chances of predation on all nesting birds (Singer et. al. 1991, Marzluff and Balda 1992). A small increase in predation rate, when coupled with other factors, may have negative impacts on population viability. The magnitude of these impacts on marbled murrelets is currently unknown in RNSP and throughout the murrelet's distributional range.

Increasing urbanization is occurring immediately adjacent to suitable marbled murrelet habitat but outside of RNSP boundaries. The communities of Crescent City, Klamath, Hiouchi, and Orick all abut RNSP and suitable murrelet habitat. Corvids utilizing areas in these communities presumably forage within RNSP and prey on marbled murrelet egg and young. This threat is potentially significant to the marbled murrelet population within RNSP.

7. Air Pollution

The marbled murrelet recovery plan states that burning and smoke production may affect marbled murrelets. However, no data or reports on impacts of smoke to marbled murrelets are currently available. A research program is needed to quantify what effects these factors may have on marbled murrelet nesting biology.

8. Oil pollution and Other Contaminants

Oil and other contaminants in the marine environment are recognized as a serious threat to murrelets residing adjacent to the park's coastline, as the offshore ocean is a major shipping lane and tidal conditions could move effluents from outside sources into the parks' coastal shores. Oil spills, similar to the M/V Kure and Stuyvesant incidents, threaten murrelets with direct mortality, sublethal effects of oiling, displacement from foraging areas, impacts on prey populations (many of which are intertidal spawners, and thus more vulnerable to oil pollution than pelagic spawners) (Trasky et al. 1977), and mortality of mates. The Kure and Stuyvesant oil spills are estimated to have killed 10 percent of the population of marbled murrelets in Zone 4 based on the year 2000 population estimate of more than 4,876 birds (Bentivoglio et. a. 2002). Based on mortality rates, alcids may be even more sensitive to the effects of oil than other seabirds (Ford et al. 1991, Piatt et al. 1990).

9. Vulnerability to Natural Disturbance

NPS and CDPR management objectives include preservation of fundamental ecological processes. Consequently, abundance of marbled murrelet can be influenced by catastrophic events such as wildfire, landslides, windstorms, and possibly West Nile disease.

H. Northern spotted owl

1. Loss of Habitat

Throughout the range of the species, northern spotted owl habitat declined at a rate of one to two percent per year between 1966 and 1991 (USDI 1992b). Only six percent of the original old-growth redwood forests have been preserved within national and state parks (USDI 1992b). RNSP presently have about 40,843 acres of old-growth forest, with an additional 21,210 acres of second-growth forest considered suitable potential spotted owl nesting/roosting habitat (Figure 2).

The threat of activities within RNSP causing a loss of habitat to the northern spotted owl is minuscule compared to the total existing habitat and the potential for $17{,}000^{+}$ acres of younger-aged second-growth forests becoming suitable owl habitat in the very near future. Loss of habitat is presently attributed to the watershed restoration program where marginal second-growth trees (>40 years) growing on unstable logging and skid road prisms are occasionally removed. Numerous younger-aged trees growing in fill, which do not exhibit any nesting structure, are routinely removed. These densely packed younger-aged trees are quickly replaced, and will become more suitable habitat in the mid- to long-term, as they become established on stable, restored slopes, and are not likely to be lost during future storms due to failure of sidecast fill. Other RNSP programs that might remove suitable spotted owl habitat are the prairie/oakwoodland restoration program whereby encroaching conifers (some considered to be suitable nesting trees) will be removed, and the second-growth forest stand management program whereby selected trees will be removed following a silvicultural thinning prescription model. Prescribed burns of old-growth redwood forests could reduce potential suitable spotted owl habitat as trees of varying size and height succumb to fires burning in the canopy. However, canopy fires create cavities in tree boles that are used by spotted owls for nesting. There is also a possibility that external influences such as a highway relocation or environmental factors such as wildfire, landslides or windstorms could negatively influence northern spotted owl habitat.

2. Forest Fragmentation

Remnant northern spotted owl habitat is limited and highly fragmented throughout much of the species' range because of timber harvest and human developments. Forest fragmentation increases the edge habitat throughout forested stands and is suspected to increase rates of nest predation to all birds (Johnston and Temple 1990). The great horned owl is the most commonly noted predator of the northern spotted owl (Gutierrez et al. 1985, USDI 1992c). Great horned owls occupy forested areas that are more fragmented than northern spotted owls (USDI 1992c). Common ravens are considered predators of juvenile northern spotted owl (USDI 1992c).

Much of the old-growth forested lands in the southern half of RNSP are in fragmented blocks in the Redwood Creek watershed. Nearly 50 percent of all known northern spotted owl territories in RNSP are in areas of fragmented old-growth forest (Tanner and Gutierrez 1996).

Fragmentation within RNSP will diminish over time as stands age naturally and/or the second-growth forest management program accelerates the development of old-growth stand conditions.

3. Human Caused Visual and Noise Disturbance

Forest wildlife species deal with the presence of human activities by habituating/adjusting their feeding patterns, shifting nest site selection and seeking more secluded areas within a territory for roosting sites (Fraser 1985, Buehler et al. 1991, Gerrard et al. 1960). Raptors are typically more tolerant of auditory stimuli when the sources are at least partially obscured from view (Knight and Skagen 1988).

For example, researchers that studied the effects of noise on raptors concluded that raptors' responses to different military jets were brief and insignificant (Smith et al. 1988). Johnson and Reynolds (2002) reported that fixed-wing F-16 jet aircraft fly-overs of about 460 m over day-roosting Mexican spotted owls (*Strix occidentalis lucida*) resulted in no body movement or sudden turning of the head responses. They reported that all owls quickly returned to normal day-roosting behavior (e.g., sleeping, awake but quiet, preening). Studies on bald eagles concluded that some breeding bald eagles may have become habituated to jet, light plane and helicopter noise levels (Grubb and King 1991, Grubb et al. 1992). Distance and sound threshold findings for other species seem to indicate that distance was a better predictor of response to helicopter overflights than sound levels. For example, Grubb and Bowerman (1997) recommended survey helicopter flights be >150 m from bald eagle nests and of < 1 minute duration. In contrast, Carrier and Melquist (1976) were able to approach osprey *(Pandion haliaetus*) with helicopters as close as 50 m without eliciting a flush response, while Ellis (1981) came as close as 30 m before peregrine falcons would flush. Delaney et al. (1997) reported that chainsaws were more disturbing to Mexican spotted owls than helicopters at comparable distances. They reported that a 105 m radius would minimize, and possibly eliminate, Mexican spotted owl flush response to helicopter overflights. They also reported that Mexican spotted owls did not flush when helicopter noise levels were < 92 decibels

Since northern spotted owl pairs are residents on their territories throughout the year in RNSP, and many do not breed annually, the threat to reproductive success from human activities could be minimal to moderate depending upon the location of a particular management activity relative to a known nest site location (e.g., a trail running within a few hundred feet of a nest tree or

backcountry camp within ¼ mile of a nest tree). Disturbances during the nesting season could come from a variety of human activity sources such as machinery, aircraft, road construction, or visitor use of existing park facilities.

Noise disturbance is identified as a threat in the draft Recovery Plan (USDI 1992c) and conservation strategy (Thomas et al. 1990).

4. Barred Owl Displacement or Predation

Thirty-five independent barred owl (*Strix varia*) sites are known within RNSP. Twenty-two (63%) of the 35 barred owl sites fall within spotted owl territories; of these, 14 (40%) fall within the 0.7 mile radius core area around the spotted owl activity center, and in seven instances a barred owl location is synonymous with a spotted owl activity center. Fifteen of the 35 barred owl sites have had pairs recorded at one time or another. In 1995, a male barred owl was seen with a juvenile near the Howland Hill Outdoor School. In 2001 two barred owl pairs were confirmed to have reproduced two young each, and in 2002 three barred owl pairs were confirmed with two young each at sites all well removed from one another.

Historically, seven of RNSP's 36 spotted owl territories occurred in Prairie Creek Redwoods State Park and north. As of this date, five appear to be vacant at the activity center, one appears to be occupied by a single male and the other had a nesting pair in 2002. At five of the seven territories, barred owls have been documented at or near the spotted owl activity center.

Twenty-nine spotted owl territories have been documented south of Prairie Creek Redwoods State Park. Barred owls have been detected at, or close to, the activity center in 11 of these territories. In five instances the spotted owls appear absent at the activity centers and one or more barred owls now reside at the activity center. At a number of territories there appears to be competition between the two species at the activity center: one year both species were present, then spotted owls the next year, then barred owls the next, and so on. At two spotted owl activity centers (Lost Man Creek and Cloquet Creek) where barred owls were observed in previous years, spotted owls reproduced or attempted to reproduce in 2001. At another site (Emerald Creek) where spotted owls reproduced successfully in 1999, barred owls produced young in 2001. The overall pattern of observations suggests that ultimately the barred owls prevail at an activity center.

Based on long-term monitoring of known spotted owl territories by RNSP staff, barred owl behavioral interactions with spotted owls were documented. In some cases, the barred owls appear to have displaced the spotted owls at the activity centers (Schmidt 2000, Kelly 2001). Barred owls are slightly larger and known to be more aggressive than spotted owls. Their aggressiveness could contribute to the predation of spotted owls by barred owls and also increase the competition for nest sites and food (Kelly 2001). The southerly expansion of barred owls from Oregon and Washington into northern California may be a function of its generalist nature in selecting habitat where they are known successfully to colonize a variety of forest and riparian habitats, including forests that are also inhabited by spotted owls. The full extent or long-term significance of the barred owl interaction with spotted owls is unknown. The significance of barred owl impact to spotted owl viability needs to be assessed.

5. Interspecific Breeding

A cause for concern relative to the increasing occurrence of barred owls within RNSP is the potential for interspecific pairing with spotted owls. To date, barred owls have been observed in 18 (50%) of known spotted owl territories within RNSP. Interspecific pairing was suspected on one territory. Twenty-nine spotted owl territories have been documented south of Prairie Creek Redwoods State Park. Barred owls have been detected at, or close to, the activity center in 11 of these territories. Observations at the Skunk Cabbage territory indicated that the barred owl may have paired up with the female spotted owl and produced hybrid young. There are three other barred owl detections in RNSP in which observers thought they were seeing or hearing a hybrid, however, there is no way to confirm these observations.

6. Vulnerability to Natural Disturbance

NPS and CDPR management objectives include preservation of fundamental ecological processes. Consequently, abundance of northern spotted owl activity centers can be influenced by catastrophic events such as wildfire, landslides, windstorms, and possibly West Nile disease.

I. Peregrine falcon

There are many threats to this species including transmission lines, shooting, falconry, and human disturbance. In early spring, disturbance during courtship may result in the abandonment of nest sites. If human activities occur throughout the nesting area, the entire territory may be abandoned (Fyfe and Olendorf 1976). Aerial disturbance from low-flying helicopters and airplanes also may be responsible for nest abandonment (USFWS 1982). Known predators include great horned owls, red-tailed hawks, common ravens, coyotes, bobcats, raccoons, and skunks.

VIII. RATIONALE FOR DETERMINING AREA OF EFFECT TO TERRESTRIAL LISTED SPECIES WITHIN DEVELOPED AND UNDEVELOPED AREAS

Major issues pertinent to Section 7 consultations regarding RNSP management activities, based on previous consultations with the USFWS, are noise disturbance, nest predation risks, human caused visual disturbance, and habitat loss or degradation.

A. Noise

Excessive noise, above existing ambient levels, has been asserted by the USFWS potentially to impact marbled murrelet and spotted owl reproduction. Very little data currently exist that clarify how and at what levels noise affects marbled murrelets and northern spotted owls. Based on studies of other animals a conservative interpretation is that human related noise indirectly affects marbled murrelets, spotted owls by interrupting courtship, breeding and feeding behaviors, and by attracting predators into occupied habitat. Consequences of these types of disruptions could result in reduced reproduction by marbled murrelets and spotted owls because the predators may directly or indirectly disrupt nesting activity of spotted owls and murrelets after they have investigated the human related noise.

Although scientific research on noise effects to marbled murrelets and spotted owls is lacking there are a number of research studies on other species. Based on inferences from these other studies the USFWS places noise restrictions on RNSP management activities that occur in

suitable spotted owl and marbled murrelet habitat during the breeding season. However, marbled murrelets have been reported to successfully nest in campgrounds (Naslund 1993 and Singer et al. 1995), and these observations suggest that noise disturbance may not be as sensitive an issue as is currently thought contrary to other areas that show failure at these sites on an annual basis. The USFWS has identified a quarter mile radius as the area of disturbance around occupied spotted owl and marbled murrelet habitat in which RNSP staff cannot carry out activities if consultation has not been completed for those operations that exceed existing ambient noise levels. Restricting activities within ¼ mile of suitable habitat is believed to reduce the potential for adult abandonment of eggs or young, premature fledging or disruption of chick feeding, and reduces the potential of noise disturbance to disrupt incubating or brooding murrelets which could expose both adults and young to predation.

Noise level monitoring by RNSP staff of heavy equipment at project sites in forested habitat (40 years or older) showed that equipment noise levels reached ambient levels at distances of 130 to 200 meters (Wallen et al. 1999b). Results of these preliminary tests imply that noise levels varied according to vegetation type, topography, and possibly weather and that more studies are required. Also, determining the precise effects of sound on wildlife can be challenging and subject to interpretation based on the type of decibel reading, equipment used, and the methods of monitoring conditions (David Delaney pers. comm.). Currently, a quarter mile radius is used to determine the area of spotted owl and marbled murrelet suitable habitat affected by noise disturbance that is greater than existing ambient levels generated from RNSP activities. On occasions, projects occuring <1/4 mile from suitable spotted owl habitat have occurred as vegetation screening and topography reduced the potential noise impacts from RNSP activities.

B. Predation Risks

The relationship between the creation of habitat edges and increased nest predation has been attributed to human induced habitat disturbances associated with the creation of fragmented forests, roads and visitor use developments. Results of published studies on the effects of created habitat edges have been contradictory and the mechanisms involved warrant further study (Raphael et al. 2002). Human activities along trails and other developed facilities, and introduction of human activities into areas where they previously did not exist may potentially create some disturbance and habitat degradation for some species of wildlife. Human activities are associated with providing food sources for predatory corvids that prey on nesting marbled murrelets. However, little to no data currently exist to quantify these impacts on marbled murrelets, northern spotted owls, or other listed wildlife species that occur in RNSP.

Managers need to determine whether trails, parking lots, backcountry campsites and other visitor use facilities within RNSP potentially create habitat edge that results in increased predation pressure on nesting marbled murrelets. The gradients of edge effects in old-growth forests along trails, campsites, existing facilities like picnic areas, parking areas, and trailheads would probably differ based on the amount of human use pressure. Another way to differentiate casual effects of trail use is to weight predation effect of corvids according to the types of associated edge (i.e., forest, campground and other facilities with or without the potential for food sources), as severity of predation effect could potentially increase with increased corvid numbers. Campgrounds and picnic areas are known source areas for attracting corvids because of the potential accessibility of human food (Marzluff, pers. comm.). Food rich sites have been known

to increase the reproductive success of common ravens and American crows, although Stellar's jay numbers have not increased (Marzluff, pers. comm., manuscript in prep.).

Trails are not a prime food source area for corvids. However, trails do provide opportunistic encounters with Stellar's jay, as sometimes jays are naturally curious and drawn to people on trails. Therefore, the impact of attracting Stellar's jays to trails could potentially lead to predation of marbled murrelet nests. However, trails through forested habitat retain their overhead closed canopy structure as mostly understory shrubs and small trees are removed to create a tunnel-like path through the forest. Canopy retention along trails reduces the potential growth of fruit-bearing shrubs favored by Steller's jays and thus reduces the likelihood of Steller's jays occupying the area (Marzluff, pers. comm.) and preying on eggs and chicks of nesting marbled murrelets. Other considerations in determining the potential negative effect of trails are the intensity (magnitude), frequency, and duration of the public's use of trails; and whether corvid occurrences are a natural behavioral selection of the habitat. Steller's jays are known to frequent habitat edges rather than forest interior. Common ravens are not edge specialists but are known to frequent more open areas and areas with some vertical relief feature, and are usually associated with human altered habitat (e.g., road corridor, parking lot, agricultural field, etc.).

C. Human Caused Visual Disturbance

Wildlife can habituate to some level of human activity if the visual disturbance is predictable and non-threatening as discussed in Section VII G part 5 (human caused visual disturbance). However, quantifying different levels of human activity may be difficult. The activity of visitors hiking through the forest would probably be considered non-threatening. The frequency of hikers walking along backcountry trails would probably be lower than frontcountry trails. Since marbled murrelets select nest sites that are located on large branches and situated in the upper 1/3 or higher of the canopy, there is a high degree of visual screening between the incubating birds and hikers below a nest. Northern spotted owls typically select nest sites in the upper portion of the canopy as well, in areas with a lot of visual screening from activities on the ground. Visual screening has been shown to lessen the effects of disturbance that may influence an animal's response to human interactions as discussed in Section VII G part 5.

D. Habitat Loss and/or Degradation

RNSP operations will not contribute to any loss of nesting marbled murrelet habitat. The threat of RNSP activities causing loss to potential suitable spotted owl habitat is minuscule compared to the total available suitable habitat and the potential of younger-aged forests becoming suitable spotted owl habitat in the very near future through natural processes or planned forest management practices. Consultations with both regulatory agencies are completed for any RNSP management activities determined by the park fish and wildlife branch to have potential impact to listed species before the operation can begin. For operations that have the potential to degrade listed species habitat, RNSP consults with the Services to develop measures in lessening or removing the potential project effects on listed species. If no suitable mitigation measure(s) can be developed during the initial consultation, RNSP will reassess the proposed project and continue to work closely with the Service to develop an acceptable operation strategy.

IX. AREA OF EFFECT DETERMINATIONS ASSOCIATED WITH NOISE DISTURBANCE, NEST PREDATION RISKS, HUMAN CAUSED VISUAL DISTURBANCE, AND HABITAT LOSS OR DEGRADATION

The following distances were used to compute acres of potential take for determining the area of effect on spotted owls associated with noise disturbance, human caused visual disturbance, and habitat loss and/or degradation for various RNSP operations (Table 6). Distances to compute acres of potential take for marbled murrelets include the preceding three types of disturbances plus nest predation risks (Table 6). Resulting distances for computing area of effect were determined from published references and information obtained from Dr. John Marzluff regarding his research on nest predation effects. Emphasis was placed on: 1) the potential for retention of visual screening of nesting marbled murrelet and spotted owl nest sites from re-occuring visitor use along trails and other park facilities; 2) the potential habituation of the animal; 3) the timing, intensity and frequency of public use of a park facility; 4) the type of park facility; 5) the type of habitat edge; 6) behavioral traits of Steller's jay and common raven; and 7) publications.

Table 6. A summary of distances used to determine the area of effect of RNSP's park facilities on spotted owls associated with human caused visual and noise disturbances, and habitat degradation; and for marbled murrelets, nest predation risks plus the preceding factors for owls.
Code for numbered attributes are:
1= Retention of visual screening in the form of intact overhead canopy.
2= Potential habituation of animal to noise/visitor use pressure.
3= Noise levels generated from RNSP's operation may be greater than ambient levels during the breeding season.
4= Removal of understory shrubs could create travel corridor for corvids and/or attract corvids from human presence on trails.
5= Potential for food to attract corvids due to food preparation and consumption.
6= Facility creates an edge that could favor Steller's jay or common ravens.
7= Average distance for potential disturbance based on published references (for marbled murrelets or other bird species). See bottom of table for specific reference citations.

Park Facility	Distances	
	500 ft (150 m)	1320 feet (1/4 mi.)
Existing and newly constructed trails	1,4,7*	
Campgrounds/picnic areas		2,3,5,6,7*
Trailheads		2,3,5,6
Horse Camps		2,4,5
Primitive Camps		2,4,5,6**
Administrative/maintenance facilities		2,3,5,6

7* Marzluff et. al. 2000, Paton 1994, Brand and George 2001.
6**Some primitive camps do and some don't.

X. RNSP'S CONSERVATION STRATEGY

A. Introduction

The purpose of RNSP's conservation strategy is to provide park staff with a guideline for conducting management activities and programs so that they are compatible with management and recovery goals established for the conservation of threatened, endangered and candidate (TEC) species and/or their critical habitats. Park management and recovery goals are intended to reduce the likelihood of conflicts between proposed park actions and listed species or critical habitat in pursuance of furthering the conservation of listed species as required under Section 7(a)1 of the ESA.

RNSP's management goals for TEC species are to:

1. Identify and verify all locally listed threatened, endangered or candidate species within park boundaries and their critical habitats and to promote the conservation of these species. Whenever feasible, RNSP conservation efforts will focus on preserving listed species' known active sites. Inactive territories will be surveyed periodically through intensive surveys to determine whether sites have become occupied.

2. Protect and promote the conservation of TEC species and their critical habitats by conducting RNSP management activities and programs in such a way as to minimize, reduce or eliminate the potential for incidental take from the effects of noise disturbance, habitat removal or degradation, and corvid predation of nests.

3. Provide, enhance, and protect nesting and rearing habitat.

RNSP recovery goals for TEC species are to:

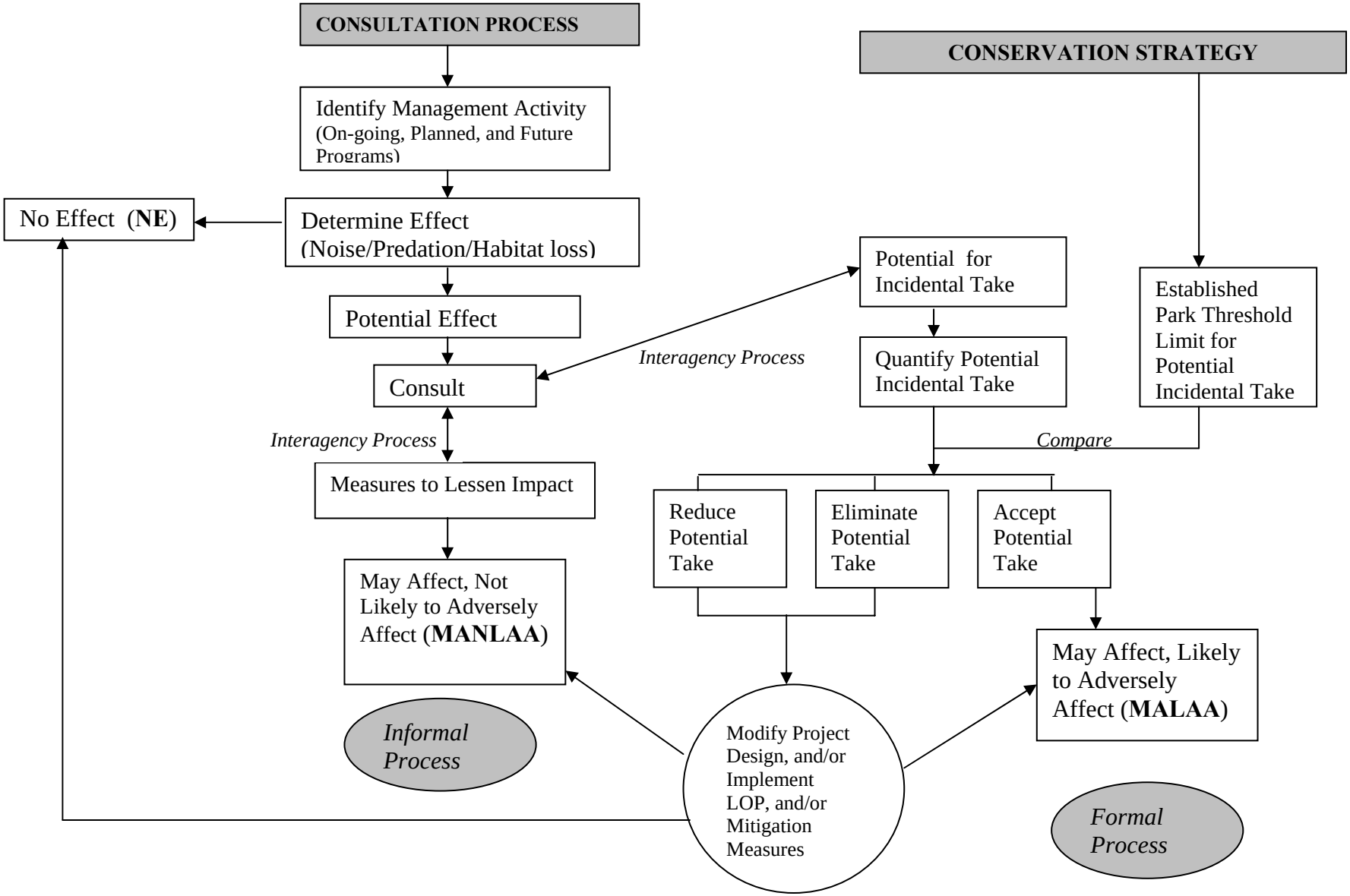
1. Implement short-term actions that protect and restore TEC habitat. This goal will be accomplished, in part, by: a) maintaining potential suitable habitat in large contiguous blocks, b) stabilizing forested slopes from the potential effects of fluvial erosion and mass wasting (landsliding) by restoring watersheds, and c) decreasing the risk of catastrophic fire in old-growth forests.

2. Implement short-term actions to increase knowledge of TEC species through the coordination of research. This goal will be accomplished by focusing research topics on basic life history, distribution, habitat requirements, habitat quality and quantity, effects of predation, and effects of human-caused disturbances to TEC species as a means of answering questions that will further accomplish established management and recovery goals.

3. Implement long-term actions that increase TEC habitat. This goal will be accomplished by treating RNSP's $50{,}000^{+}$ acres of second-growth forests to increase the amount, quality and distribution of suitable nesting habitat primarily for marbled murrelets and spotted owls and secondarily for a host of other fish and wildlife species.

RNSP's operational procedures to reduce the potential for proposed park actions' adversely affecting listed species and/or their critical habitat are outlined in Figure 5.

Figure 5. Operational flowchart outlining RNSP operating procedures and strategies in addressing potential incidental take.



In meeting ESA and NEPA compliance requirements, RNSP's conservation strategy addresses potential effects on all 27 species currently listed as threatened, endangered, or candidate. Specific measures to reduce impacts from RNSP management activities have been developed in consultation with USFWS and NMFS for listed species known to occur regularly within the parks. Protective measures developed for species known to occur regularly in RNSP will also help protect listed species that do not occur regularly or species for which little is known within RNSP. On occasions, consultations have been completed for some listed species that do not occur regularly in RNSP, or for which their status in RNSP is unknown. For example, the listed Oregon silverspot butterfly and the candidate mardon skipper butterfly, both with unknown status in RNSP, have been addressed in consultations with the USFWS within the prescribed fire and exotic plant management program BAs.

To reduce predation risks to marbled murrelet, the USFWS recommends the following measures: (1) reducing the number of nest predators (i.e., mainly corvids) in areas with human disturbance by controlling trash accumulation and encouraging proper food storage, and (2) reducing unnatural attraction of predators to specific forest areas with human disturbance during the breeding season. Research is needed to validate these measures in studying the effects of various anthropogenic causes on nest predator abundance, distribution, and survivorship.

To protect listed salmonids, RNSP staff attempts to reduce sediment input into watercourses by implementing project design standards; reassessing project design standards upon completion of projects (includes pre- and post-project monitoring of watercourse), implementing mitigation measures to reduce sediment entry from road restoration work into watercourses; and conducting field projects prior to the rainy season. However, working outside of listed terrestrial species' breeding seasons often conflicts with listed fish species restriction periods. RNSP staff will continue to pursue a joint regulatory agency agreement to extend the current one-month work window for the watershed restoration program.

B. RNSP's On-Going Management Activities and Measures for Reducing the Potential Impact to Threatened, Endangered, and Candidate Species

RNSP staff is committed to minimizing potential incidental take associated with noise disturbance, corvid predation, and habitat loss and/or degradation to listed and candidate species by actively implementing measures to minimize documented impacts. Table 7 summarizes the various measures for the type of authorized potential take presently being implemented within RNSP for reducing potential impacts due to on-going park programs.

Table 7. A summary of on-going park programs, types of potential take authorized by the USFWS, and measures implemented to reduce potential impacts to various listed species. Numbers represent: 1=spotted owl, 2=marbled murrelet, 3= beach layia, 4=brown pelican, 5=bald eagle, 6=tidewater goby, 7=snowy plover, 8=chinook/coho salmon, steelhead trout, 9=Steller sea lion

Programs and Activities	Measures to Reduce Impacts for Targeted Listed Species														Types of Authorized Take	
	Habitat Improveme nt	Seasonal Restrictions	Survey to Avoid Seasonal Restrictions	Area Restriction	Permit Restrictions	Refuse Management	Habitat Modification Restrictions	Food Storage + Management	Sediment/Pollution Management	Noise Reduction	Public Education	Law Enforcement/ Patrols	Prescribed Fire	Stop Work if T&E Species Unexpectedly Encountered	Incidental	Habitat
Road Maintenance	6,8	1,2,5, 8	1,2				1,2,5,8		6,8	1,2,5				1,2,3,5,7	1,2	
Trail Maintenance		1,2,5, 8	1,2				1,2,5,8		6,8	1,2,5				1,2,5,7	1,2	
Campground Maintenance		1,2,5	1,2,3			2		2	6,8	1,2,5				1,2,5,7	1,2	
Facility Maintenance			1,2,3, 5			2		2	6,8	1,2,5				1,2,5	1,2	
Watershed Restoration	1,2,5, 6,8	1,2,5, 8	1,2,5, 8			2	1,2,5,8	2	6,8	1,2,5				1,2,5	1,2	1
Trail Construction		1,2,5, 8	1,2,3, 5,8	1,2,3, 5,7			1,2,5,8		6,8	1,2,5				1,2,3,4,5,7	1,2	
Road Rebuilding	6,8	1,2,5, 8	1,2,5, 8				1,2,5,8		6,8	1,2,5				1,2,5	1,2	
Site Restoration	1,2,5, 6,8	1,2,8					1,2,5,8		6,8	1,2,5				1,2,3,4,5,6, 7	1,2	
Special Park Uses		1,2,3, 4,5,7			1,2,3, 4,5,7, 8,9	2		2		1,2,5		1,2,3,4, 5,7,8,9		1,2,3,4,5,6, 7	1,2	
Helicopter Use		1,2,5		1,2,5, 9	1,2,5, 8,9							1,2,5,9		1,2,5	1,2	
Exotic Plant Management	1,2,3, 5,7	1,2,3, 7		1,2,3, 5,7			1,2,3,5, 7		6,8	1,2,5			1,2,5	1,2,3,4,5,6, 7		

Programs and Activities	Measures to Reduce Impacts for Targeted Listed Species														Types of Authorized Take	
	Habitat Improvement	Seasonal Restrictions	Survey to Avoid Seasonal Restrictions	Area Restriction	Permit Restrictions	Refuse Management	Habitat Modification Restrictions	Food Storage + Management	Sediment/Pollution Management	Noise Reduction	Public Education	Law Enforcement/ Patrols	Prescribed Fire	Stop Work if T&E Species Unexpectedly Encountered	Incidental	Habitat
Conifer Removal		1,2					1,2,5			1,2,5				1,2,5		
Prescribed Fire		1,2,5, 8					1,2,5,8		6,8				1,2,5	1,2,5		
Facility Construction		1,2,5					1,2,5		6,8	1,2,5				1,2,5		
Vehicle Beach Access			3,7	3,47	3,4,7							3,4,7		3,4,5,6,7		
Second-growth Forest Management	1,2,5	1,2					1,2,5							1,2,5		
Outdoor Schools					1,2,8	2		2			1,2,5, 8					
Camping						2		2				1,2,3,4, 5,6,7,8				
Recreational Fishing					8							8				
Hiking/ Backcountry Use		1,2	1,2	1,2,5	1,2,5	2		2				1,2,5				

C. Descriptions of Management Activities, On-going Program Measures and Recommended Additional Measures to Reduce Potential Impacts on T&E Species

1. Types of RNSP Management Activities

a. Road Maintenance

A variety of techniques are used to keep park roads and bridges safe, functional, and to minimize erosion caused by road surfaces. Activities include: clearing fallen trees with chainsaws; mowing and brushing shoulders with flail mowers; cleaning inboard ditches with hand tools and backhoes; cleaning culverts with hand tools and backhoes; grading road surfaces with graders, rollers and water trucks; and patching paved surfaces with hot asphalt and smoothing with steamrollers. Very rarely, large snags with the potential to fall on roadways are removed. Failed or inadequate culverts are replaced using excavators, bulldozers, front-end loaders, and dump trucks. Fallen or damaged roadside signs are repaired or replaced using powered hand tools and mechanized augers. These activities can occur at various frequencies and for various lengths of time depending on the location and type of work being accomplished. For example, some maintenance occurs only once (e.g. culvert replacement) but takes many days while other road maintenance can occur every few months (e.g. mowing) but lasts only for a few hours.

b. Trail Maintenance

A variety of techniques are used to keep park trails safe, functional, and to minimize erosion caused by trail surfaces. Activities include: brushing trail corridors with chainsaws/line trimmers/hand tools, clearing down trees with chainsaws and hand tools, cleaning drainage structures, recontouring or raising non-draining foot beds, repairing footbridges with powered hand tools, moving equipment and materials with mechanized trail tractors, and repairing waterbars and rolling dips with hand tools. As with road maintenance, these activities can occur at various frequencies and for various lengths of time depending on the location and type of work being accomplished.

c. Campground Maintenance

Campgrounds and backcountry camps are maintained year round at Prairie Creek, Del Norte, and Jedediah Smith Redwoods State Parks, and Freshwater Spit. Activities include: picking up garbage in trashcans with a trash truck, cleaning toilets with a power washer, repairing restrooms with heavy equipment and powered hand tools, repairing camp sites with powered hand tools and heavy equipment, repairing above and below ground utilities, clearing fallen trees with chainsaws and log splitters, and mowing grass with tractor pulled units/ride-on mowers/line trimmers. Occasionally, large snags and dying trees (>18” DBH) with the potential to fall in campgrounds are removed (felled, bucked, chipped and/or trucked out) for safety purposes. Backcountry camps that are scattered throughout RNSP are maintained year round. Activities include: clearing felled trees with chainsaws, mowing grass with hand brush mowers and line trimmers, and repairing tables and food storage containers. These activities can occur at various frequencies and for various lengths of time depending on the location and type of work being accomplished. For example, restroom repair may only occur once every few years but last for many days, while trash pickup can be a daily occurrence.

d. Facility Maintenance

Facilities include any built structures which cannot be classified in one of the above categories, including, but not limited to: buildings, parking lots, power lines, water and sewer lines, and developed landscapes. Activities include: repairing facilities and surrounding areas with a wide variety of hand tools and mechanized heavy equipment, brushing with power tools, mowing grass with tractor pulled and ride-on mowers, clearing fallen trees, power washing and painting buildings, and picking up garbage in trashcans/bins with a garbage truck. As with the maintenance activities described above, these activities can occur at various frequencies and for various lengths of time depending on the location and type of work being accomplished.

e. Watershed Restoration

Watershed restoration projects involve the use of a variety of heavy mechanized equipment (e.g. excavators, bulldozers, front end loaders, scrapers, and dump trucks). To reduce erosion associated with unwanted roads, RNSP staff recountour old failing or potential failing logging roads and stream crossings that are no longer needed for RNSP management activities. Stream crossings are fully excavated, exposing the original stream bed and banks, and restoring the natural stream valley configuration. Road reaches between crossings are reshaped to resemble pre-disturbance topography, minimizing future failures of side cast fill and artificial concentration and diversion of hillslope runoff. Chainsaws are also used to clear access ways into work sites. Second-growth trees growing in road fill that need to be excavated are felled and used to control erosion on finished slopes. Occasionally, larger trees (18" – 32" DBH) become established in the road fill, and must be removed in order to achieve the erosion control and slope stabilization goals. Heavy mechanized equipment is occasionally moved into work sites on access roads which pass through suitable habitat areas.

f. Trail Construction

New trails are added periodically to create connections between existing trails or provide visitors access to areas not served by existing trails. Construction activities include: brushing and felling small trees (<18" DBH, but usually much smaller understory trees only) with chainsaws along trail routes, excavating and filling slopes with hand tools to create flat foot beds, building bridges with powered hand tools, and moving equipment and material with mechanized trail tractors. Also, segments of existing trails are re-routed to reduce resource damage, provide safer accessibility, eliminate structures, and improve curve-linear alignment.

g. Road Rebuilding

Occasionally, roads become severely damaged during flood events or from continuous use, necessitating rebuilding beyond routine maintenance. The same techniques used for road maintenance (described above) are used for rebuilding except that heavy equipment is used more often and for longer periods. Some areas of small second-growth forest (usually <18" DBH) growing in road fill are removed during road rebuilding activities.

h. Site Restoration

Developed sites existing before the designation of RNSP are sometimes converted back to wild lands if they are determined to have no historic value or are adversely affecting

natural resources. Restoration activities include demolishing buildings and associated structures using a wide variety of heavy equipment and power tools, burning structures and debris, restoring natural contours to the site using heavy equipment and hand tools, and planting native vegetation.

i. Special Park Uses

Permits are issued to visitors who wish to conduct activities within RNSP that are outside the range of typical visitor use. These include, but are not limited to: large gatherings, concerts, private and commercial filming, weddings, wildlife survey training sessions, Native American events, fishing tournaments, bicycling and running events, and horseback riding events. Disturbances are usually confined to below ambient noise levels.

j. Helicopter Use

Helicopters are used for a variety of park management activities including: search and rescue, backcountry patrol, illegal drug eradication, fire fighting, resource survey, prescribed fire, trail maintenance, facility maintenance, and staff orientation. Non-park law enforcement, and resource management agencies may also use helicopters for similar reasons within park airspace. Filming companies may also occasionally use helicopters.

k. Exotic Plant Management

Native plant communities are maintained within RNSP by removing or controlling a variety of exotic plants. Techniques utilized include direct mechanical removal with hand tools and mechanized equipment (chainsaws, line trimmers, chippers, winches, bulldozers, and backhoes), biological controls, chemical control (only if other means are ineffective and only using glysophosate based herbicides), and prescribed fire (described below). Cleared exotic plants are disposed of by chipping, piling and burning, trucking to another site, or piling and composting.

l. Conifer Removal

Encroaching conifers are removed from grasslands, oak woodlands, and Jeffrey pine woodlands in order to prevent conversion of these vegetation communities to coniferous forest. These areas maintain the highest diversity of plant species in RNSP and are a priority for management and maintenance. Conifers are removed either through felling or girdling with a chainsaw, or prescribed fire (described below). Slash created by felling is piled and burned during the wet season or is lopped, scattered, and burned in coordination with a seasonal prescribed burn. Sometimes felled logs are dragged to a roadway for later disposal or use within RNSP.

m. Prescribed Fire

Prescribed fire is used to maintain or enhance various vegetative communities, control exotic plants, reduce conifer encroachment, maintain or recover cultural landscapes, and restore fire as an ecosystem process within RNSP. Prescribed fire is used extensively within the Bald Hills area to maintain the integrity of the coastal grasslands and Oregon white oak woodlands and cultural landscapes. Encroached seedling and pole sized conifers are targeted for removal via burning. Activities include preparing burn area fire

lines with chainsaws/line trimmers/brush mowers, digging hand lines, felling hazard trees, igniting vegetation by hand or from helicopters, suppressing fire with fire engines and hand tools.

n. Facility Construction

Construction of facilities usually involves the use of powered hand tools and a wide variety of heavy equipment. Equipment and tool use varies widely depending on the size and type of facility being constructed. Some future projects include replacing an entrance station, replacing overhead power and telephone lines, constructing/replacing restrooms, converting campsites to RV hookups and relocating the RV dump station at Elk Prairie campground, and replacing water distribution system at Mill Creek campground.

o. Vehicle Beach Access

Currently, three beaches within RNSP are open to vehicle access for permitted commercial and mobility impaired recreational fishermen, and Yurok Native Americans for conducting traditional activities. Commercial fishing access permits are renewed annually and only to those individuals previously issued permits between March 1996 and September 1, 1999. No new permits are issued, and any permit not renewed in a given year is terminated. Vehicle beach access by mobility impaired sport fishermen will continue until all commercial fishing permits have expired. Yurok access to Gold Bluff Beach will continue indefinitely. All vehicle use on RNSP beaches is managed to prevent resource damage and to minimize public use conflicts. All persons in vehicles accessing park beaches must adhere to a list of conditions identified on the permit. The permit conditions include a maximum speed limit on the beach of 20 mph, with access restricted to street legal motor vehicles; no ATVs, dune buggies, or motorcycles are allowed. Other conditions of the permit include a specific definition of the wave slope area where vehicles are allowed to drive on the beaches and provisions regarding the collection of firewood.

p. Second-Growth Forest Management

Almost 50,000 acres of parkland were commercially harvested within the last 100 years. Many of these harvested stands are now extremely over-stocked, contain exotic species, lack structural diversity, lack understory species, and exhibit stand level stagnation as a result of intense competition for light and soil nutrients. In order to stimulate the recovery of old-growth forest characteristics, RNSP has initiated planning for second-growth forest management. Future activities will include: thinning stands with chainsaws, using ATV's on existing skid trails to access stands, chipping felled trees along roadways and trails, pile burning in the winter to reduce fuel loading, and bucking and limbing felled trees with chainsaws.

q. Outdoor Schools

A variety of interpretive programs (e.g., field seminars, evening programs, nature hikes, and student activites) are offered at outdoor schools to educate and inform park visitors and students. A specific program may involve hikes on trails within suitable spotted owl and marbled murrelet habitat during the breeding season, collection of water samples from fish bearing streams, constructing temporary bridges across Prairie Creek, and presenting evening campfire talks within suitable T&E species habitat. Food and trash

may become available to corvids if food items and trash are not properly stored or disposed off by park visitors and students staying at outdoor schools.

r. Camping

Developed frontcountry and backcountry camps are dispersed throughout RNSP in a variety of habitats ranging from coastal to inland forests. These camps serve hikers, equestrians, mountain bikers, and car/recreational vehicle campers. Dispersed camping is allowed with a free national park permit on gravel bars along the main channel of Redwood Creek upstream of McArthur Creek, except within one-quarter mile of the Tall Trees Grove. Park regulations require all campers to store food and other scented materials properly in bear proof food lockers, if available, and to maintain a clean camp to avoid attracting wildlife, particularly bears, and to dispose of trash/waste properly. Food and trash may become available to corvids if food items and trash are not properly stored or disposed off. Campfires are permitted in designated frontcountry and backcountry camps only in park-provided grills and fire rings. No ground fires are allowed outside of park-provided fire rings or grills except by permit on the Redwood Creek gravel bars and on beach waveslopes. Fire use has the potential of escaping into adjacent suitable T&E habitat.

s. Recreational Fishing

Sport fishing, though controlled by the California Department of Fish and Game Commission, is allowed in park streams and rivers. Some stream regulations permit only catch and release. However, fish are harassed and may suffer delayed mortality after release.

t. Hiking/Backcountry Use

Hiking, biking, and horse trails are established throughout RNSP in a variety of frontcountry and backcountry habitats, including suitable T&E species terrestrial and aquatic habitat. Backcountry use involves hiking on established trails, use of campsites, horse camps, and camping on gravel bars along portions of Redwood Creek. Additional new trails and backcountry campsites are being planned.

2. Measures To Reduce Impacts

NPS and CDPR propose to continue with on-going measures as summarized in Table 7 and to consider additional measures to reduce potential impacts to listed species. RNSP's on-going and potential additional measures for reducing the potential impact to listed species are described in greater detail below.

a. Habitat Improvement

Some RNSP activities improve or speed the recovery of threatened and endangered species habitat, thereby preventing potential future habitat losses. For example:

- European beachgrass removed from foredunes benefits the beach layia by creating habitat for new colonization. Removal of European beachgrass also favors snowy plovers by improving potential nesting, wintering, and migration habitat.
- Removing culverts that are impassable to migrating fish and replacing them with properly sized and placed culverts, arched culverts or bridges increase the availability of spawning and rearing fish habitat.

- Watershed restoration, erosion control and road removal provide long-term benefits by creating a more stable environment for re-establishment of the forest community, improving habitat for listed terrestrial species, and reducing sediment input to the aquatic system. Short-term negative effects of road restoration work are mitigated through measures such as use of silt fences, straw bales, covering exposed soil with wood chips or other woody debris to prevent and decrease sediment entry into watercourses.
- Improving the Redwood Creek estuary to mimic pre-levee conditions will improve water quality and circulation that would favor the re-establishment of tidewater goby populations and improve estuarine conditions for the rearing of juvenile listed coho and chinook salmon and steelhead trout.
- The goal of second-growth forest management is to speed the recovery of old-growth forest characteristics through the application of silvicultural methods. Objectives will include increasing available habitat for listed species in a shorter time frame, buffering existing habitat edges from exposure to climatic factors, protecting stand integrity, and reducing risks which limit the reproductive success of listed species such as spotted owls, marbled murrelets, and bald eagles.

b. Seasonal Work Restrictions

Work restrictions are placed on projects with the potential to cause disturbance in or within one quarter mile of suitable spotted owl and/or marbled murrelet habitat or spotted owl reproductive sites during their respective breeding seasons. Bald eagle work restrictions are either one half mile or line of sight from known nest sites. In RNSP, the breeding season is considered to last from 1 February through 15 September for spotted owls, 24 March through 15 September for marbled murrelets, and 1 January through 31 August for bald eagles. Potential disturbance from work that occurs during the murrelet breeding season in areas within a quarter mile of suitable marbled murrelet habitat is restricted to two hours after sunrise and two hours before sunset. Work restrictions are also placed on areas along streams within the visual range of migrating and spawning adult salmonid fish. The migration/spawning season for salmonid fish in RNSP streams is considered to last from 15 October through 31 May.

c. Survey to Avoid Seasonal Restrictions

Some areas with proposed park projects in or within a quarter mile of suitable spotted owl and/or marbled murrelet habitat are surveyed to determine occupancy by one or both species, using established survey protocols. Surveys are conducted annually to assess beach layia, tidewater goby and snowy plover presence/absence, using established protocols. In addition to annual surveys, RNSP staff conduct pre-project surveys for beach layia and snowy plover in all potential suitable habitat to gain access for heavy equipment to beach sites under the exotic vegetation program, and to ensure that vehicles operated on beaches are not impacting the snowy plover and brown pelican. Smaller order streams and tributaries are surveyed on an irregular basis for chinook salmon, coho salmon, and steelhead trout presence/absence. If target individuals are not detected, then project activities are allowed to occur during breeding seasons.

d. Area or Activity Restriction

Management actions that protect listed species include area closures where necessary to protect nest sites from unnecessary disturbance by human activities. Trails with low visitor use or redundant trails that affect significant resources are being removed. Through educational programs, RNSP staff inform the public about T&E species and explain why certain areas might be closed to protect the species during the breeding season or why proper food storage is important. Channeling visitors and directing visitor use to specific areas prevent widespread destruction of listed species and habitat components important for the species recovery or survival. Specific activities are restricted or modified near or within habitat areas that are not sufficiently covered by the seasonal work restrictions described in section b above. Some examples include prohibiting helicopter use within 500 feet or 1,000 feet (depending on season, location, and activity) above or within a quarter mile of suitable habitat areas during breeding seasons of listed terrestrial and marine species, restricting vehicles on beaches to the wave slope, avoiding brown pelicans loafing on beaches by requiring a reduced speed, allowing for birds to move safely away from oncoming vehicles, and restricting ground disturbance activities to areas away from listed plant species.

e. Permit Restriction

Language is included in permits (i.e., special use, incidental business, and collecting) which prohibits the disturbance or harm of breeding spotted owls, marbled murrelets, and other listed species (including the brown pelican, bald eagle, beach layia, and snowy plover, chinook salmon, coho salmon, and steelhead trout). Some examples of permit conditions include proper food storage and trash disposal to limit the attraction of potential murrelet predators, no feeding of wildlife, proper horse feed storage, keeping music at conversation levels, keeping public address system volumes low, limiting activities to the period between two hours after sunrise and two hours before sunset, prohibiting floodlight use, keeping on established trails**,** and restricting vehicle use on beaches to waveslope areas only.

f. Refuse Management

Most park facilities and campgrounds are equipped with sufficient waste receptacles to prevent visitors, park staff, and park contractors from improperly disposing of food waste and thereby attracting potential marbled murrelet predators. RNSP staff is making every effort to purchase additional bear proof (and thus murrelet predator proof) receptacles for those sites currently without them. Educational signs are placed throughout RNSP encouraging visitors to use bear proof receptacles and to store food properly (refer to Appendix I for examples). Park interpreters and rangers regularly educate visitors about the importance of proper garbage disposal. Visitor orientation publications produced by RNSP staff also emphasize the importance of proper garbage disposal. RNSP staff regularly give presentations to incoming staff and California Conservation Corps workers on proper trash disposal as part of bear safety awareness training. Permits and contracts stipulate that permitees and contractors must properly dispose of all garbage by placing it in animal proof containers, if available, or by packing it out. Interpretive staff will develop signs and interpretive programs to address the issue of corvids, trash, and negative impacts on nesting marbled murrelets. RNSP staff intends to establish an

outreach program with the adjacent landowners and other local government facilities to educate and/or establish cooperative projects in managing garbage.

g. Habitat Modification Restriction

All park maintenance, restoration, or construction activities are designed so that an absolute minimum of suitable habitat components are damaged or removed. For example, most new facilities are placed in areas without trees greater than 18" DBH. Every attempt is made to retain trees larger than 18" DBH that occur along areas being actively re-contoured during watershed restoration projects. New trails are placed to avoid removing large trees. During trail establishment, understory shrubs and a few isolated small trees are removed but no major mid-story sized trees are removed. Hazard trees are removed in state park campgrounds for public safety purposes. However, before any potential nest tree (≥ 18" DBH) is removed, an evaluation of each tree is conducted to assess it for potential suitable nest tree characteristics using an established form developed by RNSP staff and validated by the USFWS (Appendix II). If a tree is determined to be a suitable spotted owl or marbled murrelet nest tree, consultation occurs with the USFWS.

h. Food Storage Management

Most campgrounds are equipped with sufficient numbers of properly designed food storage containers (i.e. bear proof lockers) so that visitors can keep their food away from potential marbled murrelet predators. RNSP staff are making every effort to purchase additional bear proof (and thus murrelet predator proof) lockers for those sites currently without them. Permits and contracts stipulate that permittees and contractors must properly store food (including horse feed) while on site. Visitors are informed through signs (see Appendix I), park staff contact, interpretive programs and pamphlets about the importance of proper food storage.

i. Sediment/Pollution Management

RNSP staff utilizes a variety of techniques to limit or eliminate the transportation into fish bearing streams of sediment or toxic substances from any ground disturbing management activity. Some examples include replanting streamside vegetation, placing woody debris in streams, erecting sterile hay bale or silt fence barriers, placing surface erosion control materials on finished slopes (either breaking up and scattering on-site native downed vegetation or importing shredded redwood bark or weed-free straw), "winterizing" roads by installing waterbars and gravel, storing fuel away from streams, placing motorized equipment away from streams during refueling, and staging toxic spill containment equipment at active work sites near streams.

j. Noise Reduction

Methods of reducing noise produced by RNSP management activities include enhanced engine mufflers for bulldozers, quiet generators, generators placed in sound proof boxes, liquid filled bulldozer tracks, alternative construction techniques (i.e. attaching boards with screw and bolt assemblies instead of nails, thus eliminating pounding), off-site construction (e.g. pre-cutting and drilling boards away from suitable habitat and hauling prefabricated pieces to be assembled at the project site), and extensive use of hand tools

instead of power tools. In addition, natural and man-made sound barriers are taken advantage of whenever available. For example, ridge tops, dense forest stands, highways, and large buildings are effective for attenuating loud noises. Contractors are not permitted to camp at work sites located within ¼ mile of potential spotted owl or marbled murrelet habitat, and specific language stipulating the importance for keeping sounds at or below ambient levels and the need for proper food storage is written in the contract agreement.

k. Public Education

Visitors are informed through park staff contact, interpretive programs, and pamphlets on the importance of reducing noise levels within suitable threatened and endangered species habitat and the potential negative impacts of corvids to nesting marbled murrelets. In addition, park visitors are informed through interpretive staff outreach, roving programs, signs on bulletin boards in high use areas (e.g., campgrounds, trailheads, picnic areas, and parking lots), visitor guides, and backcountry permit information of the potential negative impacts of corvids to nesting marbled murrelets. Visitors are also informed about the need for proper trash disposal in animal proof trashcans or instructed to pack trash out if animal proof trashcans are not available.

RNSP staff present curriculum-based residential, in-class, and day/use education programs for Humboldt and Del Norte County students in 1st through 12th grade during the school year. Programs include life histories on park threatened and endangered species, appropriate stewardship activities, and related resource management projects. Programs include information on proper food storage and trash disposal and the importance of reducing and maintaining low noise levels.

l. Law Enforcement/Patrols

Visitors are informed through ranger contact on the importance of reducing noise levels within suitable threatened and endangered species habitat. Visitors are also informed of the need for proper trash and food storage/disposal procedures. Routine patrols of frontcountry and backcountry facilities ensure that park resources (includes known T&E nest sites) are protected from unnecessary harassment or harm. Violators are cited.

m. Prescribed Fire Management

Prescribed fires are planned to take advantage of favorable weather that will efficiently disperse smoke into the atmosphere. Slash piles created by exotic plant management, second-growth forest management, and conifer removal projects that are within a quarter mile of suitable threatened and endangered species habitat and are to be burned during breeding seasons are only allowed to be up to 6’ x 6’ x 6’ in size in order to minimize the amount of smoke generated. Old-growth stand burns are planned to occur after 15 September.

n. Stop Work if T&E Species Unexpectedly Encountered

If, during the course of any park project, beach layia, Steller sea lion, brown pelican, snowy plover, bald eagle, tidewater goby, coho salmon, chinook calmon, steelhead trout, spotted owl or marbled murrelet is discovered unexpectedly near a project, then all project activities are halted. The project is allowed to continue only after a RNSP staff

biologist has determined whether there will be any potential adverse effects to the new individual(s) and only after an informal consultation is completed with the USFWS and NMFS.

3. Additional Measures under Consideration to Reduce the Potential Threat to Spotted Owls, Marbled Murrelets and Other Listed Species

The following additional measures could be implemented to provide additional protection to listed species, but contingent on additional funding and/or further refinement.

a. Conduct intensive spotted owl surveys within historic activity centers known to be inactive following several years of monitoring efforts. These surveys will help determine whether spotted owls have moved from the historic activity center, altered their behavior (i.e., have become less vocal and responsive to surveyor's hooting) or emigrated far from the historic activity center.
b. Conduct spotted owl surveys outside known territories, in habitat considered atypical or less suitable, to determine whether owls have moved into these peripheral habitats.
c. Continue to acquire and maintain bear-proof trash receptacles for all park facilities to reduce the potential for attracting corvids.
d. Encourage and support research (e.g., research topics described under section XI) on all listed species.
e. Protect active T&E species nests. Protection of nest sites could involve the following activities: (1) re-route new trails being proposed for construction away from known nest trees, (2) close trails if surveys detect occupancy during the nest establishment/courtship period, (3) continue informal consultation with USFWS to modify survey protocol to eliminate the need to survey for spotted owls in areas with suspected occurrence of barred owls, and (4) implement certain management activities (e.g., conifer removal treatment to re-establish historic prairies) in conjunction with second-growth treatment periods.
f. Eliminate self-registration at trailheads for backcountry permits.

D. Potential Incidental Take Threshold

1. Summary of Annual Potential Incidental Take at RNSP

Prior to the 1994 NPS - CDPR agreement for managing RNSP, NPS staff conducted operations outside of the breeding seasons of the spotted owl and marbled murrelet, which resulted in no potential incidental take. However, through 1994, CDPR conducted normal maintenance operations in the three state parks using equipment that produced noise levels greater than ambient levels during the spotted owl and marbled murrelet breeding season. Potential incidental take associated with CDPR trail maintenance program in 1994, before CDPR switched to hand tool use only, is reflected in Table 8.

From 1992 through 1997, the NPS consulted with the USFWS for management activities on a project-by-project basis. In 1998, RNSP staff switched from project-specific consultations to a broader programmatic form of consultation. The 1998 RNSP annual maintenance biological assessment (BA) for trails, facilities, and roads was the first programmatic BA to be completed.

In biological opinions for the annual maintenance programmatic and subsequent comprehensive park program BAs, the USFWS authorized specified amounts of incidental take (in acres**)** to RNSP and provided terms and conditions in the incidental take statement. It was agreed by the USFWS, NPS and CDPR that RNSP staff would complete an annual report to summarize the total annual potential incidental take (in acres) for disturbance related actions (i.e., noise) and cumulative acres of potential take for habitat loss/degradation in RNSP.

Tables 8 and 9 illustrate that the total annual potential incidental take associated with noise disturbance in RNSP was much lower than the annual take authorized by USFWS. These tables also show that, since 1994, RNSP staff has reduced its total actual annual noise disturbance take for spotted owls and marbled murrelets, with the greatest reduction being for spotted owls. The average annual potential incidental take attributed to noise disturbance since 1994 was 755 acres for spotted owls (roughly 1% of total 64,700acres of suitable nesting/roosting spotted owl habitat), and 1,818 acres for marbled murrelets (4% of total 41,400 acres of suitable nesting marbled murrelet habitat). Spotted owl annual noise disturbance potential incidental take ranged from a high of 27% of total available acres in 1994 to a low of 1% in 2001. Marbled murrelet annual noise disturbance was much more variable than spotted owls, and annual potential incidental take ranged from a high of 17% in 1994 to a low of <1 % in 1997, and 11% in 2001.

Table 10 summarizes, by year, the total spotted owl cumulative potential incidental take of habitat (total 106 acres) attributed to RNSP management activities. A majority (95%) of the total cumulative potential incidental take attributed to habitat loss/degradation occurred as a result of the watershed restoration program. No potential incidental take was requested or authorized for habitat loss/degradation for marbled murrelets.

Table 8. Summary of marbled murrelet potential incidental take attributed to noise disturbance authorized by the USFWS for management activities in RNSP, reported in acres. The programmatic consultation was completed in 1998.

◀Year and Take Specific Project▶	Annual Maintenance	Howland Hill Road Rebuild	Watershed Restoration	Equipment Removal Howland Hill Road	B-5 Road Repair	Mill Creek Campground/Road Repair	Tall Trees Road Repair	A-9, B-5 Roads/Horse and Tall Trees Trails Repair	Jammin' at Jed	State Park Trails Maintenance	B Mill Deck Restoration	Skunk Cabbage Trail Construction	Helicopter Use	Total Annual Take (acres)
2001														
Auth.	3584	1577	241									59	295	5756
Actual	2703	1577	44									59	0	**4383**
2000														
Auth.	3584	1577	136											5297
Actual	1724	1577	30											**3331**
1999														
Auth.	3584	1577	136								59			5356
Actual	1419	0	145								59			**1623**
1998														
Actual	480	727	150	354	16									**1727**
1997														
Actual						14	18	129						**161**
1996														
Actual		727												**727**
1995														
Actual		727							63					**790**
1994														
Actual										7214				**7214**

Table 9. Summary of northern spotted owl potential incidental take attributed to noise disturbance authorized by USFWS for management activities in RNSP, reported in acres (1999 to present). Note: the programmatic consultation was initiated and completed in 1998.

◄Year and Take Specific Project(s) ►	Annual Maintenance	Howland Hill Rd. Rebuild	Watershed Restoration	Equipment Removal Howland Hill Road	B-5 Road Repair	Cal Trans Disposal Site	Mill Creek Campground/Road Repair	Tall Trees Road Repair	A-9, B-5 Roads, Horse and Tall Trees Trail Repair	Jammin' at Jed Concert	State Park Trail Maintenance	Total Annual Take (acres)
2001												
Auth.	3072	1577										4649
Actual	400	0										**400**
2000												
Auth.	3072	1577										4649
Actual	750	0										**750**
1999												
Auth	3072	1577										4649
Actual	532	0										**532**
1998												
Actual	480	727	150	354	16							**1727**
1997												
Actual						75	14	18	255			**362**
1996												
Actual		727								63		**790**
1995												
Actual		727										**727**
1994												
Actual											17232	**17232**

Table 10. Summary of northern spotted owl annual and cumulative total potential incidental take attributed to suitable habitat loss/degradation authorized by USFWS for management activities in RNSP, reported in acres for what was authorized (i.e. from 1999 to present) by the USFWS and actual acres of potential incidental take.

Program ► Year and Take ▼	**Watershed Restoration**	**Campground Maintenance – Hazard Tree Removal**	**Total Annual Take**
2001 Authorized Actual	168 9		9
2000 Authorized Actual	168 6		6
1999 Authorized Actual	168 21		21
1998 Actual			
1997 Actual	30		30
1996 Actual		5	5
1995 Actual	35		35
1994 Actual			
CUMULATIVE ACTUAL POTENTIAL INCIDENTAL TAKE			**106**

2. Threshold Limit of Park-wide Potential Incidental Take

a. Targeted Threshold Limits

RNSP staff will manage for a threshold limit for potential incidental take based on a five year running average of 24 % for spotted owls and 27 % for marbled murrelets (Table 11). RNSP staff projects zero (0) acres of total available suitable marbled murrelet habitat will be altered/lost or degraded from normal management activities. Approximately 1 % of total available suitable spotted owl habitat will be altered/lost, and about 1% of total available suitable spotted owl habitat will be degraded (Table 11).

Table 11. Summary of the targeted threshold limits of potential incidental take and associated types of disturbance for spotted owls and marbled murrelets at RNSP. Potential incidental take is shown in percent of total available habitat and total acreage.

Species	Targeted Threshold Limit-Potential Incidental Take		Types of Disturbances				
	Percent of Total Available Suitable Habitat	Total Acres	Noise	Human Use Visual	Jay Predation	Habitat Alteration/ Loss	Habitat Degradation
Spotted Owl	24	15,800	X	X			
	1	962				X	
	1	830					X
Marbled Murrelet	27	11,240	X		X		
	0	0				X	X

The preceding threshold limits are based on a 150 m buffer width on either side of all trails (existing and to be constructed) and 1/4 mile buffer within all potential suitable marbled murrelet habitat. In computing for potential incidental take, RNSP staff did not double count overlapping areas. For example, if a portion of the 150 m buffer width on either side of a trail overlapped within the ¼ mile buffer around a campground facility, the trail portion of overlap within the ¼ mile circle would not be counted in computing the total potential take. Threshold limits for spotted owls were based on ¼ mile buffers within all potential suitable habitat except a 150 m buffer width on either side of trails was used to determine effects of human use visual disturbances to owls.

The established threshold limits for potential incidental take may be subject to change based on the status of the species. Based on the short time frame of potential take associated for certain park programs (e.g., prescribed fire program and conifer encroachment program) and the potential for change in program direction, this strategy should be revised a minimum of every five years.

b. Rationale for Established Threshold Limits

The preceding threshold limits for potential incidental take are based on on-going and planned RNSP management activities. The threshold limits for both species are compatible with RNSP's management and recovery goals (as stated in Section X, part A Introduction) in pursuance of furthering the conservation of listed species. The targeted threshold limits for potential incidental take may need to be adjusted in the near future as new information about listed species is acquired or as more potential suitable habitat (i.e., spotted owl) within the RNSP becomes available through natural and/or managed processes. For example, within the next five years, RNSP staff estimates that 10,700 acres of second-growth forests will mature into 40 year old stands to become potential suitable spotted owl habitat.

There is a distinction between permanent and temporary alteration of suitable habitat. These differences need to be considered in conjunction with total potential incidental take acres as reported to the USFWS or the number of stream crossings reported to the NMFS. Consultation has not been completed for all on-going RNSP management activities (i.e., existing trail use) and future proposed programs (e.g., second-growth forest management, building new visitor use trails, prescribed burning of old-growth forests). The majority of RNSP's potential incidental take for on-going programs with completed consultations is attributed to noise disturbance occurring mainly in developed areas. In addition to noise disturbance effects, all pending and future consultations will need to address the potential impacts associated with Steller's jay predation on nesting marbled murrelets.

The RNSP threshold limits account for a broad view of a program's potential impact or benefit to listed species. Certain programs may permanently improve suitable spotted owl habitat (e.g., second-growth management program) while other programs may temporarily degrade suitable spotted owl habitat (e.g., watershed restoration and second-growth management programs). For example, the watershed restoration program may result in potential short-term negative effects from the removal of some potential suitable spotted owl habitat, yet the long-term positive benefits gained by providing a more stable environment for re-establishment of the forest community for use by listed species far outweighs the potential negative short-term effects. Also, the second-growth management program, as well as some other RNSP management activities, initially may degrade potential suitable spotted owl habitat, but the long-term positive benefits of these programs in restoring stable, multi-level canopy structure habitat for listed aquatic and terrestrial species clearly offsets the negative effects associated with these programs.

c. Computation of Threshold Limits

A detailed description of the various park programs that contributed to the targeted threshold limit for potential incidental take is shown in Table 12. Acres contributing to potential incidental take are estimates provided by the RNSP program managers.

Table 12. Summary of park programs used in computing RNSP's targeted threshold limits of potential incidental take for marbled murrelets and spotted owls, projected for five years (into 2008). Total available habitat for marbled murrelets is estimated at 41,400 acres and spotted owls at 64,700 acres.

Park Program	Marbled Murrelet	Spotted Owl
	Acres of Potential Take/Yr	**Acres of Potential Take/Yr**
Noise or Predation Effects		
Annual Maintenance (includes existing trails	10,600	15,400
New Trail Construction	2,100/15 yrs= 140 ac/yr	2,700/15 yrs = 180 ac/yr
Emergency Removal of OG trees during breeding season	250	250
TOTAL	**11,000 = 27%**	**15,800 = 24%**
Habitat Loss/Alteration Effects		
Watershed Restoration	0	250
Conifer Removal	0	700
Westridge Road Removal (20' wide x 5 miles)	0	12
TOTAL	**0**	**962 = 1.4%**
Habitat Degradation Effects		
Prescribed Fire in Old-Growth forest	0	400
Hazard Fuels Reduction	0	400
New Trail Construction – 8 ft wide	0	22 (1 time)
TOTAL	**0**	**830 = 1.3 %**

The watershed restoration program focuses on reducing the accelerated erosion associated with the logging haul and skid roads and benefits the recovery of listed salmonids as well as listed terrestrial species by reducing fluvial erosion and mass wasting (landsliding). The threshold level for maintaining this important program for five years should not exceed more than 1% (i.e., < 250 acres) of the total available spotted owl nesting and roosting habitat.

Construction of new trails and the routine maintenance following contruction, using mechanical noise producing equipment, are planned to occur outside of the spotted owl and marbled murrelet breeding season; thus no additional incidental take is anticipated. Potential incidental take attributed to human visual disturbance of potential nesting spotted owls for completed new trails will total about 2,700 acres. If the results of recent research (Marzluff et. al. 2000) regarding corvid predation associated with campgrounds can be extrapolated and applied to trails in old-growth forests, the completion of all new trails proposed within RNSP, without considering offsetting mitigating actions taken by RNSP staff, would result in a hypothetical incidental take attributed to jay predation on nesting marbled murrelets of about 2,100 acres. These acreages were based on a 150 meter buffer either side of all proposed trails. In addition, potential

incidental take attributed to emergency use of chainsaws during the spotted owl and marbled murrelet breeding seasons to clear fallen old-growth trees from high use trail segments is estimated to be roughly 250 acres per year (based on 2 potential visits/year where 1 visit = 125 acres of potential incidental take for noise as consulted on in RNSP's 1998 annual maintenance program BA). This operation may not occur every year. In such emergencies, RNSP staff will initiate consultation with the USFWS.

About 700 acres of Douglas-fir encroached oak-woodland/grassland in the Bald Hills area of the park are targeted for treatment to remove young Douglas-fir. This program requires consultation with the USFWS, as potential suitable nesting and roosting spotted owl trees may be removed. RNSP staff intends to conduct habitat surveys of the project area, prior to conducting consultation with the USFWS, to validate the suitability of the treatment area for spotted owl nesting habitat. If surveys are inconclusive regarding the suitability of the treatment area as owl habitat, then RNSP staff will delay portions of management activities in these areas to minimize potential impacts to spotted owls.

XI. RESEARCH TOPICS

The following research would contribute to the regional and local understanding of the biology of the listed species most likely to be affected by management activities at RNSP. The answers gained from such research should help land managers and officials in regulatory positions decide whether populations of threatened and endangered species are recovering. NPS and CDPR do not have the resources to accomplish all of these projects, nor will RNSP staff seek funding for all of them. However, RNSP staff will endorse such research and seek outside researchers to pursue projects that address these information needs. As funding opportunities arise, RNSP staff will actively solicit other agencies with similar challenges or interests to form an interagency coalition to address the highest priority research and management questions.

Tidewater goby
- Determine current status and distribution of gobies within all potentially suitable habitats.
- Determine biological requirements of gobies within RNSP.
- Determine whether gobies can migrate from Stone Lagoon to Redwood Creek estuary.

Brown pelican
- Determine effects of public use of beaches on brown pelican behavior.
- Develop survey technique to index relative abundance of brown pelicans.
- Identify importance of beaches in RNSP for brown pelican night roosts.

Bald eagle
- Determine whether human disturbance affects bald eagle foraging, nesting, or social behavior.
- Determine whether food, nesting habitat, and/or other factors are limiting use of potentially suitable habitat within RNSP.
- Determine the rate of increase in occupied territories within the Oregon/California coastal zone of the recovery area.

Western snowy plover
- Determine whether suitable nesting and wintering habitat exists within RNSP.
- Conduct snowy plover habitat evaluation of RNSP coastal beaches
- If snowy plover utilize park beaches, determine effects of public use on snowy plover behavior and habitat suitability.

Marbled murrelet
- Determine the potential effects of human-induced predation risk associated with noise and human disturbance to nesting murrelets in developed and undeveloped areas of RNSP.
- Determine the levels of use of residual old-growth stands by nesting marbled murrelets.
- Determine the effects of various anthropogenic habitats on nest predator abundance, distribution, and survivorship.
- Determine how edge type (e.g., forest with recreational facility, roads, trails, etc.) affects marbled murrelet breeding success.
- Determine whether fragmentation affects marbled murrelet behavior and nesting success.
- Quantify noise level effects on the behavior of nesting marbled murrelets.
- Determine the extent of predator effects on marbled murrelet reproduction.
- Determine marbled murrelet occupancy of different sized stands in RNSP.
- Determine offshore and terrestrial population size for assessing the viability and recovery of marbled murrelet population.
- Validate marbled murrelet survey protocol for occupied behavior definitions.

Northern spotted owl
- Determine whether noise and human disturbance affect nesting spotted owls.
- Determine the effects of barred owl interactions with spotted owls. Are they displacing, predating, hybridizing, lowering reproductive success, or competing for food and nesting sites?
- Conduct home range/habitat use study of barred owls in RNSP.
- Identify prey base, abundance of prey, and use of prey by spotted owls in RNSP.
- Identify habitat features important for spotted owls and their prey species.
- Determine occupancy and use patterns of spotted owls and barred owls in disturbed and undisturbed forests of RNSP.
- Conduct spotted owl re-inventory surveys throughout suitable habitat within RNSP following 10 years post-initial survey.

Beach layia
- Determine the extent of distributional range of the species within RNSP.
- Determine the effects of public use and invasive plant species to population viability.

Chinook salmon, Coho salmon, Steelhead trout
- Determine the amount of sediment transported into streams from prescribed burning within RNSP per unit area of grassland, oak woodland, pine woodland, and old-growth redwood forest vegetation types.
- Determine the effects of RNSP management activities on salmonid reproduction and population viability.

- Determine the amount of suspended sediment and turbidity following watershed restoration work.

Steller sea lion
- Determine seasonal use by Steller's of coastal and offshore rocks within RNSP's coastline.
- Determine the significance of RNSP's marine coastal environment to Steller sea lion biology.

Oregon silverspot/Mardon skipper butterfly
- Determine presence/absence of the species within potential suitable habitat in RNSP.
- Determine the biological and habitat requirements of both species.

XII. LITERATURE CITATIONS

Anderson, D. G. and R. A. Brown. 1982. Anadromous salmonid nursery habitat in Redwood Creek watershed. In: Proceedings of the first biennial conference of research in California National Parks. University of California, Davis.

Anderson, D.G. 1988. Juvenile salmon habitat of the Redwood Creek basin in Humboldt County, California. M.S. Thesis. Humboldt State University, Arcata, CA. 99 pp.

Anderson, D.G. 1995. Biological supplement to Redwood National and State Parks US Army Corps of Engineers application: coho salmon utilization of Redwood Creek estuary. Unpub. Rep. on file at Redwood National and State Parks, Orick, CA. 13 pp.

Anderson, D. G. 2000. Tidewater goby annual report. Unpub. Rep. on file at Redwood National and State Parks, Orick, CA. 4 pp.

Andren, H. 1992. Corvid density and nest predation in relation to forest fragmentation: a landscape perspective. Ecology 73:794-804.

Andren, H., P. Angelstam, E. Lindstrom, and P. Widen. 1985. Differences in predation pressure in relation to habitat fragmentation: an experiment. Oikos 45:273-277.

Angelstam, P. 1986. Predation on ground nesting birds' nests in relation to predator densities and habitat edge. Oikos 47:365-373.

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. Forest Ecology and Management 108: 99-113.

Barlow, J. and B.L. Taylor. 2001. Estimates of large whale abundance off California, Oregon, Washington, and Baja California based on 1993 and 1996 ship surveys. Administrative Report LJ-01-03 available from Southwest Fisheries Science Center, National Marine Fisheries Service, P.O. Box 271, La Jolla, CA 92038. 12 pp.

Batten, L. A. 1977. Sailing on reservoirs and its effects on waterbirds. Biological Conservation 11:49-58.

Beissinger, S. 1995. Population trends of the Marbled Murrelet projected from demographic analysis. *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.

Bell, E. 2001. Survival, growth, and movement of juvenile Coho Salmon (*Oncorhynchus kisuth*) over-wintering in alcoves, backwaters, and main channel pools in Prairie Creek, California. MS thesis. Humboldt State University, Arcata, California. 75pp.

Bentivoglio N., J. Baldwin, P. Jodice, D. Evans 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. US Fish and Wildlife Service, Portland, OR. 72 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.

Boarman, W. I. and B. Heinrich. 1999. Common Raven (*Corvus corax*). *In* A. Poole and F. Gill, eds. The bird s of North America, No. 476. The Academy of Natural Sciences, Philadelphia, PA and the American Ornithologists' Union, Washington, D.C.

Bomford, M. and P. H. O'Brien. 1990. Sonic deterrents in animal damage control: A review of device tests and effectiveness. Wildl. Soc. Bull. 18:411-422.

Boyd, M.J. and J.D. DeMartini. 1977. Intertidal and subtidal biota of Redwood National Park. Unpub. Rep. on file. Orick, CA 171 pp.

Boyle, S. A. and F. B. Samson. 1985. Effects of nonconsumptive recreation on wildlife: a review. Wildl. Soc. Bull. 13:110-116.

Bowlby, C.E. 1981. Feeding behavior of pinnipeds in the Klamath River, northern California. M.A. Thesis. Humboldt State University, Arcata, CA. 80 pp.

Brand, L. A. 1998. Edge effects in coast redwood forest fragments. M.S. thesis, Humboldt State University, Arcata.

Brand, L. A. and T. L. George. 2000. Predation risk of nesting birds in coast redwood forest fragments. J. Wildl. Manage. 64:42-51.

Brand, L. A. and T. L. George. 2001. Response of birds to edges in redwood forest fragments. Auk 118:678-686.

Briggs, K. T., W. B.Tyler, D. B. Lewis, P. R. Kelly, and D. A. Croll. 1983. Brown Pelicans in central and northern California. Journ. of Field Ornith. 54(4):353-466.

Brown, R.A. 1988. Physical rearing habitat for anadromous salmonids in the Redwood Creek basin, Humboldt County, California. M.S. Humboldt State University, Arcata, CA. 132 pp.

Buehler, D. A., T. J. Mersmann, J. D. Fraser, and J. K. D. Seegar. 1991. Non-breeding Bald Eagles communal and solitary roosting behavior and roost habitat on the northern Chesapeake Bay. J. Wildl. Manage. 55:273-281.

Call, M.W. 1978. Nesting habitats and surveying techniques for common western raptors. USDI-BLM Technical Note TN-316. Portland, OR. 115 pp.

Carey, A.B., J.A. Reid, S.P. Horton. 1990. Spotted owl home range and habitat use in southern Oregon coast ranges. J. Wildl. Manage. 54(1):11-17.
California. The Condor. 92:739-748.

Calambokidis, J., G.H. Steiger, J.M. Straley, L.M. Herman, S. Cerchio, D.R. Salden, J. Urban-R., J.K. Jacobsen, O. von Zeigesar, K.C. Balcomb, C.M. Gabriele, M.E. Dalheim, S. Uchida, G. Ellis, Y. Miyamura, P. Ladron de Guevara-P., M. Yamaguchi, F. Sata, S.A. Mizroch, L. Schlender, K. Rasmussen, J. Barlow, and T.J. Quinn II. 2001. Movements and population structure of humpback whales in the North Pacific. Marine Mammal Science. 17(4): 769-794.

Carretta, J.V., J. Barlow, K. A. Forney, M.M. Muto and J. Baker. 2001a. Sperm whale (Physeter macrocephalus), California, Oregon, Washington stock. U.S. Pacific Marine Mammal Stock Assessments: 2001. NOAA Technical Memorandum NOAA-TM-NMFS-SWFSC-317. pp. 144-148 pp.

Carretta, J.V., J. Barlow, K. A. Forney, M.M. Muto and J. Baker. 2001b. Blue Whale (Balaennoptera musculus), Eastern North Pacific Stock. U.S. Pacific Marine Mammal Stock Assessments: 2001. NOAA Technical Memorandum NOAA-TM-NMFS-SWFSC-317. pp. 156-160.

Carretta, J.V., J. Barlow, K. A. Forney, M.M. Muto and J. Baker. 2001c. Fin Whale (*Balaennoptera physalus*), Eastern North Pacific Stock. U.S. Pacific Marine Mammal Stock Assessments: 2001. NOAA Technical Memorandum NOAA-TM-NMFS-SWFSC-317. pp. 161-165.

Carretta, J.V., J. Barlow, K. A. Forney, M.M. Muto and J. Baker. 2001d. Sei Whale (Balaennoptera borealis), Eastern North Pacific Stock. U.S. Pacific Marine Mammal Stock Assessments: 2001. NOAA Technical Memorandum NOAA-TM-NMFS-SWFSC-317. pp. 170-173.

Carretta, J.V., J. Barlow, K. A. Forney, M.M. Muto and J. Baker. 2002. Humpback Whale (*Megaptera novaeangliae*), Eastern North Pacific Stock. U.S. Pacific

Marine Mammal Stock Assessments: 2001. NOAA Technical Memorandum NOAA-TM-NMFS-SWFSC-317. pp. 68-75.

Carrier, W. D. and W. E. Melquist. 1976. The use of rotor-winged aircraft in conducting nesting surveys of ospreys in northern Idaho. J. Raptor res. 10:77-83.

Carter, H.R. 1984. At sea biology of the Marbled Murrelet in Barkley sound, British Columbia. Master's Thesis, University of Manitoba. 143 pp.

Carter, H.R., and J. Stein. 1995. Molts and plumages of the marbled murrelet. Pages 99-109 in C.J. Ralph, G.L. Hunt, M. Raphael, and J.F. Piatt (Tech. Eds.). Ecology and Conservation of the Marbled Murrelet. Gen. Tech. Report. PSW-GTR-152. Albany, CA: Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture. 420 pp.

[CDFG] California Department of Fish and Game. 1994. Petition to the Board of Forestry to list coho salmon as a sensitive species. Calif. Dept. Fish and Game Rep. 35 pp plus appendices.

Colwell, M.A., R.R. LeValley, A.N. Transou, S.E. McAllister, J. Hall, C.B. Millett, J.J. Meyer and D. LeValley. 2002. Final report: 2002 snowy plover breeding in northern California, with emphasis on Humboldt County. Submitted to MRB Research, Inc.

Craig, D. P. 1996. Stellar's Jays as dominant nest predators and an analysis of predation on different types of artificial nests. Bulletin of the ecology Society of America 77(3 Supp. Part II):95.

Craig, D. P. 1997. Corvid densities and nest predation in rural versus wild forests. (abstract only). Page 13 in Abstracts of the 24th Annual Natural Areas Association Conference ("Bridging Natural and Social Landscapes").

Craighead, R. C. Jr., and D. P. Mindell. 1981. Nesting raptors in western Wyoming, 1947 and 1975. J. Wildl. Manage. 45:865-872.

Croll, D.A., C.W. Clark, J. Calabokidis, W.T. Ellison, B.R. Tershy. 2001. Effect of anthropogenic low frequency noise on foraging ecology of Balaenoptera whales. Animal Conservation. 4(1):13-27.

de Blois, S. 1986. The social behavior of an emerging breeding population of *Eumatopias jubatus* on the coast of Humboldt County. M.A. Thesis. Humboldt State University, Arcata, CA. 73 pp.

Delaney, D. K., T. G. Grubb and L. L. Pater. 1997. Effects of helicopter noise on nesting Mexican spotted owls. Project report prepared for the U.S. Air Force, Holloman Air Force Base. Northern Arizona University, Flagstaff. 49 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

Donovan, G.P. 1991. A review of IWC stock boundaries. Report International Whaling Commission, Special Issue. 13:39-68.

Donovan, T. M., P. W. Jones, E. M. Annand, and F. R. Thompson, III. 1997. Variation in local-scale edge effects: mechanisms and landscape context. Ecology 78(7):2064-2075.

Dornfield, E.J. 1980. The butterflies of Oregon. Timber Press, Forest Grove, OR. 276 pp.

Ellis, D. H. 1981. Responses of raptorial birds to low level military jets and sonic booms: Results of the 1980-81 Joint U.S. Air Force-U.S. Fish and Wildl. Serv. Study. Report by Inst. For Raptor Studies for U.S. Air Force; FWS. NTIS No. ADA108-778. 59pp.

Engel, K. A. and L. S. Young. 1989. Spatial and temporal patterns in the diet of Common Ravens in southwestern Idaho. Condor 91:372-378.

Falvey, B. 1998. Peregrine Falcon inventory and monitoring- 1998, Redwood National and State Parks (RNSP). Unpub. Rep. on file at Redwood National and State Parks, Orick, CA. 10 pp.

Falvey, B. 1999. Peregrine Falcon inventory and monitoring- 1999, Redwood National and State Parks (RNSP). Unpub. Rep. on file at Redwood National and State Parks, Orick, CA. 7 pp.

Fiedler, P.C., S.B. Reilly, R.P. Hewitt, D. Deemer, V.A. Philbrick, S. Smith, D.A. Croll, B.R. Tershy, B.R. Mate. 1998. Blue whale habitat and prey in the California Channel Islands. Deep Sea Research II. 45: 1781-1801.

Fisk, L., E. Gerstung, R. Hansen, and J. Thomas. 1966. Stream damage surveys-1966. Inland Fisheries Administrative Report No. 66-10. The Resources Agency of California, Department of Fish and Game, Sacramento, CA. 14 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.

Ford, R. G., M. L. Bonnell, D. H. Varoujean, G. W. Page, B. E. Sharp, D. Heinemann, and J. L. Casey. 1991. Assessment of direct mortality in Prince William Sound and the western Gulf of Alaska resulting from the Exxon Valdez oil spill. Report on file: Ecological Consulting, Portland, OR.

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. Manage. 49(3):585-592.

Friedman, C.S., K.B. Andree, K.A. Beauchamp, J.D. Moore, T.T. Robbins, J.D. Shields, R.P. Hedrick. 2000. '*Candidatus* Xenohaliotis californiensis', a newly described

pathogen of abalone, *Haliotis* spp., along the West Coast of North America. Int. J. Syst. Evolut. Microbiol. 50:847-855.

Frissell, C.A. 1993. Topology of extinction and decline of native fishes in the Pacific Northwest and California. Conserv. Biol. 7:342-354.

Fyfe, R.w. and R.e. Olendorff. 1976. Minimizing the dangers of nesting studies to raptors and other sensitive species. Canadian Wildlife Service, Occ. Paper No. 23. 12 pp.

Gates, J. E. and L. Gysel. 1978. Avian nest dispersion and fledgling success in field-forest ecotones. Ecology 59:871-883.

Gerrard, P. N., J. M. Gerrard and F. R. Bortolotti. 1960. The impact of road development and tourist access on a Bald Eagle population at Besnard Lake, Saskatchewan. Pages 160-165.

Gisiner, R.C. 1985. Male territorial and reproductive behavior in the Steller sea lion, *Eumatopias jubatus.* Ph.D. Thesis. Univ. California, Santa Cruz. 145 pp.

Golightly, R. T., P. N. Hebert, and D. L. Orthmeyer. 2002. Evaluation of human-caused disturbance on the breeding success of Marbled Murrelets (Brachramphus marmoratus) in Redwood National and State Parks, California. Unpubl. Progress Report, Humboldt State University, Department of Wildlife, Arcata, CA., and U.S. Geological Survey, Western Ecological Research Center.

Gregr, E.J., L. Nichol, J.K.B. Ford, G. Ellis, A.W. Trites. 2000. Migration and population structure of northeastern Pacific whales off coastal British Columbia: an analysis of commercial whaling records from 1908-1967. Marine Mammal Science. 16(4): 699-727.

Griswold, M.D. 1985. Distribution and movements of pinnipeds in Humboldt and Del Norte Counties, California. M.A. Thesis, Humboldt State University, Arcata, CA. 108 pp.

Groombridge, B. (compiler). 1982. The IUCN amphibia-reptilia Red Data Book, Part 1. Olive ridley, pp. 209-223. Intl. Union for the Conserv. of Nature and Natural Res. (IUCN), Gland, Switzerland. 426 pp.

Grubb, T. G. and W. W. Bowerman. 1997. Variations in breeding Bald Eagles response to jets, light planes, and helicopters. J. Raptor Res. 31(3):213-222.

Grubb, T. G. and R. M. King. 1991. Assessing human disturbance of breeding Bald Eagles with classificiation tree models. J. Wildl. Manage. 55:500-511.

Grubb, T. G.,W. W. Bowerman, J. P. Giesy, and G. A. Dawson. 1992. Responses of breeding Bald Eagles to human activities in northcentral Michigan. Can. Field Nat. 106:443-453.

Gutierrez, R. J., A. B. Franklin, W. LaHaye, V. J. Meretsky, and J. P. Ward. 1985. Juvenile spotted owl dispersal in northwestern California: preliminary results. Page 60-65 *in* R. J. Gutierrez and A. B. Carey, tech. Eds. Ecology and management of the spotted owl in the Pacific Northwest. U.S. For. Serv. Gen. Tech. Rep. PNW-185.

Hamer, T. E. and S. K. Nelson. 1995. Nesting chronology of the Marbled Murrelet, pp. 49-56. *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.

Hammond, P.C. 1986. Ecological investigation of *Viola adunca* 1986 supplement. U.S. Department of Agriculture, Forest Service, Siuslaw National Forest. 25 pp.

Hammond, P.C. 1994. 1994 report of silverspot butterfly use of native meadow habitat on the Siuslaw National Forest. U.S. Department of Agriculture, Siuslaw National Forest. 16 pp.

Hammond, P.C. and D.V. McCorkle. 1984. Ecological investigations of *Viola adunca*. U.S. Department of Agriculture, Forest Service, Siuslaw National Forest. 84 pp.

Hamr, J. 1988. Disturbance behavior of chamois in an alpine tourist area of Austria. Mountain Research and Development 8:65-73.

Hernandez, F., Serrano, R., Roig-Navarro, A.F., Martinez-Bravo, Y., and Lopez, F.J. 2000. Persistent organochlorines and organophosphorus compounds and heavy elements in common whale (*Balaenoptera physalus*) from the western Mediterranean Sea. Marine Pollution Bulletin 40(5): 426-433.

Hile, A. G. 1993. Densities and substrate use of Scrub Jays (*Aphelocoma coerulescens*) and Steller's Jays (*Cyanocitta stelleri*) at Mt. Pinos, California. M.S. thesis, California State University, Northridge.

Holden, B. III. 2002. Redwood Creek basin 2000-2001 spawning and carcass survey. Annual Progress Report. Redwood National and State Parks, Orick, CA. 17 pp.

Holm, G. 2002. Peregrine Falcon inventory and monitoring annual progress report. Unpub. Rep. on file at Redwood National and State Parks, Orick, CA. 12 pp.

Hunter, J.E., R. J. Gutierrez, and A. B. Franklin. 1995. Habitat configuration around spotted owl sites in northwestern California. Condor. 97:684-693.

Imper, D. 1983. Report of the 1983 field inspection for McDonald's rock-cress (Arabis macdonaldiana ssp. macdonaldiana). Unpub. Rep. 18 pp.

Ingles, L.G. 1965. Mammals of the Pacific states. Stanford University Press, Stanford, CA. 523 pp.

IUCN [International Union of the Conservation of Nature] 1991. Dolphins, porpoises and whales of the world: the IUCN Red Data Book. J. Klinowska (compiler). IUCN, Gland, Switzerland, and Cambridge, United Kingdom. viii + 429 pp.

Jameson, R.J. and K.W. Kenyon. 1977. Prey of sea lions in the Rogue River, Oregon. J. Mamm. 58:672.

Jaques, D.L. and D.W. Anderson. 1988. Brown pelican use of the Moss Landing Wildlife Management Area. State of Calif., The Resources Agency, Dept. of Fish and Game. 65 pp.

Jaques, D.L., R.L. Lowe, and D.W. Anderson. 1994. Brown Pelican range expansion in the eastern North Pacific: roles of tradition and climate change. *In* Jaques, D.L. 1994. Range expansion and roosting ecology of non-breeding California Brown Pelicans. Unpub. M.S. Thesis. Univ of Calif, Davis. 133 pp.

Jaques, D.L., C.S. Strong, and T.W. Keeney. 1996. Brown pelican roosting patterns and responses to disturbance at Mugu Lagoon and other non-breeding sites in the Southern California Bight. Nat'l. Biol. Serv., Coop. Nat'l. Park Res. Studies Unit. Univ. of Arizona, Tucson, AZ. 62 pp.

Jimerson, T.J., L.D. Hoover, E.A. McGee, G. DeNitto, and R.M. Creasy. 1995. A field guide to serpentine plant associations and sensitive plants in northwestern California. R5-ECOL-TP-006. USDA Forest Service, Pacific Southwest Region.

Jodice, P. 2002. Draft Marbled Murrelet Effectiveness Monitoring Northwest Forest Plan – 2001 Annual Summary Report. US Fish and Wildlife Service, Portland, OR. Unpub. Report - on file at RSNP. 19 pp.

Johnson, C. L. and R. T. Reynolds. 2002. Responses of Mexican spotted owls to low-flying military jet aircraft. USDA Forest Service, Rocky Mountatin Research Station RN-12. 4 pp.

Johnston, R. G. and S. A. Temple. 1990. Nest predation and brood parasitism of tall grass prairie birds. J. Wildl. Manage. 54:106-111.

Kelly, E. G. 2001. The Range Expansion of the Northern Barred Owl: An evaluation of the impact on spotted owls. M.S. Thesis. Oregon State University. 78 pp.

Knight, R.L. 1984. Responses of nesting ravens to people in areas of different human densities. Condor 86:345-346.

Knight, R. L. and K. J. Gutzwiller. 1995. Wildlife and Recreationists: coexistence through management and research. Island Press. Covelo, California. 372 pp.

Knight, R. L. and S. K. Knight. 1984. Responses of wintering Bald Eagles to boating activity. J. Wildl. Manage. 48:999-1004.

Knight, R. L. and S. K. Skagen 1988. Effects of recreational disturbance on birds of prey: a review. Pages 355-359. *In* R. L. Glinski et al., eds. Proceedings of the Southwest Raptor Management Symposium and Workshop. National Wildl. Fed., Washington, D. C.

Konkel, G.W. and J.D. McIntyre. 1987. Trends in spawning populations of Pacific anadromous salmonids. USDI Fish and Wildlife Service Wildl. Tech. Rep. 9, Washington DC. 25 pp.

LeValley, R. 2001. Redwood National Park, Humboldt County California, Marbled Murrelet surveys in residual stands, interim report- Summer 2000 surveys. RNSP Work Order Number P8480000019. Unpub. Rep. on file at RNSP, Orick, CA.

MacCall, A.D. 2002. Status of bocaccio off California in 2002. Pacific Fishery Management Council.

MacCall, A.D. and Xi He. 2002. Status review of the southern stock of bocaccio (*Sebastes paucispinis*). Santa Cruz Laboratory, Southwest Fisheries Science Center and National Marine Fisheries Service, Santa Cruz, CA SCL #366. 23 pp.

Mad River Biologists. 1999. Report to RNSP, marbled murrelet surveys at Miller Creek old-growth area. Unpublished report – on file at RNSP. 1 p. with attachments.

Marquez, M.R. 1990. Seat turtles of the world. An annotated and illustrated catalogue of sea turtle species known to date. FAO Species Catalog, FAO Fisheries Synopsis 11(125):81 pp.

Marzluff, J. M. and R.P. Balda. 1992. The Pinyon Jay. T & A D Poyser, London.

Marzluff, J. M., R. B. Boone, and G. W. Cox. 1994. Historical changes in populations and perceptions of native pest and birds species in the West. Studies in Avian Biology 15:202-220.

Marzluff, J.M., F.R. Gehlbach, and D.A. Manuwal. 1998. Urban environmentalists: Influences on avifauna and challenges for the avian conservationist. In: J.M. Marzluff and R. Sallabanks (eds.) Avian Conservation: Research and Management. Island Press, Washington, D.C. pp. 293-299.

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 Pennisula. Unpublished Report submitted to the USFWS. January 31, 1996. 63 pp.

Marzluff, J.M., M.G. Raphael, and R. Sallabanks. 2000. Understanding the effects of forest management on avian species. Wildl. Soc. Bulletin. 28:1132-1143.

Marzluff, J.M., K.J. McGowan, C. Caffrey, R. E. Donnelly, and R.L. Knight. 2001. Causes And consequences of expanding American Crow populations. Page 33 *in* J. M. Marzluff, R. Bowman, and R. A. Donnelly, (Eds.). Avian conservation and ecology in An urbanizing world. Kluwer Academic Publishers, Norwell, MA.

Marzluff, J. M. and E. Neatherlin. Under Review, unpublished. Corvid response to human settlement and recreation: causes, consequences, and challenges for managers. On file at RNSP 51 pp.

Masselink, M.N.M. 1999. Steller's Jay ecology in fragmented forests of coastal British Columbia, with implications for Marbled Murrelets. Proceedings of the 26 Annual Meeting of the Pacific Seabird Group.

Mate, B. R. 1982. History and present status of the Norther (Steller) Sea Lion, *Eumetopia Jubatus. In* Mammals in the Sea, Vol. IV, FAO Fisheries Series, No. 5. Pp 311-317.

Mate, B.R., B.A. Lagerquist, J. Calamborkidis. 1999. Movement of North Pacific blue whales during feeding season off Southern California and their southern fall migration. Marine Mammal Science. 15(4):1246-1257.

McCorkle, D.V. and P.C. Hammond. 1988. Observations on the biology of *Speyeria zerene hippolyta* (Nymphalidae) in a marine modified environment. J. Lepid. Soc. 42: 184-195.

McIver, J., S. Muttillinja, D. Pickering, and R. VanBuskirk. 1991. Population dynamics and habitat selection of the Oregon silverspot butterfly (*Speyeria zerene hippolyta*): a comparative study at four primary sites in Oregon. Report to the U.S. Department of Agriculture, Forest Service, Siuslaw National Forest, Corvallis OR. 61 pp.

Miller, D.J. and R.N. Lea. 1972. Guide to the coastal marine fishes of California. Calif. Dep. Fish and Game, Fish Bull. No. 157. 249 pp.

Mrovosky, N. 1993. World's largest aggregation of sea turtles to be jettisoned. Mar. Turtle Newsl. 63(Supplement):2-3.

Naslund, N.L. 1993. Breeding biology and seasonal activity patterns of Marbled Murrelets (Brachyramphus marmoratus) nesting in old-growth forest. Santa Cruz, California: University of California; 146p. M.S. Thesis.

Nehlsen, W., J. E. Williams, and J. A. Lichatowich. 1991. Pacific salmon at the crossroads: Stocks at risk from California, Oregon, Idaho, and Washington. Fisheries 16(2):4-21.

Nelson, S.K. 1992. Intensive searches for nests of Marbled Murrelets through the use of visual observations and sophisticated audio equipment. Publicatio Number 91-9-07. Final Report to the Nongame Program. Portland, OR: Oregon Department of fish and Wildlife.

Nelson, S.K. and T.E. Hamer. 1995. Nest success and the effects of predation on Marbled Murrelets. *In* Ecology and Conservation of the Marbled Murrelet in North America (C.J. Ralph, G.L. Hunt, M.G. Raphael, and J.F. Piatt, eds.) Gen. Tech. Report PSW-GTR-152. USFS, Albany, California.

Nelson, S.K. and J.G. Hardin. 1993. Shore-based surveys of Marbled Murrelets along the Oregon coast, 1988-1992 (abstract). Pacific Seabird Group Bulletin 20(1): 59.

Neatherlin, E., and J. M. Marzluff. Under Review,unpublished. Campgrounds enable American Crows to colonize remote native forests: Why a landscape view is needed to address a local issue. On file at RNSP 38 pp.

Newcomer, E.J. 1966. Life histories of three western species of Polites. J. Res. Lepid. 5: 243-247.

Newton, G. 1987. A field search for Arabis macdonaldiana on High Plateau Mountain, Del Norte County, California. Unpub. Rep. 13 pp.

Newton, I. 1979. Population ecology of raptors. Berkhamsted:Poyser.

NMFS [National Marine Fisheries Service]. 1992. Recovery plan for the Steller sea lion (*Eumatopias jubatus*). Prepared by the Steller Sea Lion Recovery Team for the National Marine Fisheries Service, Silver Spring, MD. 92 pp.

NMFS and USFWS [National Marine Fisheries Service and US Fish and Wildlife Service]. 1998a. Recovery plan for U.S. Pacific populations of the East Pacific green turtle (*Chelonia mydas*). National Marine Fisheries Service, Silver Spring, MD.

NMFS and USFWS [National Marine Fisheries Service and U.S. Fish and Wildlife Service]. 1998b. Recovery plan for U.S. Pacific populations of the leatherback turtle (*Dermochelys coriacea*). National Marine Fisheries Service, Silver Spring, MD.

NMFS and USFWS [National Marine Fisheries Service and U.S. Fish and Wildlife Service. 1998c. Recovery plan for the U.S. Pacific populations of the Loggerhead Turtle (*Caretta caretta*). National Marine Fisheries Service, Silver Spring, MD.

NMFS and USFWS [National Marine Fisheries Service and US Fish and Wildlife Service]. 1998d. Recovery plan for U.S. Pacific populations of the Olive Ridley Turtle (*Lepidochelys olivaca*). National Marine Fisheries Service, Silver Spring, MD.

Orr, R. T. and T. C. Poulter. 1965. The pinniped population of Ano Nuevo Island, California.

Page, G.W. and L.E. Stenzel, (eds). 1981. The breeding status of the Snowy Plover in California. Western Birds. 12:1-40.

Page, G.W., F.C. Bidstrup, R.J. Ramer, and L.E. Stenzel. 1986. Distribution of wintering snowy plovers in California and adjacent states. Western Birds. 17(4):145-170.

Page, G.W., L.E. Stenzel, W.D. Shuford, and C.R. Bruce. 1991. Distribution and abundance of the snowy plover on its western North American breeding grounds. J. Field Ornith. 62:245-255.

Palacios, E.P., L. Afaro, and G.W. Page. 1994. Distribution and abundance of breeding snowy plovers on the Pacific coast of Baja California. J. Field Ornith. 65(4):490-497.

Parker, I., W. Harpole, and D. Dionne. 1997. Changes in the south Puget prairie landscape. Pages 149-161 in P.V. Dunn and K. Ewing (Eds.). Ecology and conservation of the south Puget Sound prairie landscape. The Nature Conservancy, Seattle, WA. 289 pp.

Paton, P.W.C. 1994. The effect of edge on avian nest success: How strong is the evidence? Conservation Biology 8:17-26.

Pearcy, W., J. Fisher, R. Brodeur, and S. Johnson. 1985. Effects of the 1983 El Nino on coastal nekton off Oregon and Washington. Pp. 188-204 in El Nino North, Nino Effects in the Eastern Subarctic Pacific Ocean, W. S. Wooster and D. L. Fluharty (*eds*.), University of Washington Press, Seattle.

Piatt, J. F., C. J. Lensink, W. Butler, M. Kenziorek, and D. R. Nysewander. 1990. Immediate impact of the Exxon Valdez oil spill on marine birds. Auk 107(2):387-397.

Pickering, D., D. Salzer, and C.A. Macdonald. 1992. Population dynamics and habitat selection of the Oregon silverspot butterfly (*Speyeria zerene hippolyta*). Report to the Siuslaw National Forest. The Nature Conservancy, Portland, OR. 100 pp.

Potter, A., J. Fleckenstein, S. Richardson, and D. Hays. 1999. Washington state status report for the mardon skipper. Washington Department of Fish and Game, Olympia. 39 pp.

Raimondi, P.T., C.M. Wilson, R.F. Ambrose, J.M. Engle, T.E. Minchinton. 2002. Continued declines of black abalone along the coast of California: are mass mortalities related to El Nino events? Mar. Eco. Prog. Ser. Vol. 242: 143-152.

Ralph, C.J., P.W.C. Paton, A. Zakis, G. Strachan. 1990. Breeding distribution of the marbled murrelet in Redwood National Park and vicinity during 1988. Pages 57-70 *in* C. van Riper III, T.J. Stohlgren, S.D. Veirs, Jr., and S.C. Hillyer (Tech. Eds.). Examples of resource inventory and monitoring in National Parks in California. Proceedings of the Third Biennial Conference on Research in California's National Parks, Series No. 8. U.S. Dept. of the Interior, National Park Service, Washington, D.C.

Ralph, C.J., G.L. Hunt, Jr.; M.G. Raphael; and J.F. Piatt. 1995. Ecology and conservation of the Marbled Murrelet in North America: an overview. *In* Ralph, C.J., George L. Hunt, Jr.; Martin G. Rapael; John F. Piatt (Tech. Eds.). 1995. Ecology and conservation of the Marbled Murrelet. Gen. Tech. Rep. PSW-GRT-152. Albany, CA: Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture. 420 pp.

Ralph, C.J., B.P. O'Donnell, L.L. Long, S.L. Miller, T. Shaw. 1998. Abundance, distribution, and productivity of marbled murrelets along the northern California coast in 1997. Final Report to the Marbled Murrelet Study Trust. Redwood Sciences Laboratory, Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture and U.S. Fish and Wildlife Service, Arcata, CA. Unpublished Report. 49 pp.

Ralph, C.J., S.L. Miller, L.L. Long. 2001. Abundance, distribution, and productivity of marbled murrelets along the northern California coast and southern Oregon in 2000. Final Rept. to the Marbled Murrelet Study Trust, Eureka, California.

Ralph, C.J., S.L. Miller, K. Hollinger, B. Hogoboom, R.I. Frey, L. Long, T. Matsumoto, H.Stauffer. 2002. 2001 Annual report – marbled murrelet monitoring in northwestern California and Oregon – marbled murrelet research. Redwood Sciences Laboratory, Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture. Internet publication. 5 pp.

Raphael, M.G., D. E. Mack, J. M. Marzluff, and J. M. Luginbuhl. 2002. Effects of forest fragmentation on populations of the Marbled Murrelet. Studies in Avian Biology 25:221-235.

Ratti, J. T. and K. P. Reese. 1988. Preliminary test of the ecological trap hypothesis. J. Wildl. Manage. 52:484-491.

Reese, K. P. and J. T. Ratti. 1988. Edge effect: a concept under scrutiny. Transactions of the North American Wildlife and Natural Resources Conference 53:127-136.

Reeves, G. H. and J. R. Sedell. 1992. An ecosystem approach to the conservation and management of freshwater habitat for anadromous salmonids in the Pacific Northwest. In Transactions of the 57th Wildlife and Natural Resources Conference. Washington, DC. Pages 408-415.

Reimers, P.E. 1973. The length of residency of juvenile fall chinook salmon in Sixes River, Oregon. Res. Rep. of Fish Comm. of Oregon 4(2).

Reiser, D. W., and T. C. Bjornn. 1979. Influence of forest and rangeland management on anadromous fish habitat in the western United States and Canada Part 1: Habitat requirements of anadromous salmonids. USFA Forest Service. General Technical Report. PNW-96 Pacific Northwest Forest and Range Experiment Station. Portland, OR.

Ricks, C. 1983. Flood history and sedimentation at the mouth of Redood Creek, Humboldt County, California. MS thesis. Oregon State University, Corvallis, Oregon. 166pp.

Ricketts, E.F. and J. Calvin. 1952. Between Pacific tides. 3rd Edition. Stanford Univ. Press, Stanford, CA.

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.

[RNSP] Redwood National and State Parks. 1998. Tidewater Goby annual report, Fish and Wildlife Branch. Unpub. Rep. on file at Redwood National and State Parks, Orick, CA.

Robinson, S. K., F. R. Thompson, III, T. M. Donovan, D. R. Whitehead, and J. Faaborg. 1995. Regional forest fragmentation and the nesting success of migratory birds. Science 267:1987-1990.

Rosenberg K. and M. G. Raphael. 1986. Effects of forest fragmentation in Douglas-fir forests. Pages 263-272 *in* J. Verner, M. L. Morrison, and C. J. Ralph, editors. Wildlife 2000: modeling habitat relationships of terrestrial vertebrates. Univ. of Wisconsin Press, Madison, WI.

Roth, J. E., J. P. Kelly, W. J. Sydeman, M.W. Parker, and S.G. Allen. 1999. Ecosystem-level management of Common Ravens on the Point Reyes National Seashore. Report to Point Reyes National Seashore. Point Reyes Bird Observatory, Stinson Beach, CA.

Salata, L.R. 1982. Ecological relationships of Scrub and Steller's Jays in the San Francisco Bay area, California. M.S. thesis, California State University, Sacramento.

Sandegren, F.E. 1970. Breeding and maternal behavior of the Steller sea lion (*Eumatopias jubatus*) in Alaska. M.S. Thesis, Univ. of Alaska, Fairbanks. 138 pp.

Sandercock, F. K. 1991. Life history of Coho Salmon (*Oncorhynchus kisutch*). In C. Groot and L. Margolis (*eds.*), Pacific salmon life histories, p. 396-445. Univ. British Columbia Press, Vancouver.

Schmidt, K. 2000. Spotted owl monitoring and inventory, Redwood National and State Parks, 2000 annual report. Unpub. Rep. on file at Redwood National and State Parks, Orick, CA. 16 pp.

Scrivener, J. C. and B.C. Andersen. 1982. Logging impacts and some mechanisms which determine the size of spring and summer populations of coho salmon fry in Carnation Creek. *In*: Proceedings of the Carnation Creek Workshop: a ten year review. G.F. Hartman, ed. Pacific Biological Station, Nanaimo, BC, Canada.

Sea Grant. 2001. First known sightings of "withering" abalone bacteria in northern California. Sea Grant Research at Work, Website, 2 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.

Seed, A. 1972. Baleen Whales in Eastern North Pacific and Arctic Waters. Pacific Search. Seattle.

Sieving, K. E. and M.F. Willson. 1998. Nest Predation and avian species diversity in a northwestern forest understory. Ecology 79:2391-2402.

Sieving, K. E. and M. F. Willson. 1999. A temporal shift in Steller's Jay predation on bird eggs. Canadian Journal of Zoology 77:1829-1834.

Singer, S. W., N. L. Naslund, S. A. Singer, and C. J. Ralph. 1991. Discovery and observation of two tree nests of the Marbled Murrelet. Condor 93:330-339.

Singer, S.W., D.L. Suddjian, and S.A. Singer. 1992. Discovery, observations and fledging of a Marbled Murrelet from a redwood tree nest. Santa Cruz Museum of Natural History Report. 10 pp.

Singer, S. W., D. L. Suddjian, and S. A. Singer. 1995. Fledging behavior, flight patterns, and forest characteristics a Marbled Murrelet tree nests in California. Pp. 54-62. *In* Biology of the Marbled Murrelet: inland and at-sea (S. K. Nelson and S. G. Sealy, eds). Northwestern Naturalist, Vol. 76.

Singleton, T.A. 1989. Population dynamics and habitat selection of the Oregon silverspot butterfly (*Speyeria zerene hippolyta*) at Cascade Head Preserve. The Nature Conservancy, Portland, OR. 9 pp.

Smith, D. G., D. H. Ellis, and T. H. Johnson. 1988. Raptors and aircrafts: Pages 360-367 in R. L. Glinski, B. Millsap, S. W. Hoffman (e*ds*), Proceedings of the Southwest Raptor Management symposium and workshop. Nat. Wildl. Fed., Wash. D.C. USA.

Solis, D.M. Jr. and R.J. Gutierrez. 1990. Summer habitat ecology of northern spotted owls in northwestern. Condor. 92:739-748.

Stack, J.D. 1981. Diurnal activity patterns of nonbreeding *Zalophus californianus* and *Eumatopias jubatus* at Klamath Cove, California. M.A. Thesis, Humboldt State University, Arcata, CA. 78 pp.

Stafford, K.M., S.L. Nieukirk, and C.G. Fox. 1999. An acoustic link between blue whales in the eastern tropical Pacific and Northeast Pacific. Marine Mammal Science. 15(4): 1258-1268.

Stalmaster, M. V. 1987. The Bald Eagle. Universe Books. New York. 227 pp.

Stalmaster, M. V. and J. L. Kaiser. 1998. Effects of recreational activity on wintering Bald Eagles. Wildl. Monogr. 137:1-46.

Stalmaster, M. V. and J. R. Newman. 1978. Behavioral responses of wintering Bald Eagles to human activity. J. Wildl. Manage. 2(3): 1978.

Steiger, G.H., J. Calambokidis, R. Sears, K.C. Balcomb, and J.C. Cubbage. 1991. Movement of humpback whales between California and Costa Rica. Marine Mammal Science. 7:306-310.

Steinbeck, J.R., J.M Groff, C.S. Friedman, T. McDowell, R.P. Hedrick. 1992. Investigations into a mortality among populations of the California black abalone, Haliotis cracherodii, on the central coast of California, USA. Pages 203-213 in S.A. Shepherd, M.J. Tegner, S.A. Gusman del Proo (Eds.). Abalone of the world: biology, fisheries, and culture. Proc. 1st Int. Symp. Abalone. Blackwell Scientific Publishers, Oxford.

Stinson, M.L. 1984. Biology of sea turtles in San Diego Bay, California, and in northeastern Pacific Ocean M.S. Thesis, San Diego State Univ. CA. 578 pp.

Strong, C.S., J. Jacobsen, D.M. Fix, M. R. Fisher, R. LeValley, C. Striplen, W. R. McIver, I.Gaffney. 1997. Distribution, abundance, and reproductive performance of marbled murrelets along the northern California coast during the summers of 1994 and 1995. Final Report to the Marbled Murrelet Study Trust. Crescent Coastal Research and Mad River Biologists. McKinleyville, CA. Unpublished Report. 32 pp.

Sullivan, R.M. 1980. Seasonal occurrence and haul-out use in pinnipeds along Humboldt County, California. J. Mamm. 61(4): 754-760.

Swift, C. L., J. L. Nelson, C. Maslow, and T. Stein. 1989. Biology and distribution of the Tidewater Goby, *Eucyclogobius newberryi* (Pisces: Gobiidae) of California. Contributions in Science No. 404. Natural History Museum of Los Angeles County. Los Angeles, CA 19 pp.

Tanner, R.G. 1999. Habitat use by northern spottted owls in coastal redwood forests of northwestern California. M.S. Thesis, Humboldt State University, Arcata, CA. 47 pp.

Tanner, R.G. and R.J. Gutierrez. 1996. A partial inventory of northern spotted owls (*Strix occidentalis caurina*) in Redwood National Park, 1995. Annual Report to National Park Service, Redwood National Park. Coop. Agmt. No. CA 8480-3-9005.

Terborgh, J. 1989. Where have all the birds gone? Princeton University Press, Princeton, N.J.

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.

Tissot, B.N. 1995. Recruitment, growth, and survivorship of black abalone on Santa Cruz Island following mass mortality. Bull. South. Calif. Acad. Sci. 94:179-189.

Trasky, L. L., L. B. Flagg, and D. C. Burbank. 1977. Environmental studies of Kachemak Bay and Lower Cook Inlet. Vol. 1: Impacts of oil on the Kachemak Bay environment. UnPub. Report. Alaska Dept. of Fish and Game, Marine Coastal Habitat Management, Anchorage, AK.

[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.

[USDC] U.S. Department of Commerce. 1999a. Endangered and threatened species; threatened status for two Chinook Salmon evolutionarily signigicant units (ESUs) in California. Fed. Reg. 64(179):50394-50415.

[USDC] U.S. Department of Commerce. 1999b. Designated critical habitat; central California coast and southern Oregon/northern California coasts coho salmon; final rule and correction. Fed. Reg. 64(86):24049-24062.

[USDC] U.S. Department of Commerce. 2000. Designated critical habitat: critical habitat for 19 evolutionarily significant units of salmon and Steelheadin Washington, Oregon, Idaho, and California; final rule. Fed. Reg. 65(32):7764-7787.

[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; six plants and Myrtle's silverspot butterfly from coastal dunes in northern and central California determined to be endangered. Fed. Reg. 57:27848-27872.

[USDI] U.S. Department of the Interior. 1992b. 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. 1992c. Final draft recovery plan for the Northern Spotted Owl. USDI Fish and Wildlife Service. Washington DC.

[USDI] U.S. Department of the Interior. 1992d. 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. 1993. Endangered and threatened wildlife and plants; determination of threatened status for the Western Snowy Plover. Fed. Reg. 58:12864-12872.

[USDI] U.S. Department of the Interior. 1994. Endangered and threatened wildlife and plants; determination of endangered status for the Tidewater Goby. Fed. Reg. 59: 5494-5499.

[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. 1997. Endangered and threatened species; threatened status for the southern Oregon/northern California coast evolutionarily significant unit (ESU) coho salmon; final rule. Fed. Reg. 62(117):33038-33039.

[USDI] U.S. Department of the Interior. 1998. Seven coastal plants and the myrtle's silverspot butterfly recovery plan. Portland, OR: USDI Fish and Wildlife Service. 141 pp.

[USDI] U.S. Department of the Interior. 1999a. Endangered and threatened wildlife and plants; proposed rule to remove the northern populations of the Tidewater Goby from the list of endangered and threatened wildlife. USDI Fish and Wildlife Service. Fed. Reg. 64(121): 33816-33824.

[USDI] U.S. Department of the Interior. 1999b. Endangered and threatened wildlife and plants; proposed rule to remove the Bald Eagle in the lower 48 states from the list of endangered and threatened wildlife; proposed rule. USDI Fish and Wildlife Service. Fed. Reg. 64(128): 36453-36464.

[USDI] U. S. Department of the Interior. 1999c. Endangered and threatened wildlife and plants; final rule to remove the American peregrine falcon from the federal list of endangered and threatened wildlife, and to remove the similarity of appearance provision for free-flying peregrines in the conterminous United States; final rule. Fed. Reg. Vol 64(164): 46541-46558.

[USDI] U.S. Department of the Interior and [CDPR] California Department of Parks and Recreation. 1999. Redwood National and State Parks, Humboldt and Del Norte

Counties; final general management plan/ general plan; environmental impact statement/ environmental impact report. Vol. 1. Crescent City, CA: USDI National Park Service and California Department of Parks and Recreation.

[USDI] U.S. Department of the Interior. 2002. Endangered and threatened wildlife and plants; withdrawal of proposed rule to remove the northern populations of the tidewater goby from the list of endangered and threatened wildlife. Fed. Reg. 67(216): 67803-67818.

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

[USFWS] U. S. Fish and Wildlife Service. 1983. The California Brown Pelican recovery plan. Prepared by F. Gress and D.W. Anderson for USFWS. Portland, OR. 179 pp.

[USFWS] U. S. Fish and Wildlife Service. 1986. Recovery plan for the Pacific Bald Eagle. USDI Fish and Wildlife Service. Portland, OR. 160 pp.

[USFWS] U. S. Fish and Wildlife Service 1992. Final draft recovery plan for the northern spotted owl. U.S. Dept of Interior. Washington DC. 338 pp.

[USFWS] U. S. Fish and Wildlife Service. 1997. Recovery plan for the threatened Marbled Murrelet (*Brachyramphus marmoratus*) in Washington, Oregon, and California. Portland, OR. 203 pp.

[USFWS] U. S. Fish and Wildlife Service. 1998. Seven coastal plants and the myrtle's silverspot butterfly recovery plan. Portland, OR: USDI Fish and Wildlife Service. 141 pp.

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

[USFWS] U. S. Fish and Wildlife Service. 2000. Endangered and threatened wildlife and plants; final rule to list the short-tailed albatross as endangered in the United States. USDI Fish and Wildlife Service. Fed. Reg. 65(147): 46643-46654.

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

[USFWS] U.S. Fish and Wildlife Service. 2001b. Western Snowy Plover (*Charadrius alexandrinus nivosus*) Pacific coast population draft recovery plan. Portland, OR. xix + 630 pp.

Van Kirk, S. 1994. Historical information on Redwood Creek. Unpub. Rep. on file at Redwood National and State Parks, Arcata, CA

Wallen, R., J. Gordon, and C. Arguello. 1998. Abundance of corvids in old-growth forest habitats in Redwood National and State Parks. Annual report of Redwood National and State Parks. 12 pp.

Wallen, R., C. Arguello, J. Friedman, and D. Baldwin. 1999a. The corvids of Redwood National and State Parks: What is their relative abundance and how does abundance vary relative to human activities in the forest? Annual progress report of Redwood National and State Parks. 6 pp.

Wallen, R. C., D. Baldwin, and K. Leep. 1999b. Noise level monitoring of heavy equipment during road removal projects in Redwood National Park. Summary report of Redwood National Park. 7 pp.

Wheeler, Jim. Park Guide. Redwood National and State Parks, Orick, CA

Wilderness Society. 1993. The living landscape, Vol. 2: Pacific salmon and federal lands. Bolle Center for Forest Ecosystem Management, 87 p. (Available from The Wilderness Society, 900 Seventeenth Street, N.W., Washington, DC 20406-2596).

Wyoming Game and Fish Department. 1983. A Bald Eagle management plan. Cheyenne, WY. 84pp.

Yahner, R. H., and D.P. Scott. 1988. Effects of forest fragmentation on depredation of artificial nests. J. Wildl. Manage. 52:158-161.

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

XIII. CONTACTS

David Anderson. Fish Biologist. RNSP
Leonel Arguello, Botanist, RNSP
Dr. Jeff Black, Professor Humboldt State University, Arcata, California
Jeff Bomke, Chief of Maintenance, CDPR
Dr. Rick Brown, Professor Humboldt State University, Arcata, California
Charles Chamberlin, Senior Fishery Biologist, Yurok Tribe, Hoopa, CA.
Cathleen Cook, Chief of Interpretation Division, RNSP
Dr. David Delaney, Northern Arizona University, Flagstaff, Arizona
Corky Farley, Supervisory Park Ranger, RNSP
Dr. Alan Franklin, Cooperative Unit, Colorado State University, Ft. Collins, Colorado
Dr. Luke George, Professor Humboldt State University, Arcata, California
Valerie Gizinski, Ecologist, CDPR
Greg Goldsmith, U.S. Fish and Wildlife Service, Arcata, California
Dr. Richard Golightly, Professor Humboldt State University, Arcata, California
Dr. Rocky Gutierrez, Professor University of Minnesota

Robin Hamlin,U.S. Fish and Wildlife Service, Arcata, California
Dr. Stan Harris, Professor Emeritus, Humboldt State University, Arcata, California
Dr. Percy Hebert, Marbled Murrelet researcher/Wildlife Department, Humboldt State University
Chris Heppe, Program Manager Resource Division, RNSP
Terry Hofstra, Resources Management and Science Division Chief. RNSP
Baker Holden, Fish Biologist, RNSP
Sterling Mattoon, Lepidopterist, Chico, California
Richard Mayle, Roads and Trails Supervisor, RNSP
Dr. John Marzluff, Professor University of Washington, Seattle, Washington
Sherri Miller, Wildlife Biologist, Redwood Sciences Laboratory, Arcata, California
Dr. Tim Lawler, Professor Humboldt State University, Arcata, California
Kim Nelson, Cooperative Unit, Oregon State University, Corvallis, Oregon
Dr. Barry Noon, Professor Colorado State University, Ft. Collins, Colorado
Gary Page, Point Reyes Bird Observatory, Point Reyes, California
Aida Parkinson, Compliance Specialist, RNSP
Lynn Roberts, U.S. Fish and Wildlife Service, Arcata, California
Phil Rovai, Park Ranger, RNSP
Dr. Spencer Sealy, Professor University of Manitoba, Winnipeg, Canada
Terry Spreiter, Supervisory Geologist, RNSP
Gary Strachan, Chief Ranger, Ano Nuevo State Reserve, Pescadero, California
David Suddjian, Murrelet researcher, Capitola, California
Dr. Cynthia Zabel, Research Wildlife Biologist, Redwood Sciences Laboratory, Arcata, CA

XIV. CONTRIBUTORS

Keith Bensen, RNSP Fish and Wildlife Biologist, Developed RNSP's on-going park operations and measures for reducing potential impact to listed species.
Gregory Holm, RNSP Wildlife Biologist, Developed GIS maps for spotted owls and marbled murrelets.
Kristin Schmidt, RNSP Wildlife Biologist, Developed T&E life history/critical habitat accounts.
Judy Wartella, RNSP GIS Specialist, Computed GIS acreages of take, available habitat, and etc. for spotted owl and marbled murrelet species.

XV. PREPARER

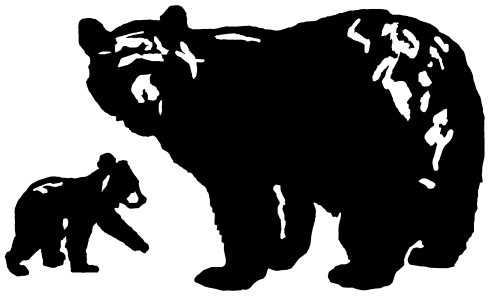
Howard Sakai, Supervisory Ecologist, RNSP

XVI. APPENDICES

Appendix I, Type 1. Bear management signing: picnic table notice for day-use areas

You are in Bear Country!

HUMAN FOOD & GARBAGE CAN
KILL BEARS



Help keep bears wild! Place all trash in dumpsters or bear-proof cans.

If trash cans or dumpsters are not available, please clean up the area and take your trash with you to dispose of properly in another location.

PLEASE DO NOT FEED WILDLIFE

REDWOOD NATIONAL & STATE PARKS

Appendix I, Type 2. Bear management signing: dumpster sticker

YOU ARE IN BEAR COUNTRY!

This dumpster was specifically designed for use in bear country.

Bears and other wildlife:

are attracted to odors of food and garbage around dumpsters.

- **PLACE TRASH INTO DUMPSTER AND CLOSE LID**
- **LIFT BAR AND <u>LATCH</u> WITH CLASP, PIN, OR OTHER DEVICE**
- **DO NOT LEAVE TRASH ON OR OUTSIDE DUMPSTER**

REDWOOD NATIONAL & STATE PARKS

Appendix I, Type 3. Bear management signing: food locker sticker for horse camps

YOU ARE IN BEAR COUNTRY!!

HUMAN **FOOD**
AND GARBAGE
CAN **KILL** BEARS

Always store food, cooking utensils, soap, shampoos, toothpaste, and other odorous items in bear-proof locker.

Temporarily store trash in locker, **then pack it out!**

Store all horse feed (grain, pellets, etc.) in locker.

REDWOOD NATIONAL & STATE PARKS

Appendix I, Type 4. Bear management signing: food locker sticker for backcountry

YOU ARE IN BEAR COUNTRY!!

HUMAN **FOOD**
AND GARBAGE
CAN **KILL** BEARS

Always store food, cooking utensils, soap, shampoos, toothpaste, and other odorous items in bear-proof locker.

Temporarily store trash in locker, **then pack it out!**

REDWOOD NATIONAL & STATE PARKS

Appendix I, Type 5. Bear management signing: picnic table notice for campgrounds

HUMAN FOOD & GARBAGE CAN
KILL BEARS !

Food attractants are the main cause of bear-human conflicts. Bears that learn to depend on human food eventually become aggressive and often have to be killed. Make sure your food, food storage containers, garbage, and other odorous items are properly stored as required by law.

After meals, before leaving camp or sleeping, check to be sure you have a bear-proof campsite :

- All food, ice chests, thermoses, dirty dishes, and cooking utensils must be stored in a bear-proof container or out of view in a closed vehicle or building.
- Treat odorous products such as soap, toothpaste, deodorant, suntan lotion, and perfumes in the same manner as food.

PLEASE DO NOT FEED WILDLIFE

REDWOOD NATIONAL & STATE PARKS

Appendix I, Type 6. Bear management signing: pack out trash sign

Appendix II. Characterizing potential tree suitability for spotted owl and marbled murrelet nesting substrates.

Site: _____ Reason?: _____ Date: _____ Observer(s):

TREE SPECIES	REF. NO.	DBH CLASSES			TREE STATUS: Dead or Live	SIDE CAVITY PRESENT? (Yes or No)	Witches Broom Present? (Y/N)	Broken Top Present? (Y/N)	BrokenTop SuitableFor Nest Placement? (Y/N)	Open Nest (Squirrel/ Raptor) Present? (Y/N)	BRANCH PROFILE:					Suitable for Nesting?		NOTES:
		≤18"	>18" - <32"	≥32"							Branch Diameter Size (>13") Sufficient For Platform? (Y/N)	Overhead Canopy Cover (>80%) Present? (Y/N)	Position relative to trunk? Close, midway, far	Multiple branches forming a platform, with moss mat?	Lichen/ Moss Mass Present? (Y/N)	Spow (Y/N)	Mamu (Y/N)	