

**A Biological Assessment of Impacts to
Terrestrial and Aquatic Threatened and Endangered Species
from Exotic Plant Management in
Redwood National and State Parks (RNSP)**

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I. INTRODUCTION

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

II. CONSULTATION TO DATE

Redwood National and State Parks obtained a list from the Arcata Fish and Wildlife Service Office website, identifying the endangered, threatened, and candidate species that may be present or may be affected by park activities, dated October 27, 2006, (Document Number 221000749-1659). This list included 23 species currently listed as threatened or endangered and four species that are candidates for listing in Humboldt and Del Norte Counties.

Endangered

Western Lily (*Lilium occidentale*)
Beach Layia (*Layia carnosa*)
Tidewater Goby (*Eucyclobius newberryi*)
Leatherback Turtle (*Dermochelys coriacea*)
California Brown Pelican (*Pelecanus occidentalis californicus*)
Short-tailed Albatross (*Phoebastria albatrus*)
Sperm Whale (*Physeter macrocephalus*)
Blue Whale (*Balaenoptera musculus*)
Humpback Whale (*Megaptera novaengliae*)
Fin Whale (*Balaenoptera physalius*)
Sei Whale (*Balaenoptera borealis*)

Threatened

Oregon Silverspot Butterfly (*Speyeria zerene hippolyta*)
California Coastal Chinook Salmon (*Oncorhynchus tshawytscha*)
Northern California Steelhead (*Oncorhynchus mykiss*)
Southern Oregon/ Northern California Coho Salmon (*Oncorhynchus kisutch*)
Green Turtle (*Chelonia mydas*)
Olive Ridley Sea Turtle (*Lepidochelys olivacea*)
Loggerhead Turtle (*Caretta caretta*)
Northern Spotted Owl (*Strix occidentalis caurina*)
Bald Eagle (*Haliaeetus leucocephalus*)
Marbled Murrelet (*Brachyramphus marmoratus*)
Western Snowy Plover (*Charadrius alexandrinus nivosus*)

Steller Sea Lion (*Eumetopias jubatus*)

Candidate

Mardon Skipper (*Polites mardon*)

Xantu's Murrelet (*Synthliboramphus hypoleucus*)

Yellow-billed Cuckoo (*Coccyzus americanus*)

Fisher (*Martes pennanti*)

Critical habitat was designated for nine species on the list. Of the nine critical habitat for four species occurs within the parks. These species are chinook salmon, coho salmon, steelhead, and the marbled murrelet. Marbled murrelet critical habitat occurs in two units; unit CA-02-a includes Jedediah Smith Redwoods and Del Norte Coast Redwoods State Parks and unit CA-02-b includes Prairie Creek Redwoods State Park. Critical habitat for the marbled murrelet does not occur on federal parklands. Critical habitats for the tidewater goby, leatherback turtle, northern spotted owl, western snowy plover, and Steller sea lion are not designated within the parks.

Terrestrial Listed Species and Tidewater Goby

Informal consultation on RNSP's Exotic Plant Management Program was previously completed on two separate occasions. A BA was completed on December 18, 2001 and a Letter of Concurrence (LOC) was issued on February 8, 2002 (Ref. No. 1-14-1999-77). It was determined the projects proposed under the programmatic may affect, but were not likely to adversely affect any threatened or endangered species. An amendment to the 2001 BA was completed on April 12, 2005 and a LOC was received on May 16, 2005. Again the determination for the amended program, which included beachgrass removal using heavy equipment and some other additional removal methods, was may affect, but not likely to adversely affect any listed species. The original BA, including its amendment, expired on December 31, 2006.

Anadromous Fish Species

A biological assessment dated October 14, 1999 evaluating impacts on threatened anadromous fish species from vegetation management program activities, including exotic plant management, was submitted to the National Marine Fisheries Service (NMFS). A Letter of Concurrence was received from NMFS on November 1, 1999 concurring with the BA's determination of "not likely to adversely affect" the listed species. This consultation had a 10 year life span, however, subsequent fish listings, changes to critical habitat designations, and modified program activities triggered a reassessment of the program.

The continuation of the exotic plant management program was discussed at an interagency consultation team (ICT) meeting on May 9, 2006. Most of the project descriptions from the original BAs and amendment would remain essentially unchanged, however, some minor modifications to the original and amended project descriptions were discussed during the ICT meeting. This BA incorporates project descriptions from the original terrestrial and anadromous BAs and the 2005 amendment, and includes an analysis of impacts on both terrestrial species and listed fish species.

III. CURRENT MANAGEMENT DIRECTION

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

Exotic Plant Management

Guidance for exotic plant management in RNSP is outlined in the *Exotic Plant Management Plan and Environmental Assessment* (USDI/NPS 1994). This plan was developed following NPS guidelines for natural resource management and integrated pest management (IPM) procedures (USDI 1991). Both NPS guidelines and direction provided in the California Department of Parks and Recreation's Department Operations Manual (DOM), Natural Resources Chapter 0300, direct the management of populations of exotic plant species, including eradication, wherever such species threaten park resources, and where control is prudent and feasible. Park managers are to take action whenever exotic species interfere with natural processes, the perpetuation of natural or cultural features, or the perpetuation of native species, especially those that are threatened, endangered, or otherwise unique. IPM procedures will be used to determine when to control exotic species and the method of control.

RNSP Management Policy Memorandum No. 98-04 (July 31, 1998) directed park personnel on the procedures for use of pesticides/herbicides within the parks. Additionally, RNSP Standard Operating Procedure #12.01, *Spill Response and Emergency Procedures* and the parks' *Spill Contingency Plan*, provide direction to staff relative to managing hazardous material spills, including pesticides. Herbicide use on state park lands is also subject to DOM Chapter 0700, Pest Control, the CDPR's Pest Control Hand Book, CDPR's Administrative Manual Chapter 1200, the California Code Regulations, Title 3, § 6400, et. Seq., and the Food and Agriculture Code §12003. Taken together, these guidelines identify federal and state laws and regulations governing herbicide use, protection of non-target species, worker safety, storage and disposal of hazardous materials, documentation, and reporting.

Executive Order 13112 of February 3, 1999 outlined federal agency duties relative to actions that may affect the status of invasive species. Section 2(a)(2) of the executive order is particularly relevant. That section states:

- (a) Each federal agency whose actions may affect the status of invasive species shall, to the extent practicable and permitted by law,
 - (1) identify such actions;
 - (2) subject to the availability of appropriations, and within Administration budgetary limits, use relevant programs and authorities to: (i) prevent the introduction of invasive species; (ii) detect and respond rapidly to and control populations of such species in a cost-effective and environmentally sound manner; (iii) monitor invasive species populations accurately and reliably; (iv) provide for restoration of native species and habitat conditions in ecosystems that have been invaded; (v) conduct research on invasive species and develop technologies to prevent introduction and provide for environmentally

sound control of invasive species; and (vi) promote public education on invasive species and the means to address them...

A Memorandum of Understanding (MOU) was signed in September 2000 by numerous local federal, state, and county agencies, and conservation organizations that formalized a cooperative relationship dedicated to effectively managing and coordinating noxious weed programs. Under the MOU the parties mutually agreed to cooperate in the development of a Weed Management Plan, respond to requests for involvement with weed eradication from other signatories, and provide opportunities to other landowners and the public to become involved in weed eradication. A revised version of this MOU was signed in April 2004 by the U.S. Bureau of Land Management, Arcata Field Office; California Department of Fish and Game, Region 1; Humboldt County; California Department of Food and Agriculture; California Department of Parks and Recreation, North Coast Redwoods District; California Department of Transportation, District 1; Del Norte County; Natural Resource Conservation Service; Humboldt County Resource Conservation District; Friends of the Dunes; Humboldt - Del Norte Cattlemen's Association; California Native Plant Society, North Coast Chapter; City of Arcata; Center for Natural Land Management; Manila Community Services District; National Park Service, Redwood National Park; City of Eureka; U.S. Forest Service, Six Rivers National Forest; PALCO; U.S. Fish and Wildlife Service, Humboldt Bay National Wildlife Refuge; UC Cooperative Extension; and the North Coast FOREST Association.

IV. DESCRIPTION OF THE PROPOSED ACTION

Background

The flora of Redwood National and State Parks includes over 200 exotic species, most of which entered the parks and became established within the past 150 years. The term "exotic" is defined as "a species occurring in a given place as a result of direct or indirect, deliberate or accidental actions by humans" (USDI 1991). Many exotic plants are ecologically harmful. They can alter the natural and/or historic scenery and impair the natural function of many native plant communities, thus, exotic plant management is a necessary part of our responsibility to protect our natural heritage (USDI/NPS 1994).

Exotic plant species are found throughout the park, in all vegetation types. The objectives of the exotic plant management program include the following:

- maintain a list of all known exotic plant species within the park and categorize each species as "innocuous," "invasive," or "to be watched";
- determine the species that are priorities for management based on the above categories, distribution, and feasibility of control;
- complete field surveys and develop distribution maps of each exotic species identified as a high priority for control; estimate numbers, population centers, and spreading centers;
- recommend specific control methods for selected species based on knowledge of their biology, ecology, habitat, and economic feasibility of control;

- establish a monitoring system, and consistently monitor populations of invasive and potentially invasive species to determine population growth trends, possible range expansions, and the effectiveness of control programs.

Exotic plants posing major biological/ecological/management threats at the species, community, or ecosystem level and that may significantly alter natural processes are identified as invasive. These species are designated high priorities for management. Species on the watch list are those that may develop community- or ecosystem-level effects if present populations are not controlled, or are known to occur outside but nearby the park. Exotic plant species were automatically categorized as invasive if they posed one of two critical threats: 1) they have the ability to displace rare, endangered, threatened, or sensitive species, or 2) they have the ability to cross-pollinate and produce viable offspring with native species. Exotic species are not always controlled in native plant communities if they do not obviously alter ecosystem functions, or are widespread throughout the region and would be impractical to control due to constant reintroduction from surrounding lands.

The number of exotic species and dominance by exotics varies widely by vegetation type within RNSP. In 1994, less than 1% of the plant cover within old growth redwood forests was from exotic species. In the Bald Hills prairies 50-75% of the plant cover was due to exotic species. RNSP staff set priorities for management of exotics that are dependent upon two independent factors:

- degree and kind of biological, ecological, economic, or health threat;
- cost and expectation of control, based on current distribution.

The exotic plant manager uses the most recent, scientifically based knowledge of the biology of exotic plant species and networks with others regionally in order to be effective at managing exotic species. The strategic approach to exotic plant management is included as Appendix A.

During the five year period between 2002 and 2006 several exotic plant management projects tiered to the previous programmatic BA were successfully completed at several high-priority sites, and significant progress toward control was made at others. Park staff have nearly eradicated the following species from certain high priority sites, and these sites currently require only minor annual hand control of re-sprouts and seedlings:

- English ivy – 100 acres of dense English ivy were cleared out of old-growth redwood stands by hand between 2001 and 2003. Additional smaller sites also were controlled in several areas.
- Silver wattle (acacia) – Dense infestations along the Smith River at Hiouchi Flat were treated with glyphosate (Aquamaster) using the “drill and fill” method of direct application. Nearly all of the mature trees in these infestations were killed.
- Scotch broom – major infestations in the Bald Hills prairies were controlled by hand over the course of many years. Additional large infestations of mature individuals on Orick Hill and in Hiouchi Flat were pulled by hand in 2005-2006.
- Cape ivy – Controlled in several locations including Davison Ranch and Wilson Creek and nearly eradicated at Requa.

- Periwinkle – very dense patches of periwinkle in two locations have been covered with tarps and treated by hand pulling for two years.
- Spotted knapweed – A small infestation of this California Department of Food and Agriculture Class A noxious weed was pulled repeatedly and has not been seen in the park for at least three years.

Significant progress has been made toward treating the following species at certain high priority sites:

- Jubata grass- ongoing mechanical removal in the Redwood Creek estuary area.
- European beachgrass – more than 18 ac of European beachgrass were removed by hand pulling and by the use of heavy equipment at the Ossagon section of Gold Bluffs Beach. Funding for this project continues into 2007 with an ultimate treatment goal of 15 acres.
- Harding grass – Chemical control was initiated in 2006 and approximately 20% of the infestation was treated.

Exotic Plant Control

The exotic plant control program discussed in this assessment will be implemented over the next five years, beginning in early 2007 through 2011. Control activities may occur year round, but would be seasonally restricted where necessary to protect threatened and endangered species or their habitats (see “Measures to Minimize Impacts” below) or to protect other sensitive resources. Treatment of exotic plants generally occurs in small areas throughout the National and State Park complex and new locations are likely to be discovered and treated each year. Total acres to be treated under the different treatment methods described below are difficult to estimate and will vary over time. At present we estimate < 200 ac (81 ha), from the Redwood Creek estuary north to Carruther’s Cove and at Enderts Beach, are occupied by European beachgrass (*Ammophila arenaria*). Scotch broom (*Cytisus scoparius*) occurs on over 70 ac (28 ha) of prairie in the Bald Hills area. Canada and bull thistle (*Cirsium arvense* and *C. vulgare*) occur on approximately 80 ac (32 ha) at Gold Bluffs Beach along the access road, in the campground and day use areas, and have also spread into wetlands. Canada thistle also occurs sporadically over the 123 ac (50 ha) of Boyes Prairie at Prairie Creek Redwoods State Park, primarily in wet areas. Thistles also occur extensively around the former “South Operations Center” (old SOC). Approximately 60 ac (24 ha) in the Bald Hills prairies are occupied by Harding grass (*Phalaris aquatica*). English ivy (*Hedera helix*) has infested over 100 ac (40 ha) in Jedediah Smith Redwoods State Park and the nearby Hiouchi area of the national park. About 5 ac (2 ha) of silver wattle (*Acacia dealbata*) occurs around Hiouchi. Tansy ragwort occurs sporadically throughout approximately 280 ac (113 ha) of coastal prairie around Enderts Beach Road. Although many of these infestations have been treated in the past, successful control relies upon many years of re-treatment. Reed canary grass (*Phalaris arundinacea*) forms extensive dense mats in the wetland and aquatic environments of Prairie Creek, Davison Ranch, Elk Meadow Day Use Area and the Redwood Creek estuary where it may be impacting anadromous fish rearing habitat. Given the extent of the various exotic species infestations within the park, and based on the level of accomplishment in the previous five years, it is unlikely that all the acres identified above will be treated during the life of this BA, although this would be the desirable outcome.

When known, locations of exotic plant infestations and methods proposed for control are stated in the treatment method sections below. However, it is difficult to describe all of the locations in need of exotic plant management in the park. Exotic plants occur in many locations and invade new sites regularly making it difficult to detail all of the sites in need of management. The locations currently proposed for actions within the next 5 years include, but are not limited to, the following:

Hiouchi Visitor Center and adjacent areas
Hiouchi Flat
Jedediah Smith Redwoods State Park including Jedediah Smith Campground
Camp Lincoln (a park residence in JSRSP)
Templeman Grove (Jed Smith)
Walker Road (Jed Smith)
Howland Hill Outdoor School
Aubell (North Operations Center)
Crescent Beach area
Crescent Beach Educational Center (CBEC)
Enderts Beach Road area
Enderts Beach
Nickel Creek Campground
Wilson Creek Hostel
Redwood Creek estuary to Carruther's Cove, including Gold Bluffs Beach area
Gold Bluffs Beach access road
Boyes Prairie (PCRSP)
Davison Ranch
Redwood Creek Trailhead
Tall Trees Access Road
Bald Hills (prairies and oak woodlands)
Bald Hills Road
Old South Operations Center (SOC)
Freshwater Spit
Kuchel Visitor Center

A variety of methods have been identified as feasible for controlling or eliminating exotic plants from an area. The methods used will depend on the biology of the exotic species, degree of effectiveness, cost, and consideration of threatened, endangered, or sensitive species (individuals or habitats) that may occur in the vicinity of an infested area. An adaptive management strategy that employs feedback information from monitoring previous control efforts also will be used to help determine choice of control methods. Following Integrated Pest Management (IPM) guidelines, one or a combination of methods may be used to control an exotic plant species.

Mechanical Control with Heavy Equipment

Heavy equipment including excavators, bulldozers, and backhoes would be used in areas where exotic plant densities are high, native species are few or insignificant, impacts to other natural or

cultural resources from use of heavy equipment would be negligible, and manual removal is not feasible.

At developed sites and along roads, a backhoe would remain on a hardened or disturbed surface during exotic plant excavation. Species that could be removed in this way include cotoneaster (*Cotoneaster franchetti* and *C. pannosa*), English holly (*Ilex aquifolium*), jubata grass (*Cortaderia jubata*), Scotch broom, and French broom (*Genista monspessulana*). An excavator or a backhoe also would be used to remove pole-sized black locust (*Robinia pseudacacia*) from approximately 100 ft (30 m) of road cut bank along Bald Hills Road at Counts Hill prairie. The treated cut bank would be mulched with either locally collected straw from the prairies or certified weed-free alfalfa hay. The cut bank would be allowed to revegetate naturally.

Excavators would be used to dig up and then bury European beachgrass to continue restoration of Gold Bluffs Beach in areas heavily infested with this species. If necessary, driftwood logs would be moved to access grass clumps. After being dug up, the beachgrass would be buried on the beach in between infested areas, to a depth of 3 m (9 ft), and covered with a 1.5 m deep cap of pure sand. Trenches excavated for beachgrass burial would be filled before they could be potentially reached by incoming tides. Weather and tides would be monitored closely to ensure movement and storage of equipment is safe. Transects would be placed to monitor beach elevations, changes in vegetation composition, and resprouting of exotic beachgrass. Resprouts would be dug by hand or burned with a hand-held propane torch. The area affected by this activity would include the sandy beach between the mean high tide line and the base of the bluffs, anywhere along the length of Gold Bluffs Beach heavily infested with this species.

Regardless of the method used for exotic plant removal (mechanical or otherwise), a backhoe or loader and dump truck may be used to load and transport large amounts of exotic plant material to an appropriate burn or disposal site.

The Waipuna™ Organic Hot Foam system would be used to control a variety of different species including Scotch broom, French broom, periwinkle (*Vinca major*), creeping St. John's wort (*Hypericum calycinum*), giant knotweed (*Polygonum sacalinense*), and Herb Robert (*Geranium robertium*). It would be tested on Canada thistle along Gold Bluffs Beach Road and at Boyes Prairie. Currently Hiouchi Flat, Davison Ranch, and Bald Hills Road have exotics targeted for treatment with the Waipuna. This method involves the use of a diesel-powered boiler and foam generator to deliver hot water with a foam surfactant to target weeds via a supply hose and a treatment wand. The foam consists of non-toxic plant extract from corn and coconut sugar. The boiler and generator are housed in a single unit and transported to the treatment site on the back of a truck. The gas tank holds five gallons of diesel, enough fuel to operate the machine for three days. Due to the limited length of supply hose the hot foam method can only be used for treating exotic plants within 200 ft (60 m) of a road.

Mechanical Control with Power Tools

Power tools including chainsaws, weed whackers, mowers, wood chippers, and vehicle winches would be used where appropriate.

Chainsaws or other power tools may be used to remove thickets of Himalayan blackberry (*Rubus discolor*), jubata grass, or cotoneaster. A chainsaw, weed-eater, or other hand tool would be used to cut back the saw-toothed leaves of jubata grass and permit access to the roots.

Manual Control

Shovels, pulaskis, loppers, weed wrenches, grip hoists, and machetes would be used to manually remove herbaceous and shallow-rooted exotic species.

European beachgrass, along with jubata or pampas grass, would be manually removed between the Redwood Creek estuary and Mussel Point and along Gold Bluffs Beach outside those areas requiring treatment with heavy equipment, or where sensitive plant species, i.e., pink sand verbena (*Abronia umbellata* ssp. *breviflora*) is present. The beachgrass would be manually dug up with shovels and rhizomes would be severed at a depth of about 8 inches. If necessary, driftwood logs would be manually moved to access individual grass clumps. Resprouting is most vigorous the first season after digging, therefore, crews would return to pull, dig, or burn resprouts as needed during the first season. Crews would return as needed in the second and third seasons after digging to continue pulling resprouts. It is estimated that at least three years would be necessary to completely eradicate European beachgrass at any site using manual control methods.

In addition to European beachgrass, a mint (*Mentha x piperita*), and Dalmatian toadflax (*Linaria genistifolia* ssp. *dalmatica*) would be manually treated (dug) where it occurs between Ossagon Creek and Carruther's Cove. Also, jubata grass clumps would be dug up with shovels and/or pulaskis where heavy equipment could not be used. This work would begin in the spring when the ground is soft and plants are non-reproductive. Plants growing in sandy substrates (dunes versus bluffs) may also be dug out in early summer. Plants located along the bluffs would be removed on non-rainy days when soils are likely to be most stable. Detached plants would be turned upside down and left on site to decompose. Annual spring visits would be made to hand pull new seedlings.

Follow-up treatment of European beachgrass would occur at Freshwater Spit, where a large removal project occurred several years ago. Crews on foot would pull resprouts by hand, with use of a shovel where necessary. A number of other exotic species also would be removed by hand pulling or with hand tools at Freshwater spit including ice plant (*Carpobrotus chilensis*), yellow bush lupine (*Lupinus arboreus*), and Himalayan blackberry.

Burning is another manual control method that would be used to control silver wattle (*Acacia dealbata*) sprouts at Hiouchi Flat and a variety of species including Scotch broom, French broom, periwinkle, creeping St. John's wort, giant knotweed, and Herb Robert at various locations in the park, European beachgrass resprouts at Gold Bluffs Beach, and periwinkle at Lyon's Ranch/Coyote Creek. Burning involves using a gas torch to pass intense heat over the leafy parts of a plant. The heat causes the cell walls to burst, killing the plant. A backpack housing a propane tank and a gas vapor torch is used to apply the flame; this method is effective

at controlling resprouts and seedlings. It is used when the ground and vegetation are too wet to carry fire.

English ivy would be removed manually from within old-growth redwood forest, primarily in Jedediah Smith Redwoods State Park. Ivy plants are severed with a machete at the base of a tree, or pulled from the ground by hand. Ivy may be removed from a site, or left on trees to decay.

Reed canary grass would be controlled by manual removal or strategic planting of native overstory tree species to shade it out. If these methods prove unsuccessful, in the future chemical control may be considered under a separate BA.

Tansy ragwort (*Senecio jacobaea*) would be dug and pulled manually from the area around CBEC, Ender's Beach, and the Bald Hills.

Areas where bare ground has been exposed after exotic plant removal by digging or hand-pulling would be covered with thatch consisting of dried grass stems and seeds gathered by hand from the adjacent area. This is to ensure that exotic plants, either the same or different species do not colonize the bare soil, providing an opportunity for native species to fill in the disturbed site.

Cultural Control

Heavy equipment would be cleaned thoroughly and inspected before being used in a vulnerable ecosystem, such as the Bald Hills, to prevent introduction of exotic plants. Details of the exotic plant management program will be provided to the public and RNSP staff using printed material, displays, and interpretive programs in order to help limit the spread of exotics to and from park lands.

Biological Control

The only type of biological control proposed would be the collection and use of Klamath beetles (*Chrysolina quadrigemina*) to control klamathweed (*Hypericum perforatum*) at Gan's Prairie. Beetles would be collected with nets in June and July from roadside klamathweed along Bald Hills Road. These beetles are species-specific biological control agents, affecting klamathweed only. *Chrysolina* larvae mine directly from the eggs into the leaves, causing eventual foliage and plant death. In areas where the beetles are established, they have been found to be >90% effective in killing adult plants.

Chemical Control

Herbicides would be considered for control of high-priority invasive species, but only when all other control techniques (mechanical, manual, cultural, and biological) were considered ineffective, or not feasible. To the extent practicable, herbicides would be used only as a last resort. If chemical control is determined to be necessary, U.S. Environmental Protection Agency (EPA)-registered chemical herbicides may be approved for use. All proposals for herbicide use in the NPS must go through a review and approval process that includes the parks' IPM coordinator and regional IPM coordinator. If approved, herbicide use would be conducted in compliance with NPS IPM guidelines (e.g., USDI 1991) and CDPR state manuals and

regulations (see Section III above). Herbicides would be applied under the direction of Certified Pesticide Applicators on staff at RNSP or other qualified NPS or CDPR personnel.

Herbicides may be the only way to effectively control Canada thistle, silver wattle, ornamental cherry (*Prunus* spp.), Cape ivy (*Delairea odorata*), and black locust. Also, where exotic plants such as jubata grass have invaded steep slopes, hand application of herbicides may be more effective, cause less soil erosion, and be a safer method than hand removal. Spot application that most effectively targets individual plants and prevents drift would be used to apply herbicides in both upland and riparian areas. One spot application method involves using a backpack sprayer with an adjustable nozzle that allows a stream or coarse spray to be applied to individual plants. This method may be used to control Canada thistle, jubata grass, or cliff-dwelling exotics. In the Bald Hills, Harding grass, Canada thistle, and teasel (*Dipsacus fullonum*) would be controlled by this method. Another form of spot herbicide application is via paint brush or sponge used to treat the cut stump of a tree, such as black locust or cherry. In upland and riparian areas near Hiouchi, herbicide would be used to control silver wattle by squirting it directly into holes drilled into the trunks or by foliar application to seedlings and resprouts.

The predominant need for herbicide use in upland areas is to control Harding grass in the Bald Hills. Prescribed fire is not effective for controlling this species and although hand-pulling or digging may effectively remove young plants, once the grass is established, hand-pulling becomes very difficult and creates a great deal of ground disturbance, including potential disturbance of numerous pre-historical and historical cultural resource sites. Using an herbicide will control Harding grass while minimizing ground disturbance.

Herbicides may be used to control European beachgrass at Gold Bluffs Beach and to control other exotic plants in difficult-to-access bluffs and cliffs wherever these occur in the park. Herbicides also may be used along the Gold Bluffs Beach access road. With the exception of Gold Bluffs Beach, application of herbicides at beach bluffs would be away from the sandy beach and/or dunes.

Under this BA, park staff are proposing the use of three herbicides, glyphosate in the form of Aquamaster, aminopyralid in the form of Milestone, and triclopyr in the form of Garlon 4. Use of any other herbicides would require a separate, or reinitiation of, consultation.

Glyphosate (Aquamaster)

“Aquamaster” is Monsanto’s trade name for the glyphosate compound that has been approved by the EPA for use in aquatic environments. Aquamaster has been used in RNSP for all glyphosate applications, including at upland sites, in order to err on the side of safety to the aquatic environment. Glyphosate is a non-selective herbicide that kills plants by inhibiting the formation of amino acids tyrosine, tryptophan and phenylalanine, all of which are necessary for protein formation in susceptible plants. While animals need these amino acids, they obtain them by ingesting plants or other animals; this makes glyphosate relatively non-toxic to animals. Glyphosate binds tightly to soil particles and tends to remain within the top six inches of soil, making it unlikely to end up in surface or sub-surface runoff except by direct soil erosion. If it does run off it remains bound to soil particles and unavailable to fish and aquatic invertebrates.

Glyphosate is short lived in the environment. According to the EPA (Patterson 2004) under aerobic soil conditions glyphosate degrades to aminomethyl phosphoric acid (AMPA) with a half life of 1.85-2.06 days, which then degrades into carbon dioxide. The principal degradation mechanism is microbial metabolism, as glyphosate is stable in terms of hydrolysis and photo degradation.

Glyphosate has been well-studied relative to its toxicity to fish and other animals. As a result of the low-levels of toxicity detected in studies, the EPA has labeled it as “practically non-toxic” to fish and aquatic invertebrates. When used according to the manufacturer’s label, it was determined “not likely to adversely affect” threatened and endangered salmon and steelhead by the EPA’s Office of Pesticide Programs (Patterson 2004).

Silver wattle, bird cherry, and other exotic plants in riparian areas that do not respond to mechanical or manual control methods would be considered for treatment with Aquamaster. Park staff have already effectively controlled more than 85% of the silver wattle in the Hiouchi Flat area with Aquamaster since 2001, with just a small number of trees and resprouts remaining to be retreated.

Giant knotweed forms large mats of 10 foot tall (or greater) canes connected by extensive, vigorous rhizomatous root structures. Hand removal of large patches of this species is virtually impossible, as the rhizomes are stout and tenacious and any piece left remaining in the soil will re-sprout. This species would be treated by direct application of herbicide (see below). At this time there is only one known patch of this species in the park, at Hiouchi Flat.

Glyphosate application methods

Direct application

Much of the park’s use of glyphosate would involve direct application of the herbicide onto a plant, either by dabbing or painting it directly on to a cut surface, or by injecting it directly into a drilled hole in a woody stem or cane with a specialized needle, where it is then transported through the phloem into the plant’s root system. Because surfactants are intended to allow the herbicide to penetrate the waxy cuticle, they are not needed when applying Aquamaster directly to a cut surface. Hiouchi Flat is the primary location where glyphosate is proposed for use by direct application.

Foliar application

Foliar application would be considered for control of grasses and some broadleaf woody and non-woody species (e.g., Harding grass, Himalayan blackberry) in various locations. Under the circumstances where glyphosate would be applied via foliar spray, a non-ionic surfactant also approved for use by the EPA, would necessarily be added to enable the glyphosate to penetrate the plant’s waxy cuticle. When Aquamaster is applied to foliage, it is applied directly to each individual plant using a backpack sprayer with the spray nozzle set to produce a coarse spray or stream rather than a fine spray or mist, minimizing the potential for drift. Spraying is only conducted when wind is minimal or absent, and when imminent rainfall is not expected. In the case of foliar application, some contact with soil is inevitable; however, given the localized

nature of the application method, there would be minimal opportunities for the herbicide to reach surface water. Aquamaster was used in the Bald Hills in 2006 to control Harding grass. Approximately 0.9 gal/ac of this herbicide was used in 8 ac consisting of small disjunct patches spread throughout a 25 ac area. By contrast, the EPA maximum allowable use for Aquamaster is 2.0 gallons per acre per year.

Glyphosate Use at Gold Bluffs Beach

In 2005 and 2006 a control project was initiated in the Carruther's Cove area of Gold Bluffs Beach that used mechanical methods (heavy equipment) to dig up and bury 18 ac (7 ha) of exotic European beachgrass, complemented by hand removal in sensitive areas and for follow-up treatment. These combined methods proved effective, however, the unit cost per acre may make implementation of these methods over a large area prohibitively expensive. Although appropriate in small areas of infestation, hand-pulling is a slow, even more costly process. Therefore, an alternative method that involves prescribed burning followed by herbicide application is being proposed.

This method would be tested as a pilot project in the area of Espa Creek in the southern section of Gold Bluffs Beach, easily accessed from Gold Bluffs Beach Road. Conducting a pilot project would ensure the treatment is effective prior to developing a more logistically complex project in more remote sections of beach. Up to 15 ac (6 ha) of beachgrass may be included in the pilot project area. If this form of treatment proves successful additional acres would be treated adjacent to the Carruther's Cove project area to increase the contiguous area of restored beach habitat at that location. If sufficient funding is obtained to continue heavy equipment removal, with prescribed burning as a pre-treatment, herbicide may be used only as a follow up treatment for resprouts in areas where heavy equipment could not effectively operate and sensitive resources will not be affected.

Because the majority of the plant biomass in established stands of European beachgrass is dead, its removal through broadcast burning greatly reduces the work required to eliminate it, increasing the efficacy of both hand and herbicide techniques. Burning reduces both the amount of herbicide needed and stimulates regrowth, causing the plant to absorb more of the herbicide and increasing mortality.

Burning would be conducted in the summer or fall. Natural breaks in vegetation would be used for control lines where possible; where this is not possible vegetation would be cleared to a width acceptable to the burn boss (a 5-meter swath created by hand digging was sufficient in a similar project at Sunset Beach State Park). Sensitive resources would be excluded from the burn (e.g., wetlands and streams, rare plants, archeological sites). Flame lengths would range up to 8 ft above the median height of the vegetation to maintain adequate control. The rate of spread would not exceed 30 ft per minute. A burn plan would be developed specifically for conditions under which burning could occur at Gold Bluffs Beach, including relative humidity, air temperature, wind speed, and wind direction parameters.

Equipment use for burning would include one 4-wheel drive pickup with a slip-on water tank

parked close to the burn area, drip torches, and hand tools including McLeods, shovels, pulaskis and rakes. A second vehicle with a slip-on water tank would be parked on the waveslope. A water tender or Type III engine would remain on Gold Bluffs Beach Road as a precaution in the event of an emergency due to a change in environmental conditions during the burn. In more remote areas of the beach, i.e., beyond the terminus of Gold Bluffs Beach Road, a 1,000 gal folda-tank would be transported and left on site as a precaution in lieu of the water tender or larger engine.

After the beachgrass is burned it would be allowed to grow to a height of at least 12 inches. Glyphosate with a non-ionic surfactant and dye (to ensure complete coverage) would be applied by one or two Certified Pesticide Applicators using a backpack sprayer in accordance with directions on the manufacturer's label and under low wind conditions. Herbicide application could occur any time of year once the beachgrass had attained the minimum 12 inch height, however, herbicide use would be terminated if necessary to protect the western snowy plover (see "Measures to Minimize Impacts on Listed Species" below). In areas where beachgrass is growing with native plants, applicators would be trained in the identification of those native plants easily confused with exotic beachgrass, thus avoiding all native plants during the herbicide application.

Aminopyralid (Milestone)

"Milestone" is Dow Agrosience's trade name for an aminopyralid compound that has been approved by the EPA under its "Reduced Risk Initiative" for use in upland habitats, seasonally dry wetlands, and "transitional" areas between upland and lowland sites. Aminopyralid is a growth regulator herbicide that mimics the action of auxin, a growth regulator found in all plants. Aminopyralid disrupts physiological processes related to the binding of auxin receptors which results in plant death in species that are sensitive to it. It is relatively immobile in soil and has a half life of 30 days. It is not approved for use in aquatic environments with standing surface water. The EPA has classified it as "non-toxic" to fish and "practically non-toxic" to birds.

Milestone is a semi-selective herbicide that does not kill most grasses, but targets annual and perennial broad leafed plants which makes it preferable for use in rangeland and grassland environments. In terms of environmental risks, aminopyralid has a few significant advantages over other products used in similar settings. It is used at lower rates (a maximum of 7 oz per acre versus 2 gal per acre for glyphosate), and is relatively immobile in soil, with most of the chemical remaining within the upper 12" of the soil profile. Products containing aminopyralid can not be applied directly to water, but can be used to treat banks of ditches or other channels that do not carry water used for irrigation or drinking (Hartzler 2006).

Although it is relatively new on the market, and only approved for use in California in October 2006, it appears to be a good weed control option for several reasons: it is lower in toxicity than glyphosate, it is effective at much lower application rates than glyphosate, it is selective and specific to some high priority species such as Canada thistle, teasel, and the knapweeds, and residual activity allows it to remain active for a longer duration after application. Because it is relatively new, it would first be used experimentally to determine its effectiveness.

Milestone application methods

Foliar application

Milestone would be applied by foliar application on broadleaved weeds such as Canada thistle and teasel in various upland locations, and along coastal bluffs. A non-ionic surfactant approved for use by the EPA would necessarily be added to enable the aminopyralid to penetrate the plant's waxy cuticle. When Milestone is applied to foliage, it would be applied directly to each individual plant using a backpack sprayer with the spray nozzle set to produce a coarse stream rather than a spray, minimizing the potential for drift. Spraying would only be conducted when wind is minimal or absent, and when imminent rainfall is not expected. In the case of foliar application, some contact with soil is inevitable; however, given the localized nature of the application method, there would be minimal opportunities for the herbicide to reach surface water.

Aquamaster and Milestone Annual Use Limits

Proposed use limits were determined by considering the extent of exotic plant infestations in various locations within the park and considering the likelihood of herbicide contacting surface water in those locations. Park staff propose to base annual herbicide usage on the type of area (watershed, uplands, coastal bluffs) where treatments would occur rather than impose park-wide limits (see Table 1), and have considered the number of acres that can be treated during a given time period using localized applications without causing damage to other resources. A maximum of 10 ac would be treated with Aquamaster in each of two riparian habitat types (small riparian and large riparian) annually, with foliar application in some habitats further restricted. Riparian zones were defined as 300 ft (91 m) either side of a perennial stream (whether fish-bearing or not) and 150 ft (46 m) either side of an intermittent stream. A maximum of 10 ac per coastal bluff area (bluffs backing Mussel Beach, Gold Bluffs Beach north of Espa Creek, Gold Bluffs Beach south of Espa, and Endert's Beach) would be treated annually with either Aquamaster or Milestone.

A maximum of 30 ac would be treated with either Aquamaster or Milestone in the Bald Hills annually, in upland areas outside of riparian zones. There would be no set limit on the amount of herbicide use on Gold Bluffs Beach. Instead, herbicide use would be governed by the feasibility of treating an area, e.g., based on access or other natural or logistical limitations.

Table 1. Proposed annual use limits for glyphosate (Aquamaster) and aminopyralid (Milestone) by habitat type.

Habitat Type	Direct Application (paint, swab, injection)	Foliar Application (coarse spray or stream setting)	Not to exceed in combination
Glyphosate			
Small Riparian Watershed (e.g. Prairie Cr., Wilson Cr., Espa Lagoon, Lagoon Cr.)	10 ac	2 ac	10 ac
Large Riparian – Redwood Creek and Smith River	10 ac	5 ac	10 ac
Subtotal Maximum Use-	20 ac	7 ac	20 ac

Riparian			
Glyphosate or Aminopyralid			
Coastal Bluff (backing Mussel, Gold Bluffs N., Gold Bluffs S., and Enderts Beach)	40 ac (10 ac per beach bluff x 4)	40 ac (10 ac per beach bluff x 4)	40 ac (10 ac per beach bluff)
Upland (Bald Hills)	30 ac	30 ac	30 ac
Maximum Possible Use	90 ac (36.4 ha)	77 ac (31.2 ha)	90 ac (36.4 ha)

Triclopyr butoxyethyl ester- “triclopyr BEE” (Garlon 4)

“Garlon 4” is Dow Agrosiences’ trade name for triclopyr butoxyethyl ester (“triclopyr BEE”, not to be confused with Garlon 3A, a triethylamine salt with different properties). Garlon 4 is a selective, systemic herbicide that kills woody species by mimicking plant growth hormones then initiating rapid, poorly regulated cell growth, culminating in the death of the treated plant. It is commonly used in agricultural settings for control of brush and other undesirable woody species and does not affect grasses (Tu et al. 2001).

Within plants and in the soil, triclopyr BEE rapidly breaks down to triclopyr acid through microbial activity and photolysis (decomposition by sunlight), often within hours. Triclopyr acid has been deemed by the EPA to be “practically non-toxic” to freshwater fish, invertebrates, birds and small mammals. The average half life of triclopyr acid is 30 days, depending on environmental conditions such as temperature, light and soil pH (warmer, moister and less acidic soils allow for faster microbial breakdown). Triclopyr BEE is not water soluble; it adsorbs to soil and sediment particles and can be persistent in aquatic environments (Tu et al. 2001). Garlon 4 is not approved for use in aquatic environments, therefore, use would be restricted to a few very specific upland locations in the Bald Hills, well away from any perennial water sources and only in the early, dry summer season when rain is not anticipated.

Garlon 4 would be used to control Himalayan blackberry under very limited circumstances and locations, to reduce the potential for spot fires and other safety concerns during prescribed fire operations. Himalayan blackberry foliage is highly volatile. Past experience has shown that when thickets are burned during fall prescribed burns, they tend to flare up and create intense fire behavior. When thickets are located on a road or adjacent to another fire line, flare-ups have resulted in the ignition of spot fires outside of the burn unit. In some cases, these spot fires can end up on private property and in other cases they end up in unburned areas in the park with heavier fuels, creating a threat of wildfire. Control of Himalayan blackberry would be by other methods not involving herbicide when those methods are deemed effective.

Pre-burn Mowing

In some locations the Himalayan blackberry is mowed as part of the prescribed fire burn preparation. This is effective where:

- the thickets are less than 8’ from the road
- the slope is relatively flat and low.

Locations that do not lend themselves to mowing include thickets that are:

- too far away from the road for the mower to reach, but close enough to the fire line to send flaming material out of the burn unit, or
- located on steep slopes, or
- growing in gullies or ravines.

Application of Herbicide

For those limited areas which cannot be mowed (approximately 4 ac total), control options include hand grubbing and the application of herbicide. Eradication of Himalayan blackberry without the use of herbicides requires initial grubbing out of the root crowns, followed by years of hand removal. Grubbing and digging in the prairies is largely prohibited due to sensitive archeological site constraints. There are also concerns about potential erosion if grubbing and digging is used at the sites with steep slopes and gullies. Hand grubbing is often not entirely successful.

Park staff would use a foliar spray application of Garlon 4 on Himalayan blackberry under limited circumstances. Garlon 4 is preferable to glyphosate for several reasons.

- It is specific to broadleaf species and would not kill the underlying grasses and herbaceous species. Glyphosate is non-specific and will kill grasses and herbs as well creating an ecological ‘void,’ that encourages re-invasion by weeds.
- Because Garlon 4 is specific to broadleaved species, it has a higher likelihood of killing the plants after the first application. It is likely that several applications of glyphosate would be required to achieve the same result as one application of Garlon 4, resulting in a greater amount of herbicide use. In addition, maintaining cover of grasses keeps invading weeds out through competition.

Approximately 4 ac in total would be treated incrementally over the five years of this BA as each prescribed burn unit was scheduled to be burned.

Methods Summary

The following table summarizes the various exotic plant treatment methods to be used, the target exotic plant species for each method, and the known locations where the methods will be applied. Note that as new infestations are discovered new locations may be added to the list under this programmatic.

Table 2. Control methods, species that may be removed by each method, and locations identified where this could occur within Redwood National & State Parks

Control Method	Exotic Plant Species That May Be Removed	Location Where One or More Exotic Species May Be Removed - (north to south)
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Control Method	Exotic Plant Species That May Be Removed	Location Where One or More Exotic Species May Be Removed - (north to south)
Heavy Equipment	Black locust Canada thistle Cotoneaster English holly European Beachgrass French broom Himalayan blackberry Jubata (or pampas) grass Ornamental cherry Scotch broom Silver wattle	Hiouchi Visitor Center Hiouchi Flat Jedediah Smith RSP Walker Road Camp Lincoln Aubell Howland Hill Outdoor School CBEC Wilson Creek Hostel Gold Bluffs Beach Boyes Prairie Davison Ranch Redwood Creek Trailhead Tall Trees Access Road Bald Hills Road
Power Tools	Bull thistle Canada thistle Cape ivy Creeping St. John's wort English holly French broom Giant knotweed Himalayan blackberry Jubata grass Periwinkle Scotch broom	Hiouchi Visitor Center Hiouchi Flat Hiouchi Gauging Station Jedediah Smith RSP Walker Road Camp Lincoln Aubell Howland Hill Outdoor School Crescent Beach CBEC Nickel Creek Campground Wilson Creek Hostel Gold Bluffs Beach Davison Ranch Redwood Creek Estuary Tall Trees Access Road Bald Hills Prairies Redwood Creek Trailhead

Control Method	Exotic Plant Species That May Be Removed	Location Where One or More Exotic Species May Be Removed - (north to south)
Hand Tools	Creeping St. John's wort Dalmatian toadflax English Ivy European beachgrass French Broom Giant Knotweed Herb Robert Himalayan blackberry Ice plant Jubata grass Klamath weed Periwinkle Scotch Broom Silver wattle Spanish heath (<i>Erica lusitanica</i>) Tansy ragwort White sweet clover (<i>Melilotus alba</i>) Yellow bush lupine Teasel	Hiouchi Flat Hiouchi Gauging Station Jedediah Smith RSP Camp Lincoln Enderts Beach Road CBEC Davison Ranch Gold Bluffs Beach Redwood Creek estuary to Mussel Point Freshwater Spit Kuchel Visitor Ctr Bald Hills/ Bald Hills Road Lyon's Ranch/Coyote Creek
Chemical Control- glyphosate	Black locust Bull thistle Canada thistle Cotoneaster Eucalyptus European beachgrass Giant knotweed Harding grass Himalayan blackberry Jubata grass Milk thistle (<i>Silybum marianum</i>) Ornamental cherry Periwinkle Silver wattle Spotted knapweed (<i>Centaurea maculosa</i>) Tall oat grass Teasel	Hiouchi Visitor Center Hiouchi Flat Hiouchi Gauging Station Jed Smith RSP CBEC Enderts Beach Road Davison Ranch All beach bluff areas Gold Bluffs Beach Gold Bluffs Beach Access Road Bald Hills prairies and oak woodlands Bald Hills Road Tall Trees Access Road Freshwater Spit
Chemical Control- triclopyr	Bull thistle Canada thistle Himalayan blackberry	Bald Hills - specific locations along roads and firelines

Control Method	Exotic Plant Species That May Be Removed	Location Where One or More Exotic Species May Be Removed - (north to south)
Chemical Control- aminopyralid	Canada thistle Milk thistle Spotted knapweed Teasel Yellow star thistle	Hiouchi Flat Jed Smith RSP CBEC Enderts Beach Road Gold Bluffs Beach Access Road Bald Hills prairies and oak woodlands Bald Hills Road Tall Trees Access Road
Biological Control	Klamathweed	Bald Hills Prairies

Inter-related and Interdependent Activities

Access

Vehicle access to exotic plant removal sites would either be via existing service roads or, for projects on the beach, the wave slope. Vehicles accessing the beach would enter at the designated access point, drive as low on the wave slope as possible until reaching the site, avoid the wrack line, and be limited to 5 mph or the minimal speed required to prevent becoming stuck in sand, but never exceeding a speed of 20 mph. On the beach, from one to three pickup trucks may be used to transport crews, equipment, and fuel to a work site. Under normal circumstances there would be one round trip with vehicles to and from a work site per day. With the exception of burning beach grass, where a pickup with a water tank would need to be close to the work site (e.g., on the upper beach or in the dunes), vehicles would remain on the wave slope during plant management operations. Vehicle fueling and maintenance would be conducted away from the coastal environment unless an emergency situation occurred.

Heavy equipment required for exotic plant removal would be moved in at the beginning of a project and expected to remain at the removal site until the project is completed. The equipment operator, project leader, and crews would make one round trip daily to and from a work site. On the beach, heavy equipment would be walked to and from the work site along the wave slope and would remain on site during duration of the project. The excavator and bulldozer would be fueled weekly on the beach; spill equipment and spill plan would be present and in place (see “Hazard Materials Treatment” below).

Disposal

Some of the actions described in this BA would necessitate disposal of the exotic plant material after treatment. This would be accomplished by chipping the material and leaving it on site to decompose, burning the material on site, or transferring the material to a designated disposal/burn area. Noise generating equipment such as gas powered chippers and chainsaws, or

heavy equipment such as bulldozers may be used to pile or prepare the material for removal. Designated disposal areas include the former South Operations Center in Orick, the former Mitchell property at the south end of Freshwater Lagoon (east side of Hwy 101), Camp Lincoln at the northwest corner of Jedediah Smith Redwoods State Park, Aubell, Jedediah Smith campground maintenance yard, and the former Hansen property at the junction of Parkway and Hwy 199. Within 0.25 mi of forested habitat suitable for threatened and endangered (T&E) species all plant material would be burned in a few small piles no more than 6 ft x 6 ft x 6 ft, in order to minimize smoke during the breeding season (1 January through 15 September). This restriction would apply to all of the disposal sites except the Mitchell property site, where there is no T&E habitat within 0.25 mi. With the exception of the beach environment, no burning would occur within suitable habitat for any of the species considered in this document.

Hand-pulled beachgrass would be disposed of by transporting it to one of the designated disposal/burn areas, left to decompose on top of mats of solid beachgrass, or dried for an approximate two week period and placed in the surf. Manually dug beachgrass may need to be burned on site depending on the circumstances of its location within the project area and the ease with which it could be moved off site. On the beach, beachgrass burning would consist of a few small piles no more than 6 ft x 6 ft x 6 ft to allow piles to dry adequately before being ignited and to minimize the amount of smoke. Ignition would be by means of a drip torch. Wood may be used to supplement fuel for ignition. Any wood used in this manner would be brought to the site and would not involve the use of driftwood.

Hazardous Materials Treatment

In the event of a fuel, oil, or other hazardous material spill, a spill contingency plan would be in place. This plan is based on NPS and CDPR existing spill plans, and was tailored to the type of hazardous spills that could be associated with exotic plant management activities. This plan is included as Appendix B at the end of this document.

Measures to Minimize Impacts on Listed Species

Beach layia- Beach fore dunes with European beachgrass, ice plant, or bush lupine proposed for removal would be surveyed in the spring for beach layia and other sensitive plants prior to work crews moving in. At Freshwater Spit, beach layia would be identified and flagged in order for work crews to avoid the areas occupied by individual plants. If in the course of surveying a proposed work site beach layia is discovered, the location would be mapped and minimum buffer of 50 ft (15 m) around plants would be clearly marked with flagging in order for crews on foot to avoid trampling over the area where seeds might occur. No exotic plant removal activities would occur in the protected area until the plant has completed its annual cycle and set seed, generally by about mid July. No chemicals or heavy equipment would be used, and no burning would occur within the 50 ft seeded-area buffer around the plants. Vehicles needed for disposal of exotic plant material would be required to stay on the wave slope. At Freshwater Spit the only method currently being proposed to control exotic species involves manual removal by crews on foot by either hand-pulling or digging with hand tools.

Tidewater goby- On beaches, heavy equipment would not be allowed to enter creeks and wet areas. Digging with heavy equipment would be allowed next to a creek or standing water unless digging causes surface water to enter the excavated area. If surface water enters the excavated area all digging next to the water body would cease. Digging would then be allowed no closer than 10 ft (3 m) from the water's edge, and would be pulled farther back if necessary. Trenches for burying exotic beachgrass would not be allowed within 30 ft (9 m) of a creek or standing water. No herbicides would be used in areas within 10 m (33 ft) of standing surface water.

Brown pelican- Crews in vehicles accessing a work site via the wave slope that encounter pelicans resting on the beach would allow the pelicans ample time to move out of the way. Crews on foot accessing a work site on the beach should be able to see resting pelicans at a distance great enough to allow them to deviate their routes and avoid flushing birds.

Oregon silverspot- Some exotic plants posing a threat to park resources may occur in coastal prairie habitat potentially suitable for the Oregon silverspot butterfly. In potentially suitable habitat for this species care would be taken to lessen the potential for disturbance of larval host plants. In any potentially suitable habitat in the Crescent Beach/Endert's Beach/ CBEC area potential impacts would be minimized by RNSP staff conducting pre-project sensitive plant surveys and identifying patches of early blue violet (*Viola adunca*) prior to management activities taking place. If Oregon silverspots were to occur in the potentially suitable habitat at this location, areas with early blue violets would be clearly marked so that trampling of butterfly larvae or pupae would be minimized or avoided. If patches or clumps of violets occur, and herbicides were proposed for use, direct application would be the method used within 25 ft (8 m) of such a patch to ensure that no herbicide inadvertently contacts a violet plant.

Spotted owl and marbled murrelet - Exotic plant management activities in or within 500 ft (152 m) of occupied or unsurveyed marbled murrelet habitat that generate noise above ambient background levels would be limited to outside the breeding season (16 September through 23 March). Management activities that generate background noise above ambient levels in or within 500 ft of unsurveyed spotted owl habitat or a known activity center would be limited to the period of 10 July through 31 January. Burning within 0.25 mi of suitable spotted owl or marbled murrelet habitat, during the breeding season, would be restricted to a few small piles at a time at any one site.

Bald Eagle- Management activities that would be restricted within 0.5 mi (800 m) of an active bald eagle nest include the use of power tools and heavy equipment that generate noise above ambient background levels, crews working within view of an occupied nest, and burning. These activities could resume two weeks after the young birds fledge (fledging generally occurs by mid July) and continue through 31 December.

Snowy Plover- Snowy plover surveys are currently being conducted twice per month during the breeding season (March through August) on the beaches with the best quality plover habitat in RNSP. These beaches include Freshwater Spit/Beach and Gold Bluffs Beach from Espa Creek to Carruther's Cove. All other accessible beaches are surveyed once per month during the breeding season. In the non-breeding season surveys are done once per month in September- February on

Gold Bluffs Beach and once per month in September, December, and January on Freshwater Spit. Additionally, daily pre-project surveys of the work area and out to 100 m would be done during any time of year to determine if plovers were in the area. During the breeding season, if a snowy plover adult, juvenile, chick, nest, or scrape occurs within the surveyed area no work will be conducted.

Heavy equipment use would occur after 21 August if no nests have been located in a project area or adjacent to the access route by that time; if nests or chicks are present in late August work would begin after 30 September. Heavy equipment work would continue through fall and winter until 15 February. Daily pre-project surveys would be conducted to determine if plovers are wintering in or near a project area. If wintering birds are located within the project area, no heavy equipment would be allowed within a 100 m (325 ft) buffer around the plovers' location, if necessary. A wildlife biologist would evaluate the circumstances (e.g., numbers of birds, how frequently present, location relative to the work site) on a case by case basis to determine if the maximum area of protection buffer is necessary.

Beachgrass burning would occur in late summer/early fall outside the breeding season, using the 21 August (no nests) or 30 September (if nests) dates as guidelines. Beachgrass herbicide application could occur at any time of year. As with heavy equipment use, all project areas would be surveyed daily, along with the 100 m buffer around the project site. If plovers are present in or within 100 m of an area being burned work would stop until the birds moved to a new area. If plovers nest in or within 100 m of an area being treated for herbicides work would stop until fledging occurred. If plovers were present but not nesting in or within 100 m of an herbicide-treated area work would stop if determined to be necessary by a wildlife biologist, taking into consideration the time of year (breeding versus non-breeding season) and location of the birds relative to the work site.

Regardless of the type of project, all trash and food would be contained in predator-proof containers and transported off-site at the end of each day.

Vehicles accessing the beach would enter at the designated access point, drive as low on the wave slope as possible until reaching the site, avoid the wrack line, and be limited to 5 mph or the minimal speed required to prevent becoming stuck in sand, but never exceeding a speed of 20 mph. On the beach, from one to three pickup trucks may be used to transport crews, equipment, and fuel to a work site. Under normal circumstances there would be one round trip with vehicles to and from a work site per day. With the exception of burning beach grass, where a pickup with a water tank would need to be close to the work site (e.g., on the upper beach or in the dunes), vehicles would remain on the wave slope during control operations. When a plover nest or chicks are present on a beach, project vehicle access would be restricted. Accessing a project site in a vehicle at any time of year would include the presence of a trained observer either walking in front of, or riding in, the vehicle to ensure plovers near the wave slope are identified and protected. All workers involved in exotic plant management on the beaches will receive educational information about snowy plovers including the most recent sighting information, habitat use, and identification.

Steelhead, Chinook, and Coho- Herbicide use in riparian habitats in watersheds with the potential to support listed steelhead, chinook, or coho would be restricted to Aquamaster (glyphosate). This herbicide would either be injected directly into a plant or applied by spot application that targets individual plants and prevents drift. In each riparian habitat type (i.e., small and large watersheds) herbicide treatments would be no greater than 10 ac/yr (4.0 ha/yr), for a maximum total of 20 ac (8.1 ha) treated in RNSP in a year. This amount represents approximately 0.22% of the riparian habitat occurring within RNSP, and is partially based on the acreage that can feasibly be treated by RNSP staff under appropriate environmental conditions. No treatment of exotics using herbicides would occur within 0.25 mi of the Redwood Creek estuary; this area would be treated with mechanical or manual methods. If those methods proved to be ineffective, herbicide treatments in the buffer zone of the estuary would be addressed in a separate BA. The other herbicides considered for use in this document, Milestone and Garlon 4, would not be used in riparian habitats or the interface between riparian and upland habitats, but would be restricted to dry upland areas when no imminent rain is forecasted.

No heavy equipment would be used in riparian habitats in watersheds with listed steelhead, chinook, or coho. The creeks flowing across Gold Bluffs Beach where heavy equipment would be used do not contain these species (RNSP unpub. data). No shade-producing exotic plant species would be removed from riparian habitats, all species slated for treatment in these areas are shade tolerant, e.g., English ivy, or do not contribute substantial amounts of shade to a stream bed, e.g., pampas grass.

Mardon skipper- At present there are no known exotic plant species that are high priority for treatment in the Little Bald Hills in mardon skipper habitat. Should a high priority species become established treatment in suitable mardon skipper habitat would be limited to hand-pulling.

Peregrine falcon- At Gold Bluffs Beach when peregrine falcons are nesting no exotic plant management activities would be allowed within 0.5 mi north and south of known eyries between 1 March and 1 July or when young are known to have fledged, whichever is later. There would be no restrictions around unoccupied eyries, where falcons have not been observed during regular monitoring visits, or are presumed non-nesting based on observations by a wildlife biologist.

Burning- At any site within 0.25 mi of forested habitat suitable for T&E species plant material would be burned in a few small piles no more than 6 ft x 6 ft x 6 ft, in order to minimize smoke during the breeding season (1 January through 15 September). With the exception of the snowy plover, no burning would occur within suitable habitat for any of the species considered in this document. On the beach, beachgrass burning would consist of a few small piles no more than 6 ft x 6 ft x 6 ft to allow piles to dry adequately before being ignited and to minimize the amount of smoke. Any wood used as fuel would be brought to the site and would not involve the use of driftwood.

Table 3 identifies limited operating periods for locations previously identified as needing some form of exotic plant management.

Table 3. Location, control methods, species of concern and limited operating periods for those sites previously identified as having exotic plant management needs.

Location	Control Method(s)	Species of Concern	Operating Dates	Comments
Hiouchi Visitor Center	Heavy Equip. Power Tools Chemical	Spotted Owl Marbled Murrelet	All Year	Highway creates high ambient noise
Hiouchi Flat	Heavy Equip Power Tools Hand Tools Chemical	Spotted Owl Marbled Murrelet	All Year	Highway creates high ambient noise
Hiouchi Gauging Station	Power Tools Chemical	Spotted Owl Marbled Murrelet Coho	9/16- 3/23	Dates apply to power tool use; SPOW surveys current
Jed Smith Campground	Heavy Equip. Chemical	Spotted Owl Marbled Murrelet Coho	6/1- 3/23	SPOW surveys current High ambient noise in summer
Jed Smith Campground Boat Launch Area	Heavy Equip. Power Tools Hand Tools Chemical	Spotted Owl Marbled Murrelet Coho	All Year	High ambient noise due to boat launching, fishermen, etc.
Jed Smith (outside campground)	Power Tools Hand Tools Chemical	Spotted Owl Marbled Murrelet Coho	9/16- 1/31 (3/23)	Dates apply to power tool use; check loc for SPOW surveys
Walker Road	Heavy Equip. Power Tools	Spotted Owl Marbled Murrelet	9/16- 3/23	SPOW surveys current
Camp Lincoln	Heavy Equip. Power Tools Hand Tools	Spotted Owl Marbled Murrelet	All Year	Located along Kings Valley Rd among residential area
Aubell	Heavy Equip. Power Tools	Spotted Owl Marbled Murrelet	All Year	Noise all year from equipment/ shop
Howland Hill Outdoor School	Heavy Equip. Power Tools	Spotted Owl Marbled Murrelet	All Year (school) or 9/16- 1/31 (access road)	School is surveyed for SPOW, no OG w/in 0.25 mi of school
CBEC	Heavy Equip. Power Tools Hand Tools Chemical	Oregon Silverspot	All Year (or 10/1-6/30 if butterflies detected)	Tansy ragwort present; check for early blue violet
Crescent Beach	Power Tools	Oregon Silverspot	All Year (or 10/1-6/30 if butterflies detected)	Tansy ragwort present; check for early blue violet
Enderts Beach Road	Hand Tools Chemical	Oregon Silverspot	All Year (or 10/1-6/30 if butterflies detected)	Tansy ragwort present; check for early blue violet
Nickel Creek Campground	Power Tools	None	All Year	
Wilson Creek Youth Hostel	Heavy Equip. Power Tools	None	All Year	
Gold Bluffs Beach	Heavy Equipment Power Tools	Spotted Owl Marbled Murrelet	All Year- depending on snowy plover	Ambient background noise high due to surf,

Location	Control Method(s)	Species of Concern	Operating Dates	Comments
	Hand Tools Chemical	Snowy Plover Brown Pelican Beach Layia Tidewater Goby Peregrine Falcon	and peregrine falcon presence/activity	visitor traffic. If beach layia is located, work after plants set seed. Seasonal restriction imposed within 0.5 mi of occupied falcon eyries.
Gold Bluffs Beach Access Road	Chemical	None	All Year	When environmental conditions allow
All beach bluff areas	Chemical	Peregrine Falcon	All Year	When environmental conditions allow
Boyes Prairie	Heavy Equip.	Spotted Owl Marbled Murrelet	Memorial Day through Labor Day	High ambient background noise during this time.
Davison Ranch	Heavy Equip. Power Tools Hand Tools	Spotted Owl Salmonids	All Year	Highway creates high ambient noise
Tall Trees Access Road	Heavy Equip. Power Tools Chemical	Spotted Owl Marbled Murrelet	9/16- 1/31	Work restricted along entire road except for 0.75 mi stretch at head of Cloquet Creek
Redwood Creek Trailhead	Heavy Equip. Power Tools	Spotted Owl Marbled Murrelet	9/16- 1/31	
Redwood Creek Estuary	Power Tools	Snowy Plover Brown Pelican Beach Layia Salmonids	All Year	If beach layia is located, work after plants set seed
Redwood Creek Estuary to Mussel Point	Hand Tools	Snowy Plover Brown Pelican Beach Layia	All Year	If beach layia is located work after plants set seed.
Old SOC	Power Tools	Spotted Owl Marbled Murrelet	All Year	High ambient background noise from shop, residence.
Kuchel Visitor Center	Hand Tools	Snowy Plover Beach Layia	All Year	If beach layia is located, work after plants set seed
Freshwater Spit	Hand Tools	Snowy Plover Brown Pelican Beach Layia	All Year	In vicinity of beach layia, work after plants set seed
Bald Hills Prairies	Power Tools Hand Tools Chemical Biological	Spotted Owl Marbled Murrelet	9/16- 1/31 or 7/10- 1/31	Restricted dates w/in 0.25 mi of suitable at lower edges
Bald Hills Road	Heavy Equip. Hand Tools Chemical	None	All Year	
Lyons Ranch/Coyote Creek	Hand Tools	None	All Year	

Monitoring

All treated sites would be monitored regularly to document the level of success and identify the need for follow-up treatments. Monitoring will be the means by which the different methods are evaluated as to each one's effectiveness at reducing, eliminating, or controlling the numbers of exotic plants at a site. Monitoring provides the feedback necessary to determine if modification of treatment methods is required to improve effectiveness. Monitoring techniques that would be used include the following:

- 1) Aerial surveys and photography. Permanent photo points will be established and photographs taken; standardized timing of photographs will reduce physiological and morphological variability of the species among photo samplings.
- 2) Roadside and trail surveys of exotic species would be implemented.
- 3) Mapping and tracking the distribution and acreage of high priority exotic species will be done using the park's GIS. This will help determine the effort required for control of a particular species.
- 4) Quadrat and line-point sampling will be used to follow trends in beaches, prairies, oak woodlands, and other native plant communities.

Success criteria have been developed to guide objectives for a species at a particular site. Exotic plant management objectives are grouped into four categories representing different levels of control: prevention, reduction, containment, and eradication. The objective for a particular exotic species at a particular site depends on the extent of the infestation, the threat of the infestation to native plant communities and/or threatened, endangered, and sensitive species habitats, and feasibility of control of the infestation.

Success criteria vary among species and among sites, and are designed specifically for each site after determining the objective of the treatment. For example, the success criterion for European beachgrass at Freshwater Spit is eradication of isolated populations; from Redwood Creek to Mussel Point the criteria are reduction in the area of cover and number of individual infestations. At both sites photo points, GIS coverage, and tracking density of resprouts were the techniques used to monitor and evaluate success. Success criteria for Scotch broom in Bald Hills Prairies and along park roadsides include reduction of area of cover, number of individual infestations, and the seed bank. However, in the prairies the monitoring methods will consist of monitoring resprouts and seedling densities and establishing photo points, but along roadsides the monitoring will use visual surveys, removal records, and GIS. Thus, monitoring techniques are also designed specifically for each particular site and exotic species.

Tiering

Specific exotic plant removal projects would be tiered to this BA through use of the tiering form attached at the end of this document. Tiered projects would be reviewed by a fish and/or wildlife biologist to ensure consistency with the project description in this BA.

V. STATUS AND DISTRIBUTION OF LISTED SPECIES

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

1. Beach Layia (*Layia carnos*) Endangered

A. Species Account

The northern-most known population of beach layia 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 2000 in all potentially suitable habitat in RNSP. No additional populations to date have been detected in the park. The population at Freshwater Spit appears to be stable, or slightly increasing, and currently consists of four or five main plant clusters with individual plants scattered in between.

B. Habitat Status

The park currently has an estimated 669 ac (267 ha) of beach that remain year round, are not likely to be inundated during high tides, and have a dune complex that provides potentially suitable beach layia habitat. 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 best potential habitat at the north end of Gold Bluffs Beach from Ossagon to Carruther's Cove. However, the widespread occurrence of European beachgrass on this beach has reduced the quality of the habitat for beach layia. In places where the exotic beachgrass was removed from Freshwater Spit, beach layia populations have responded favorably by occupying restored areas of the beach (L. Arguello pers. comm.).

2. Tidewater Goby (*Eucyclogobius newberryi*), Endangered

A. Species Account

Locally, tidewater gobies are known to occur in Humboldt Lagoons State Park, at Stone Lagoon just south of the RNSP boundary. The status of the species throughout all of RNSP is unknown, but based on the available information it appears unlikely that this species occurs in the park. Presence/absence sampling was conducted annually in the Redwood Creek estuary from 1996 through 2002, and in 1998 in Espa Lagoon, near Gold Bluffs Beach, with no detections (RNSP 1998, Anderson 2002). Pilot surveys using a draft protocol were conducted in 2004 in two creeks that could qualify as potentially suitable tidewater goby habitat, Johnson Creek/Lagoon (Carruther's Cove) and Ossagon Creek. No gobies were detected during these surveys (G. Goldsmith pers. comm.). A number of small creeks flow from the adjacent forest onto the beach, but become subsurface during the dry summer months.

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 the park. 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). Likewise, it is unlikely that Freshwater Lagoon will be recolonized unless tidal flow is restored and/or exotic species are removed from the lagoon.

B. Habitat Status

Marshy coastal creeks, especially if associated with a lagoon that is on occasion brackish, are expected to provide good quality habitat for this species (C. Chamberlain pers. comm.). Some of the creeks in the park matching this description along Gold Bluffs Beach have not had ocean contact since the 1970s due to sand accretion that has occurred there (P. Rovai pers. comm.). Some creeks that do contact the ocean during winter months include Boat and Home Creeks near Fern Canyon, and Johnson Creek/Carruther's Cove at the north end of Gold Bluffs Beach. The Klamath River estuary also may provide suitable habitat for this species.

3. Brown Pelican (*Pelecanus occidentalis californicus*), Endangered

A. Species Account

In 2002 park staff, while conducting snowy plover and beach carcass surveys, began recording the numbers and locations of brown pelicans observed loafing on park beaches. Numbers of pelicans observed have steadily risen in the five years of record-keeping (through 2006). For example, in 2002 and 2003 average numbers of birds observed in a group were approximately 15 at the Redwood Creek estuary and 47 at Gold Bluffs Beach, with high numbers of approximately 25 and 100 observed at the estuary and Gold Bluffs, respectively. In 2006 average numbers recorded were 60 per group at the Redwood Creek estuary and 80 per group at Gold Bluffs Beach. High numbers in 2006 were 90 at the estuary and 300-400 at Ossagon on Gold Bluffs Beach. Also, in addition to an increased number of pelicans on the beach, the frequency of observations (number of surveys) of pelicans loafing on a beach was higher in 2006 than in previous years.

B. Habitat Status

Brown pelican habitat is found along the entire coastline of the park. 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 park 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.

Based on the information collected during snowy plover surveys, it appears that brown pelicans select certain areas of beach as preferred loafing sites. These areas include the berm and vicinity

of the Redwood Creek estuary and certain sections of Gold Bluffs Beach, in particular the areas around Ossagon Creek, Squashan Creek, and Fern Canyon. What causes certain open beach areas to be attractive for loafing is completely unknown, but pelicans are known to gather on the beach on occasion, adjacent to offshore seabird feeding flocks (K. Schmidt pers. obs).

4. Oregon Silverspot (*Speyeria zerene hippolyta*), Threatened

A. Species Account

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

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

B. Habitat Status

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

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

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

A. Species Account

Each year since 1993 some proportion of the 36 known spotted owl activity centers have been monitored. In 2006 there were sixteen active sites (territories with one or more spotted owls present in the previous three years). Currently, all but one of these territories are located in the Redwood Creek watershed, however during the original park-wide inventory spotted owls were detected in Prairie Creek Redwoods, Del Norte Coast Redwoods, and Jedediah Smith Redwoods State Parks. Survey results from completed home range inventories (all suitable habitat surveyed in a 1.0 mi radius centered on the historic activity center) at sites with no spotted owls detected in ≥ 3 yrs indicate that spotted owls no longer occur within the majority of territories with persistently unoccupied activity centers.

We have documented high levels of barred owl (*Strix varia*) activity in many spotted owl territories, in some cases barred owls have taken up residence at spotted owl nest sites; barred owls are known to be reproducing with regularity within the park. Barred owl records in the park pre-date 1993, however, the initial spotted owl inventory began documenting barred owls in RNSP with regularity. By 1995 barred owls were documented at or near ten of the original spotted owl activity centers (Tanner unpub. data). As of 2005 barred owls have been observed in 21 of the known spotted owl territories within the parks; at least ten of these territories appear to be no longer occupied by spotted owls. As of 2005 it was estimated that there were as many as 42 independent barred owl sites within all of RNSP.

B. Habitat Status

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

Within RNSP there are an estimated 41,000 ac (16,600 ha) of old growth forest, all of which is considered suitable nesting, roosting, and foraging habitat. As of 2005, there were 23,231 ac (9,401 ha) of second growth forest ≥ 40 years old that possibly may be suitable for nesting, roosting, and foraging. There are an estimated 331 ac (134 ha) with residual old growth that are assumed to be suitable for spotted owls. Some proportion of the remaining 30,000 ac (12,140 ha) of second growth < 40 yrs of age may be suitable for spotted owl foraging.

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

from 36-100% of the suitable habitat acres; 12 territories have >80% of the suitable habitat acres in old growth. However, as was noted above, much of this suitable habitat is now occupied by barred owls, and most likely unavailable for use by spotted owls.

6. Bald Eagle (*Haliaeetus leucocephalus*), Threatened

A. Species Account

Field surveys to identify potential bald eagle nesting activities during the breeding season were begun in 1997 and have continued to the present. In 2006 there was just one known bald eagle nest site in RNSP, in the main branch of Mill Creek. This nest site was first suspected in 2003 due to eagle activity observed in this area during the breeding season. The nest was finally located in 2005, and produced one eaglet that year and in 2006. The nest discovered in 1997 on the ridge just south of Orick, which produced young every year between its discovery and 2005, was in part of a tree that broke apart during the winter wind storms of 2005-06. In 2006 observations of an eagle foraging in the ocean south of False Klamath Cove and flying inland with food on more than one occasion indicated another possible nest site. Bald eagles in all age classes have been observed with regularity along coastal areas, however, there are many fewer observations of eagles inland, e.g., up Redwood Creek.

B. Habitat Status

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

7. Marbled Murrelet (*Brachyramphus marmoratus*), Threatened

A. Species Account

Beginning in 2001 RNSP became a cooperator in a multi-agency research project, the primary objectives of which were to locate marbled murrelet nests in RNSP, determine the relationship between nesting success and proximity to park trails and highways, and measure behavioral responses of murrelet adults and chicks at the nest to noise disturbance caused by trail users and maintenance activities. Twenty-seven nests were initiated by radio-marked birds in the first three years of this study (Hebert and Golightly 2003, R. Golightly pers. comm. 2005). Preliminary results from trials with noise (from chainsaws) and people walking and talking in the vicinity of an occupied nest indicate that these forms of disturbance may not directly influence nesting success. There was no significant difference between successful and unsuccessful nests in the vicinity of human presence (e.g., trails) or noise, however, Hebert and Golightly (2003) cautioned that these results were based on small samples and trials were run in the middle of the afternoon when murrelet activity is at low levels. In contrast, Hamer and Nelson (1998) found that pedestrian activity within 131 ft (40 m) and within line-of-sight of murrelet nests caused flushing or aborted feeding 27% of the time. In old growth redwood trees nests tend to be much

higher from the ground and nest disturbance may be less due to this factor (McShane et al. 2004). A number of studies have shown that murrelet response to vehicular noise at nest sites is minimal for both chicks and nesting adults (McShane et al. 2004).

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

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

A significant threat to the marbled murrelet, and one that may explain the observed low recruitment rates, is the high level of predation on murrelet eggs and chicks. Of the fourteen known or suspected nest predators, eight are known to occur commonly in suitable murrelet nesting habitat in RNSP including the Steller’s jay (*Cyanocitta stelleri*), common raven (*Corvus corax*), great horned owl (*Bubo virginianus*), sharp-shinned hawk (*Accipiter striatus*), Cooper’s hawk (*A. cooperii*), Pacific fisher (*Martes pennanti*), Townsend’s chipmunk (*Tamias townsendi*), and Douglas squirrel (*Tamasciurus douglasii*) (Nelson and Hamer 1995, Marzluff et al. 1996).

Corvids (jays, crows, and ravens) have been implicated as the primary predator of murrelet nests (Nelson and Hamer 1995, Raphael et al. 2002). Corvids are extremely intelligent and efficient predators, using a highly refined search image for locating prey. Corvid numbers have increased significantly throughout the west in the last century in response to habitat change and human development (Marzluff et al. 1994). The densities of many corvid species, have been found to be higher in landscapes fragmented by agriculture and human development than in forested landscapes. McShane et al. (2004) cited numerous studies that found jays to be more abundant along forest edges where they appear to be attracted to supplemental food sources, especially if associated with human settlements and campgrounds.

The recovery actions for the Siskiyou Coast Range Zone (including RNSP) related to state and national parks call for consideration of the maintenance of high quality habitat when planning for new developments associated with recreation. The recovery plan also describes potential threats associated with increased corvid predation and nest disturbance from facility construction and use (campgrounds, picnic areas, visitor centers, and parking lots), and the importance of proper trash disposal in reducing some of these threats (USFWS 1997).

B. Habitat Status

In RNSP there are approximately 41,000 ac (16,592 ha) of old growth forest occurring in

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

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

Marbled Murrelet Critical Habitat

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

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

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

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

8. Western Snowy Plover (*Charadrius alexandrinus nivosus*), Threatened

A. Species Account

The 2006 statewide survey detected approximately 1,900 snowy plovers (J. Watkins pers. comm. in Colwell et al. 2006), well below the 3,000 bird recovery goal for California (USFWS 2001b). Colwell et al. (2006) calculated there were approximately 60 breeding adults in Humboldt

County each year in the period of 2001-2005. In 2006 only 57 plovers bred in all of Recovery Unit 2 (RU2), which includes Mendocino, Humboldt, and Del Norte Counties. Also, productivity was the lowest in 2006 in RU2 in the six years since intensive monitoring began. The Eel River gravel bar nests experienced the highest fledging success (10 out of 14 chicks hatched) while north Clam Beach/Little River State Beach nests had the lowest fledging success (3 chicks fledged out of 20 hatched) (Colwell et al. 2006). In contrast to 2004 and 2005, no snowy plovers were observed attempting to breed on Gold Bluffs Beach in 2006. In fact, no plovers were observed on this beach after March 23, 2006. According to Colwell et al. (2006) immigrants from outside RU2 comprise a significant portion of the breeding population in the recovery unit each year, and in fact sustain the local population. This is of concern as the proposed 4(d) rule would allow a relaxation of protective management in those recovery units where recovery goals have been met or exceeded.

In January of 2004 two snowy plovers were detected on Gold Bluffs Beach for the first time since the mid-1980s. Over the next few months between one and three adult plovers were observed during surveys, however, leg bands indicated that at least five different individuals were present at one time or another. On 24 May 2004 an adult with two newly-fledged chicks were observed; this nest was missed by surveyors despite the effort of regular bi-weekly surveys taking place. The males and his chicks were monitored regularly until one chick fledged on 23 June. The fate of the second chick was unknown; all three birds were observed for the last time in the brood area on 9 June, and the adult male was last seen on 16 June, accompanied by a single chick. This male was observed later in the season in Oregon attending another nest. Snowy plovers returned to Gold Bluffs Beach in January of 2005 and were observed regularly up until the breeding season. Based on color-banded individuals and the number of unbanded birds seen at one time, there were least eight different individuals present, with seven the maximum number observed during a single day's observation. A pair of plovers nested in early May 2005 but for unknown reasons the nest failed a few days before the estimated hatch date. All but two of the 2004-2005 known locations of snowy plovers on Gold Bluffs Beach were in the area between Squashan Creek and about 0.5 mi north of Fern Canyon; one of the other locations was south of Espa Creek (in 2004) and one was in front of the Gold Bluffs Beach Campground (in 2005).

Besides the occurrence of snowy plovers on Gold Bluffs Beach in 2004 and 2005, there are 11 records of western snowy plovers in the RNSP wildlife observation database, none of which include observations inside the park. Historic records of snowy plovers from within the parks 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 observed snowy plovers, in the vicinity of Ossagon, on numerous occasions in both winter and summer in the early 1980s. However, no nest was ever found at Gold Bluffs Beach (G. Strachan pers. comm.) These observations are not in the parks' wildlife observation database.

When snowy plovers are not present on park beaches, surveys are conducted twice per month during the breeding season (March through August) on Gold Bluffs Beach and Freshwater Spit/Beach and once per month on all other accessible beaches. Surveys are conducted once per month from September through February on Gold Bluffs Beach and in September, December-

February on Freshwater Spit. Beach carcass surveys are done in March-October on all beaches; during these surveys qualified surveyors also are on the lookout for plovers while walking the beaches looking for carcasses. In total, surveys cover approximately 858 ac (83%) of potentially suitable habitat in RNSP. Snowy plover surveys are done once per month in September-February on Gold Bluffs Beach and once per month

When plovers are present, survey effort increases and management is guided by *Redwood National and State Parks Staff Responsibilities and Management Strategy for Western Snowy plovers* (RNSP 2005).

There have been many reasons identified for the decline in western snowy plovers numbers and nest sites (USFWS 2001b). Threats to the species are many, but most fall under the broad categories of predation, human disturbance, and habitat loss. Colwell et al. (2006) identified predation as the most imminent threat to snowy plovers locally, as predator nest exclosures may be decreasingly effective at enhancing reproductive success. Exclosures were removed from Clam Beach in 2006 after predators learned to watch for nesting adults leaving exclosures. Human disturbance continues to be a close second to predation at all sites where plovers nest. In RU2 there is much unoccupied suitable habitat (e.g., at the Eel River estuary, Big Lagoon, and Gold Bluffs Beach) therefore, habitat availability does not appear to be a limiting factor in this recovery unit. In fact, Colwell et al. (2006) question the value of habitat restoration (European beachgrass removal) for the sole purpose of conserving snowy plovers in the absence of predator control at nesting areas where restoration is occurring.

In RNSP, factors that could affect the species directly include the presence of vehicles on the wave slope, dogs running off leash, visitor recreation activities (e.g., kite flying, building driftwood structures, team games such as Frisbee, volleyball, etc.), and predators. Although the abundance of predators using beach habitat in the park 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 are known to occur in beach habitats in RNSP. To a lesser extent, illegal driving (e.g., by unauthorized persons or above the permitted area of the wave slope) and firewood cutting/gathering may also impact snowy plovers directly, or indirectly, by reducing habitat quality in some areas.

B. Habitat Status

RNSP has approximately 1,029 ac (412 ha) of beach habitat that are currently considered potentially suitable for snowy plovers. The draft recovery plan identified 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, however, the draft recovery plan does state that as new breeding areas are discovered the current list of important breeding habitats should be expanded or refined as appropriate.

The quality of beach habitat in RNSP has been reduced in many locations due to extensive invasion by European beachgrass (*Ammophila arenoides*). The northern half of Gold Bluffs

Beach (including the area where plovers occurred in 2004) probably constitutes the best plover habitat where it is wide and open and exotic beachgrass has not stabilized the dunes to the same degree it has elsewhere. 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 beachgrass. 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.

9. California Coastal Chinook Salmon (*Oncorhynchus tshawytscha*), 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 National Marine Fisheries Service under the Endangered Species Act (USDC 1999a). In 2005 the California coastal chinook salmon was “re-listed” as threatened after a status review in response to a court order (the “Alsea decision”) directing the Service to consider the contribution of hatchery fish to species viability (Federal Register 2005). California coastal chinook 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’s current range is from Redwood Creek south through the Russian River.

Winter-run chinook constitute the main chinook run in RNSP streams. Adult fish return to spawn after three to six or more years in the ocean, although two year old male spawners are commonly observed (Myers et al. 1998). These fish begin their upstream migration into the park 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 only one season since 1981, when the park began summer steelhead (*O. mykiss*) surveys, but are not typically considered to use the Redwood Creek watershed. Emergence of spring- and fall-run chinook salmon fry begins in December and continues into mid-April (Leidy and Leidy 1984, Bell 1991). Fry use woody debris, interstitial spaces in cobble substrates, and undercut banks as cover (Everest and Chapman 1972). As the fry grow, habitat preferences change. Juveniles move away from stream margins and begin to use deeper water areas with slightly higher water velocities.

Post-emergent fry seek out shallow, nearshore areas with slow current and good cover, and begin feeding on small terrestrial and aquatic insects and aquatic crustaceans. As they grow to 2 to 3 inches in length, the juvenile salmon move out into deeper, swifter water, but continue to use available cover to minimize the risk of predation and reduce energy expenditure. The optimum temperature range for rearing chinook salmon fry is 50-55°F (Rich 1997, Seymour 1956) and for fingerlings is 55-61°F (Rich 1997). Data from the Mad River (Sparkman 2002) and Redwood Creek (Sparkman 2003) indicate that emergent chinook salmon fry develop rapidly following emergence. Juvenile chinook salmon in Redwood Creek and its tributaries (e.g., Prairie 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 the park. Research shows that if given the opportunity the juveniles will spend an extended period (to late summer) in the estuary before entering the ocean. There may be a survival advantage favorable to the fish that remain in the estuary and grow to a larger size before entering the ocean (Reimers 1973).

Winter spawning/carcass counts in RNSP continue to indicate low numbers of returning chinook salmon (D. Anderson pers. comm.). The low numbers of returning adult chinook are probably related in part to the conditions in the Redwood Creek estuary. 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 (*O. kisutch*).

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 Mean Sea Level 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.

Designated Critical Habitat

Critical habitat for California Coastal chinook salmon was designated on September 2, 2005 (Federal Register 2005a), and may overlap some of the areas where exotic plants are proposed for treatment under this programmatic assessment. Designated critical habitat for California coastal chinook salmon includes the stream channels within the stream reaches and includes a lateral extent as defined by the ordinary high-water line (33 CFR 329.11). In areas where the ordinary high-water line has not been defined pursuant to 33 CFR 329.11, the lateral extent will be defined by the bankfull elevation. Bankfull elevation is the level at which water begins to leave the channel and move into the floodplain and is reached at a discharge which generally has a recurrence level of 1 to 2 years on the annual flood series. Critical habitat in estuaries is defined by the perimeter of the water body as displayed on standard 1:24,000 scale topographic maps or the elevation of extreme high water, whichever is greater.

Critical habitat designations are focused on the known primary constituent elements (PCEs) essential for the conservation of the species. These PCEs are those sites and habitat components that support one or more life stages, including:

(1) freshwater spawning, (2) freshwater rearing, (3) freshwater migration, (4) estuarine areas, (5) nearshore marine areas, and (6) offshore marine areas. Within the PCEs, essential elements of Chinook salmon critical habitat include adequate (1) substrate, (2) water quality, (3) water quantity, (4) water temperature, (5) water velocity, (6) cover/shelter, (7) food, (8) riparian vegetation, (9) space, (10) safe passage conditions, and (11) salinity conditions (Federal Register 2005b).

10. Northern California Steelhead (*Oncorhynchus mykiss*), Threatened

A. Species Account

Northern California steelhead were originally listed as a threatened ESU in June, 2000. It was relisted as distinct population segment (DPS) on January 5, 2006 (Federal Register 2006). The Northern California DPS occurs from Redwood Creek south to the Gualala River.

Biologically, steelhead can be divided into two basic run-types, based on the state of sexual maturity at the time of river entry and duration of spawning migration (Burgner *et al.* 1992 *op cit* Busby *et al.* 1996). The stream-maturing type, or summer steelhead, enters freshwater in a sexually immature condition and requires several months in freshwater to mature and spawn. The ocean-maturing type, or winter steelhead, enters freshwater with well-developed gonads and spawns shortly after river entry (Barnhart 1986). Variations in migration timing exist between populations. Some river basins have both summer and winter steelhead, while others only have one run-type. In the park, summer steelhead are known to occur in the Smith and Klamath Rivers, and in Redwood Creek (Busby *et al.* 1996), in addition to the winter runs present in these basins.

Summer steelhead enter freshwater between May and October in the Pacific Northwest (Busby *et al.* 1996, Nickelson *et al.* 1992). They require cool, deep holding pools during summer and fall, prior to spawning (Nickelson *et al.* 1992). They migrate inland toward spawning areas, over winter in the larger rivers, resume migration in early spring to natal streams, and then spawn (Meehan and Bjornn 1991, Nickelson *et al.* 1992) in January and February (Barnhart 1986).

Winter steelhead enter freshwater between November and April in the Pacific Northwest (Nickelson *et al.* 1992, Busby *et al.* 1996), migrate to spawning areas and then spawn, generally in April and May (Barnhart 1986). Some adults, however, do not enter some coastal streams until spring, just before spawning (Meehan and Bjornn 1991).

There is a high degree of overlap in spawn timing between populations within a DPS regardless of run type (Busby *et al.* 1996). Difficult field conditions at that time of year and the remoteness of spawning grounds contribute to the relative lack of specific information on steelhead spawning. Unlike Pacific salmon, steelhead are iteroparous, or capable of spawning more than once before death (Busby *et al.* 1996). However, it is rare for steelhead to spawn more than twice before dying; most that do so are females (Nickelson *et al.* 1992). Iteroparity is more common among southern steelhead populations than northern populations (Busby *et al.* 1996).

Steelhead spawn in cool, clear streams featuring suitable gravel size, depth, and current velocity. Intermittent streams may be used for spawning (Everest 1973, Barnhart 1986). Steelhead enter streams and arrive at spawning grounds weeks or even months before they spawn and are vulnerable to disturbance and predation. Cover, in the form of overhanging vegetation, undercut banks, submerged vegetation, submerged objects such as logs and rocks, floating debris, deep water, turbulence, and turbidity (Giger 1973 *op cit* Bjornn and Reiser 1991) are required to reduce disturbance and predation of spawning steelhead. It appears that summer steelhead occur where habitat is not fully utilized by winter steelhead, with summer steelhead usually spawning further upstream than winter steelhead (Withler 1966, Behnke 1992). In Redwood Creek, 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.

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.

After 2 to 3 weeks, in late spring, and following yolk sac absorption, alevins emerge from the gravel and begin actively feeding. After emerging from the gravel, fry usually inhabit shallow water along banks of perennial streams. Fry occupy stream margins (Nickelson *et al.* 1992). Older fry establish and defend territories.

Summer rearing takes place primarily in the faster parts of pools, although young-of-the-year are abundant in glides and riffles. Winter rearing occurs more uniformly at lower densities across a wide range of fast and slow habitat types. Productive steelhead habitat is characterized by complexity, primarily in the form of large and small in-stream wood. Some older juveniles move downstream to rear in larger tributaries and mainstem rivers (Nickelson *et al.* 1992). 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).

Summer Steelhead surveys began in the park 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. The number of adult steelhead counted in 2004 was 8, and in 2005 twenty-two adults were counted. 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.

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. For spawning, steelhead use 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, and woody debris accumulation (logs or tree roots). Cover structures such as boulder clusters and root wads provide both summer and winter rearing habitat. Surface turbulence (or whitewater) provides another source of cover during the summer months. As juvenile steelhead grow, pools become an important habitat component. The best 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.

Designated Critical Habitat

Critical habitat for Northern California steelhead was designated on September 2, 2005 (Federal Register 2005), and may overlap some of the areas where exotic plants are proposed for treatment under this programmatic assessment. Designated critical habitat for steelhead includes the stream channels within the stream reaches and includes a lateral extent as defined by the ordinary high-water line (33 CFR 329.11). In areas where the ordinary high-water line has not been defined pursuant to 33 CFR 329.11, the lateral extent will be defined by the bankfull elevation. Bankfull elevation is the level at which water begins to leave the channel and move into the floodplain and is reached at a discharge which generally has a recurrence level of 1 to 2 years on the annual flood series. Critical habitat in estuaries is defined by the perimeter of the water body as displayed on standard 1:24,000 scale topographic maps or the elevation of extreme high water, whichever is greater.

Critical habitat designations are focused on the known primary constituent elements (PCEs) essential for the conservation of the species. These PCEs are those sites and habitat components that support one or more life stages, including:

(1) freshwater spawning, (2) freshwater rearing, (3) freshwater migration, (4) estuarine areas, (5) nearshore marine areas, and (6) offshore marine areas. Within the PCEs, essential elements of Chinook salmon critical habitat include adequate (1) substrate, (2) water quality, (3) water quantity, (4) water temperature, (5) water velocity, (6) cover/shelter, (7) food, (8) riparian vegetation, (9) space, (10) safe passage conditions, and (11) salinity conditions (Federal Register 2005).

11. Southern Oregon/ Northern California Coho Salmon (*Oncorhynchus kisutch*), Threatened

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 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). 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). In 2005 the Southern Oregon/Northern California (SONC) Coho salmon was “re-listed” as threatened after a status review in response to a court order (the “Alsea decision”) directing the Service to consider the contribution of hatchery fish to species viability (Federal Register 2005). The SONC coho ESU’s current range is from Cape Blanco, Oregon, south to Punta Gorda, California.

Unlike chinook salmon, where most production comes from mainstem spawning areas, coho tend to use smaller streams and tributaries. In contrast to the life history patterns of other Pacific salmonids, coho salmon generally exhibit a relatively simple 3-year life cycle. Most coho salmon enter rivers between September and February. Coho salmon river entry timing is influenced by many factors, one of which appears to be river flow. In addition, many small California stream systems have their mouths blocked by sandbars for most of the year except winter. In these systems, coho and other Pacific salmonid species are unable to enter the rivers until sufficiently strong freshets open passages through the bars (Weitkamp *et al.* 1995). Coho salmon spawn from November to January (Hassler 1987), and occasionally into February and March (Weitkamp *et al.* 1995). In RNSP adult coho typically run upstream to spawn from late October to early March depending on access through the Redwood Creek estuary (Anderson 1995). Access through the estuary depends 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.

Spawning may occur in a few third-order streams (Bjornn and Reiser 1991), but most spawning activity was found in fourth- and fifth-order streams. Nickelson *et al.* (1992) found that spawning occurs in tributary streams with a gradient of 3 percent or less. Spawning occurs in clean gravel ranging in size from that of a pea to that of an orange (Nickelson *et al.* 1992). Spawning is concentrated in riffles or in gravel deposits at the downstream end of pools featuring suitable water depth and velocity (Weitkamp *et al.* 1995).

Following emergence from gravel, 2 to 3 weeks after hatching, fry move into shallow areas near the streambanks (Hassler 1987, Nickelson *et al.* 1992). As coho salmon fry grow, they disperse upstream and downstream to establish and defend territories (Hassler 1987). Juvenile rearing usually occurs in tributary streams with a gradient of 3 percent or less, although they may move up to streams of 4 percent or 5 percent gradient. Juveniles have been found in streams as small as 3 to 6 feet wide. Coho salmon fry are most abundant in backwater pools during spring. During the summer, coho salmon fry prefer pools featuring adequate cover such as large woody debris, undercut banks, and overhanging vegetation. Juvenile coho prefer to over-winter in large mainstem pools, backwater areas and secondary pools with large woody debris, and undercut bank areas (Hassler 1987, Heifetz *et al.* 1986). Coho rear in fresh water for up to 15 months, then migrate to the sea as smolts between March and June (Weitkamp *et al.* 1995).

The ideal food channel for maximum coho salmon smolt production would have shallow depth

(3-24 inches), fairly swift mid-stream flows, numerous marginal back-eddies, narrow width, copious overhanging mixed vegetation, and banks permitting hiding places (Boussu 1954 *op cit* Mundie 1969). The early diets of emerging fry include chironomid larvae and pupae (Mundie 1969). Juvenile coho are carnivorous opportunists that primarily eat aquatic and terrestrial insects (Sandercock 1991, Mundie 1969).

Downstream migration of coho to the ocean from upstream Redwood Creek rearing areas occurs in early spring (March-April). Little is known about residence time or habitat use in estuaries during seaward migration, although it is usually assumed that coho spend only a short time in the estuary before entering the ocean (Nickelson *et al.* 1992). Survey data from RNSP confirm the assumption that young salmon move directly into the ocean, spending a minimal amount of time in the Redwood Creek estuary (Anderson 1995), however, migration through the Redwood Creek estuary is dependent upon the mouth being open to the ocean. Growth is very rapid once the smolts reach the estuary (Fisher *et al.* 1984 *op cit* Sandercock 1991). While living in the ocean, coho remain closer to their river of origin than do chinook salmon (Weitkamp *et al.* 1995).

News accounts and recollections of longtime residents of the Redwood Creek watershed suggest that both the size and numbers of coho have declined in recent decades (Van Kirk 1994). The total adult coho population in the Redwood Creek system at one time may have numbered more than 2,000; most occurred in the Prairie Creek drainage and probably originated from the Prairie Creek Hatchery (D. Anderson pers. comm.). Since the closure of the hatchery in 1992 the numbers of coho are probably much lower. Currently, coho distribution in the Redwood Creek basin is limited to the mainstem and the larger low gradient tributaries. Data collected by RNSP fishery biologists indicated coho can be found occupying 26 miles of stream within the lower Redwood Creek Basin (RNSP unpub. data).

B. Habitat Status and Designated Critical Habitat

Critical habitat for SONC coho salmon includes all accessible waterways, substrate, and adjacent riparian zones. Excluded are: (1) areas above specific dams identified in the federal register notice; (2) areas above longstanding natural impassible barriers (*i.e.*, natural waterfalls); and (3) tribal lands.

Designated critical habitat for SONC coho salmon (Federal Register 1999) may overlap some of the areas where exotic plants are proposed for treatment under this programmatic assessment. In designating critical habitat, NMFS focuses on the known physical and biological features within the designated area that are essential to the conservation of the species. These essential features may include, but are not limited to, spawning sites, food resources, water quality and quantity, and riparian vegetation. Within the essential habitat types (spawning, rearing, migration corridors), essential features of coho salmon critical habitat include adequate (1) substrate, (2) water quality, (3) water quantity, (4) water temperature, (5) water velocity, (6) cover/shelter, (7) food, (8) riparian vegetation, (9) space, and (10) safe passage conditions.

12. Mardon Skipper (*Polites mardon*), Candidate

A. Species Account

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

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

The Little Bald Hills population in RNSP was originally located in a mesic fescue-dominated meadow and a tall-grass horse pasture. Additional searches for mardon skippers subsequent to the initial detections have resulted in a number of individuals being detected in Little Bald Hills ridge top areas, approximately 0.5 mi southeast of the original location. It is possible that mardon skippers may occur extensively throughout the Little Bald Hills. Based on surveys by park staff in 2005 and 2006, it appears that numbers and locations of mardon skippers vary among years, and probably depend upon environmental factors that influence the emergence of adults.

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

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

B. Habitat Status

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

13. Fisher (*Martes pennanti*), Candidate

A. Species Account

Fishers are known to occur in RNSP. There have been four separate surveys for forest carnivores in the park (Gellman et al. 1993, McKenzie et al. 1994, Beyer and Golightly 1995, and Slauson et al. 2003); fishers were detected in all of these surveys. Beyer and Golightly (1995) reported a "...high detection ratio...in an area of...[Redwood] National Park...". Slauson et al. (2003) detected fishers in old growth, older second growth, and along the edges of these two types. Sample units with detections were distributed throughout the park, from Jedediah Smith State Park in the north to Devil's Creek (a tributary of Redwood Creek) in the south. There are relatively few fisher observations in the park's wildlife observations database, however, reliable sightings have occurred in the Lost Man Creek, Prairie Creek, Wolf Creek Education Center, and Newton B. Drury parkway areas, along the A-9, C-9, and Bald Hills Roads, and at Maneze Prairie. The survey results coupled with the reliable database records indicate that fishers are probably well-distributed throughout the park.

There are no records of fishers breeding within RNSP, although they are known to reproduce in private managed timberlands adjacent to the park (J. Thompson pers. comm.), and it is likely that RNSP harbors a breeding population. Data from studies in the west indicate fishers give birth in mid-March to early April, and breed shortly after. On managed forests in the redwood and redwood/ Douglas-fir transition zone it appeared that parturition was occurring during the latter part of March (J. Thompson unpub. data). Raley (2002) documented similar dates for radio-collared fishers in the southern Oregon Cascades. In that study females gave birth in late March, bred between late March and early April, and remained in natal dens until kits were about 8 weeks old. Other studies have documented kits remaining in natal dens until 6-10 weeks of age (citations in Powell and Zielinski 1994, Seglund 1995).

Fishers are known to avoid areas of human disturbance. One study (Seglund 1995) showed that fisher rest sites occurred >100 m (328 ft) from roads, homes, and campgrounds. However, fishers are somewhat frequently observed near roads in the park (RNSP unpub. data). Slauson et al. (2003) detected fishers at road-side track plate stations, including those placed near Newton B. Drury parkway, and near Alder Camp, Howland Hill and Bald Hills roads. Conversely, Beyer and Golightly (1995) attributed low and high detection ratios at certain sites to proximity of a major highway and limited human access, respectively. From a park management standpoint disturbance to females with young kits is of primary importance. Seglund (1995) indicated that denning females may be especially vulnerable when disturbed by loud noise near a natal den site. Increased movements during the day may increase mortality from predators or automobiles (Paragi et al. 1994). The presence of humans on foot in the vicinity of a den or rest site, e.g., on

a nearby trail, under most circumstances would probably not result in significant disturbance (B. Zielinski pers. comm.).

B. Habitat Status

Fishers have generally been associated with large unfragmented blocks of late successional conifer forest. Buskirk and Powell (1994) suggested that the species contributing to vegetation cover were not as important as the successional stages and structure of cover; fishers show preference for low and closed but not uniform canopies, and structural complexity near the forest floor. Fishers are known to occur in commercially managed forests in the redwood/ redwood-Douglas-fir zone where stand heterogeneity remained post-harvest, including the presence of residual trees, logs, and hardwoods (L. Diller pers.comm., J. Thompson unpub. data).

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

Within RNSP there are an estimated 41,000 ac (16,600 ha) of old growth forest, all of which may be considered suitable for occupancy by fishers for denning, resting, and foraging. There are 24,364 ac (9,860 ha) of second growth forest ≥ 40 yrs old that also may be suitable for fisher occupancy. Stands >40 years old with a legacy component (e.g., residual old growth, large snags and downed logs) may provide structures that could be used for resting and denning. Second growth stands <40 yrs of age may be suitable for fishers if they contain residual habitat sufficient to provide structure and habitat heterogeneity.

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

The peregrine falcon has an almost worldwide distribution, with three subspecies recognized in North America. The American peregrine falcon occurs throughout much of North America, from the subarctic boreal forests of Alaska and Canada south through Mexico. In the west, the

subspecies nests from central Alaska and south throughout western Canada and the United States to Baja California and the highlands of central Mexico (USDI 1999).

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

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

The recovery plan for the Pacific Coast population of the American peregrine falcon called for 185 wild self-sustaining pairs (i.e., producing 1.5 young per pair) throughout California, Oregon, Washington, and Nevada. Of those 185, there were to be 120 pairs in California (USFWS 1982). Based on data from a 1998 census there were 270 pairs meeting the productivity goal of 1.5 young per pair (USDI 1999) throughout the four-state area. The nationwide 2003 census indicated that there were approximately 1,500 pairs in the conterminous United States (USFWS website).

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

Areas in RNSP with potential peregrine falcon nesting habitat have been surveyed by boat and on land since 1993. Although peregrines were observed at a number of locations within the park (e.g., Split Rock (Falvey 1998) and False Klamath Rock (K. Schmidt pers. obs.)), the first documented eyrie and reproduction occurred in 1998 on the bluffs above Gold Bluffs Beach (Falvey 1998). Currently there are two confirmed peregrine falcon territories within RNSP, with three nest sites. One territory is centered north of Requa, and the two other (most likely alternate nest sites) are along Gold Bluffs Beach. The Requa site is difficult to observe due to its location, and reproduction there has been confirmed by observations of fledglings, with one seen in 1999 and 2004 and two seen in 2005. However, the annual presence of adult birds during the breeding season from 1993 through 2005 indicates a high probability of regular nesting and productivity at this site (Holm 2006). The pair at Gold Bluffs Beach is very productive, and has produced at least one young in 2000 and 2002. Two young were confirmed fledged in 1998, 1999, 2001 and

2003. Fledglings were not confirmed, but were suspected, in 2004 and 2005 (Holm 2006).

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

B. Habitat Status

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

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

VI. IMPACTS TO THREATENED AND ENDANGERED SPECIES

Beach Layia

One population of beach layia is known in the park, on Freshwater Spit. Although extensive surveys were conducted in 2000 on RNSP beaches north of Freshwater Spit, no other beach layia populations were found. It is unlikely that European beachgrass or other exotic species removal would negatively impact the known beach layia population or sites that may be colonized in the next five years. Sensitive plant surveys are done routinely prior to exotic plant management activities; surveys of proposed work sites, including at Freshwater spit, would help ensure that existing or new populations are not adversely impacted by project activities. In the unlikely event beach layia is discovered in a new location, the following precautions would be taken: 1) plants would be flagged to alert work crews to their exact locations, 2) exotic plant removal activities including crew access would be delayed within a marked buffer of at least 50 ft (15 m) of beach layia until after the plants have completed their annual cycle and set seed, 3) no heavy equipment would be allowed in the 50 ft seeded-area buffer at any time, 4) no burning would occur within the 50 ft seeded-area buffer at any time, and 5) no herbicides would be used within the 50 ft seeded-area buffer at any time. Vehicles needing to access a work site on the beach would remain on the wave slope.

European beachgrass removal should have a positive effect on the potential for the habitat to support beach layia. Since European beachgrass was brought under control at Freshwater Spit the number of individual beach layia plants at that location has increased. Removing or controlling exotic plant species creates suitable habitat for native plants adapted to an unstable foredune environment.

Tidewater Goby

The tidewater goby appears to be absent from the two places where sampling has occurred within RNSP, the Redwood Creek estuary and Espa Lagoon near Gold Bluffs Beach, and is probably absent in the other potentially suitable habitats on Gold Bluffs Beach, based on the limited surveys that have been conducted. Indications are that tidewater gobies locally occur mainly in larger bodies of water such as Stone Lagoon. The Redwood Creek estuary is unlikely to be occupied by tidewater gobies due to the alteration of the habitat caused by the flood control levees. However, should tidewater gobies be detected in the Redwood Creek estuary or other locations within the parks, measures designed to lessen the impacts associated with herbicide use in riparian habitats would protect this species. No treatment of exotic plants using herbicides would occur within 0.25 mi of the Redwood Creek estuary. In other riparian zones and coastal bluff areas, herbicide treatments would be limited to 10 ac per year per small watershed and large watershed, and 10 ac per year per bluff-backed beach.

Aquamaster (glyphosate) is the only chemical proposed for use in riparian areas by qualified RNSP staff or the NPS weed team. The EPA has labeled Aquamaster “practically non-toxic” to fish and aquatic invertebrates. Two independent studies (Newton et al. 1984 and Forest Pest Management Institute 1989) on ecosystem effects of glyphosate showed that, when used according to label directions, the chemical does not cause adverse health effects in fish and other aquatic animal life. Furthermore, Aquamaster dissipates rapidly from water (it has a half-life of 7-8 days) and does not bioaccumulate in fish. Given the requirements for application by an Authorized Pesticide Applicator following IPM guidelines, restrictions on the amount of riparian or coastal bluff area that may be treated, and the low toxicity of Aquamaster, it is unlikely that chemical use to control exotic plants would have any measurable effect on the tidewater goby.

Where heavy equipment is proposed for exotic beachgrass removal, it would not be allowed to enter creeks and wet areas. Digging with heavy equipment would be allowed next to a creek or standing water unless digging causes surface water to enter the excavated area, in which case all digging next to the water body would immediately cease. Due to the limited duration of goby survey results and the potential for the species to intermittently colonize habitats, it is possible that tidewater gobies could occur in some potentially suitable habitats within the parks in the future. If surface water did enter an excavated area there's a chance that gobies, if present, could be impacted. At the first sign of surface water entering an excavated area digging would be pulled back at least 10 ft (3 m) from the water's edge and farther if necessary, until no water fluctuations occurred. Trenches for burying exotic beachgrass would not be allowed within 30 ft (9 m) of a creek or standing water. This distance would be adequate to ensure there are no hydrologic changes (e.g., subsurface flow) caused by trenching in the vicinity of a water body.

California Brown Pelican

Exotic plant removal activities may impact brown pelicans by inadvertently flushing individuals off of resting locations on beaches. This could occur when removal sites are accessed by vehicles or crews on foot via the wave slope. During the day, small to medium-sized groups of pelicans (e.g., 5-40 birds) have been observed resting on mainland beaches around Ossagon Creek and other places along Gold Bluffs Beach. Larger groups of around 100 individuals have been observed with some regularity at places along Gold Bluffs Beach and the mouth of

Redwood Creek. However, pelicans observed on RNSP beaches represent a relatively small fraction of the birds observed flying, foraging, or resting on offshore rocks along our coast (Briggs et al. 1983, Jaques et al. 1994, RNSP unpub. data).

Exotic plant removal on beaches is not expected to cause an adverse impact to brown pelicans. Crews in vehicles accessing a work site via the wave slope that encounter pelicans resting on the beach would allow the pelicans ample time to move out of the way. Crews on foot accessing a work site on the beach should be able to see resting pelicans at a distance great enough to allow them to deviate their routes and avoid flushing birds. Vehicles and crews accessing a work site will make two trips per day to and from the site, so chronic disturbance on a daily basis should not be a problem. Furthermore, the amount of beach available to pelicans would be great when compared to project work sites, therefore, the level of disturbance would be restricted in area as well as in amount of time.

Oregon Silverspot

Recent surveys in the area of Enderts Beach Road indicate that Oregon silverspots do not occur in the park. If Oregon silverspots were to occur in the potentially suitable habitat at Enderts Beach Road/CBEC, exotic plant management activities could directly impact the species by inadvertently damaging butterfly larvae and pupae through trampling or other eradication activities in areas with early blue violet. These potential impacts would be minimized by RNSP staff conducting pre-project sensitive plant surveys in potentially suitable habitat and identifying whether early blue violets occur in and around a project site. If Oregon silverspots were to occur in potentially suitable habitat, areas with early blue violets would be clearly marked so that trampling of butterfly larvae or pupae would be minimized or avoided. If patches or clumps of violets occur, and herbicides were proposed for use, direct application would be the method used within 25 ft (8 m) of such a patch to ensure that no herbicide inadvertently contacts a violet plant.

Adult nectar sources may be impacted by removal of tansy ragwort and other exotic species that are known nectar sources, e.g., thistles (*Cirsium* spp.). Tansy ragwort was controlled at Enderts Beach in the late 1970s with the release of the tansy flea beetle, but some plants do occur there despite successful eradication by the flea beetle. Tansy ragwort would be removed manually from this area when encountered by work crews. This species is pervasive in fields just outside the parks (L. Arguello pers. comm.), therefore, removing this exotic plant at Enderts Beach should have little to no impact on the Lake Earl Oregon silverspot population. Exotic plant treatment at Endert's Beach would result in a gradual reduction of exotic species. Fall removal of exotic plants that may be nectar sources for adult Oregon silverspots would be followed by planting herbaceous perennial and annual nectar sources such as goldenrod and pearly everlasting, if no adjacent seed source existed. These plants respond well to exotic plant removal, and it's expected that by the next growing season many native nectar source plants would fill in the gap left by exotic plant removal (L. Arguello pers. comm.).

The Oregon silverspot butterfly may be beneficially affected by exotic plant management activities due to restoration of open meadow habitats. Removing thickets of Himalayan blackberry and Scotch broom from meadows at Enderts Beach/CBEC would undoubtedly increase the potential of this site to support butterflies over the long term.

Northern Spotted Owl

No spotted owl nesting, roosting, or foraging habitat would be removed or degraded by exotic plant management activities.

Using power tools or heavy equipment to control exotic plants has the potential to impact the spotted owl by generating noise above ambient levels in or within 500 ft of suitable habitat during the breeding season. The use of heavy equipment and power tools would be restricted between 1 February and 9 July in or within 500 ft of unsurveyed suitable nesting and roosting habitat. This measure would reduce the potential for adverse impacts from noise disturbance. Burning exotic plant material is not expected to impact nesting spotted owls because material would be burned in small piles no larger than 6 ft high by 6 ft wide. This would minimize the amount of smoke produced to a level that would ensure it would not travel into the canopy of suitable nesting habitat. No burning would occur within suitable nesting and roosting habitat.

Spotted owls may be indirectly impacted by exotic plant management due to the removal of prey habitat such as Himalayan blackberry thickets and ivy patches. However, these impacts are expected to be minimal due to the great extent of these invasive species in some areas, and the gradual (versus abrupt) reduction of exotic plants through time regardless of the treatment method selected for use. The overall quality of spotted owl habitat is expected to improve as native plant species occupy the void left by removal of the exotics.

Herbicide use is not likely to impact the spotted owl because two of the chemicals proposed for use, Aquamaster (glyphosate) and Milestone (aminopyralid), have been classified by the EPA as “practically non-toxic” to birds and other animals. Glyphosate has a very short half-life of about 2 days and would degrade between applications; this coupled with the limited area of use (50 ac per year maximum in potentially suitable spotted owl habitat park-wide) decreases the likelihood of it completing the exposure pathway (e.g., being taken up by spotted owl prey). Although aminopyralid has a longer persistence in the environment (a 30 day half-life) the amount of use is low at 7 oz/ac with a maximum of 50 ac of potentially suitable habitat treated per year park-wide. This would result in a low risk of concentration within the spotted owl food web. Garlon 4 (triclopyr BEE), has been shown to be practically non-toxic to mammals, birds, and other terrestrial fauna. Only four acres maximum would be treated in a five year period and treatments would be restricted to relatively unsuitable foraging habitat in the upper Bald Hills prairies. All three herbicides proposed for use would be applied under strict IPM guidelines by an Authorized Pesticide Applicator further reduces the risk of the chemicals making their way into soil or water.

Bald Eagle

No bald eagle nesting or roosting habitat would be removed or degraded by exotic plant management activities.

The bald eagle would not be impacted by exotic plant management activities. All activities with the potential to impact nesting bald eagles would be restricted within 0.5 mi (800 m) of a nest site during the breeding season (1 January through about mid-July or two weeks after fledging).

Such activities include the use of heavy equipment and power tools that generate noise above ambient levels, crews working within view of an occupied nest, and burning.

Herbicide use would not impact the bald eagle because two of the chemicals proposed for use, Aquamaster (glyphosate) and Milestone (aminopyralid), have been classified as “practically non-toxic” to birds and other animals. Glyphosate has a very short half-life of about 2 days and would degrade between applications; this coupled with the limited area of use (20 ac per year maximum in large riparian watersheds park-wide) decreases the likelihood of it completing the exposure pathway (e.g., being taken up by bald eagle prey). None of the herbicides proposed for use would be applied directly into an aquatic environment, e.g. Freshwater Lagoon, where eagles are known to forage. Although aminopyralid has a longer persistence in the environment (a 30 day half-life) the amount of use is low at 7 oz/ac with a maximum of 20 ac in large watersheds treated per year park-wide. This would result in a low risk of concentration within the bald eagle food web. Garlon 4 (triclopyr BEE), has been shown to be practically non-toxic to mammals, birds, and other terrestrial fauna. Only four acres maximum would be treated in a five year period and treatments would be restricted to areas in the Bald Hills prairies, where bald eagles are not known to occur. All three herbicides proposed for use would be applied under strict IPM guidelines by an Authorized Pesticide Applicator further reduces the risk of the chemicals making their way into soil or water.

Marbled Murrelet and Marbled Murrelet Critical Habitat

No marbled murrelet nesting habitat or primary constituent elements of critical habitat would be removed or degraded by exotic plant management activities.

The exotic plant management activities described in this assessment do not have the potential to impact the marbled murrelet. Power tools would be used within 500 ft of suitable habitat between Memorial Day and Labor Day only in those areas with high amounts of public use such as state park campgrounds and along major roadways. Otherwise, noise generating activities associated with this proposed action would not occur during the breeding season in or within 500 ft of suitable habitat. Burning exotic plant material is not expected to impact nesting marbled murrelets because material would be burned in small piles no larger than 6 ft high by 6 ft wide. This would minimize the amount of smoke produced to a level that would ensure it would not travel into the canopy of suitable nesting habitat. No burning would occur within suitable nesting habitat.

Western Snowy Plover

Snowy plover habitat is expected to improve in quality with the removal or control of exotic plant species, particularly European beachgrass.

Exotic plant management activities could negatively impact the western snowy plover primarily due to wave slope access by vehicles and heavy equipment, and concentrated, increased human activity on more remote sections of beach. If plovers are present in a project area or along the wave slope access route, vehicle access to and from the project area could increase the potential for disturbing birds foraging on or near the wave slope (USFWS 2001b). At Gold Bluffs Beach, we have observed snowy plovers using vehicle tracks as perching locations, probably due to the

warmth and protection from wind track depressions provide. Plovers that are forced to move from a sheltered location, or to alter their behavior frequently, could be at risk for increased predation, or expend energy that would otherwise be spent on foraging or some other beneficial activity. However, limiting access to one round trip to and from the work site on the wave slope would minimize the potential for disturbance to the greatest extent practicable. Restricting vehicle access to daylight hours, maintaining as slow a speed as possible, and trained observers either riding in or walking in front of each vehicle should substantially decrease the likelihood that a collision with a plover would occur. The potential for these impacts should be minimized further by conveying precise plover locations to park staff or contractors working on the project.

On Gold Bluffs Beach there would be no potential impacts on nesting plovers or broods due to heavy equipment use and beachgrass burning limited to after 21 August (no nests initiated by that date) or 30 September (nests initiated by 21 August) through 15 February. Regular monthly surveys on Gold Bluffs Beach plus daily pre-project surveys of a work site would ensure protection of winter flocks. If wintering plovers are located within a project area, no heavy equipment would be allowed to operate within 100 m (325 ft) of the birds if determined by a wildlife biologist to be necessary to ensure protection. No burning would be allowed within 100 m of the plovers' location.

The nest on Gold Bluffs Beach in 2004 went undetected despite regular surveys. Chicks from an undetected nest could be vulnerable to being run over by vehicles during the period between hatching and detection by park staff. This risk would increase relative to time between hatching and timing of the next survey. However, all nests in Recovery Unit 2 (Mendocino, Humboldt, and Del Norte Counties) were initiated by 17 July in the five years that these data were reported (2001-2004, and 2006), with most nests initiated by the end of May (Colwell et al. 2003, 2004, and 2006), indicating only a minor possibility of a late nesting attempt that might go undetected.

Beachgrass herbicide application could occur at any time of year. As with heavy equipment use and burning, all project areas would be surveyed daily, along with the 100 m buffer around the project site. If plovers nest in or within 100 m of an area being treated for herbicides work would stop until fledging occurred. If plovers were present but not nesting in or within 100 m of an herbicide-treated area work would stop if determined to be necessary by a wildlife biologist, taking into consideration the time of year (breeding versus non-breeding season) and location of the birds relative to the work site. Herbicide use is not expected to negatively impact snowy plovers due to the fact that application would occur in areas heavily infested with beachgrass, poor habitat that is likely to be infrequently or not used by plovers, and application would be via the direct method under appropriate environmental conditions (e.g., low wind). Snowy plovers mainly forage in and around the wrack line, away from the beachgrass-dominated dunes and therefore are not likely to come into contact with an herbicide indirectly through prey.

Piles of manually dug beachgrass may be burned on the beach. Restricting burning within 100 m of wintering areas would ensure that plovers are not negatively impacted by burning or smoke. Also, restricting the size of the piles would ensure that fires do not escape into driftwood or create excessive amounts of smoke.

Driftwood may need to be moved in order to access exotic plants slated for removal. It is not expected that this would result in habitat degradation because the driftwood would remain on site.

European beachgrass occurs in monotypic stands over many acres of beach, thus, reducing dune habitat suitable for snowy plovers. Removing European beachgrass is expected to restore snowy plover habitat by allowing native beach vegetation to return and reducing dune stabilization. This would be a benefit to any snowy plovers using park beaches in the future.

Chinook Salmon, Coho Salmon, and Steelhead and Critical Habitat

Most of the exotic plant program activities described in this document would not impact the three species of listed salmonids or their critical habitats. Removal of exotic plants by manual methods including hand pulling, the use of hand tools, and burning would at most result in minor amounts of sediment entering creeks and wet areas. Most of exotic species slated for manual removal are in upland locations away from streams and in places that tend to be level in slope. Where manual removal of exotics would occur in riparian areas very minor amounts of sediment could be generated due to digging, however, such minor amounts of sediment, if mobilized into a watercourse, would not be great enough to result in impacts to the habitat.

Removal of exotic plants using mechanical methods also would not have measurable effects on salmon and steelhead. Heavy equipment (outside of beach areas) would remain on hard surfaces and be used to dig up roadside weeds and exotic shrubs such as cotoneaster and Himalayan blackberry, Scotch and French broom, and black locust. These species mainly occur at upland locations, away from riparian areas. Likewise, Waipuna hot organic foam would be used mainly in upland areas, or areas with minimal slope. Due to the limited length of hose this method must necessarily be used within 200 ft of an existing road. Heavy equipment and Waipuna have a slightly increased possibility of generating sediment should work occur adjacent to (but outside of) a riparian area. This is due to the greater amount of soil that can be disturbed by heavy equipment as compared to hand tools. As with any heavy equipment and power tool use there is always the slight possibility of petroleum products entering the environment should a spill occur. Spill plans and best management practices for managing petroleum products should minimize the probability of run off of hazardous materials in the unlikely event of a spill associated with power tool or heavy equipment use.

No significantly increased light levels and water temperatures would result from proposed exotic plant management activities. Most of the exotic plants to be removed from stream banks and adjacent areas are shade tolerant. Minor amounts of stream bank vegetation, e.g., pampas grass would be removed but not in amounts that would alter stream shading or temperature.

The use of chemical herbicide has the potential to impact riparian habitats should it make its way into ground water in a riparian area. However, restricting chemical use in riparian habitats to Aquamaster (glyphosate) would minimize the potential for adverse impacts. Glyphosate is a plant-specific compound that targets enzymes found only in plants, not animals. It has been approved for use by the EPA in aquatic environments, and has been determined by an EPA assessment not likely to adversely affect salmon and steelhead when used according to the

manufacturer's instructions. Glyphosate that comes in contact with soil binds tightly to particles and tends to remain within the top six inches of soil which makes it unlikely to end up in surface or sub-surface runoff except where direct soil erosion is a factor. The glyphosate application methods proposed include direct application onto a plant by dabbing, painting on cut surfaces, or injection into a drilled hole in a woody stem or cane. Direct application further reduces the likelihood of the herbicide contacting soil. Indirect foliar application would be the method used with glyphosate to control grasses and other non-woody species. Application by this method would use a backpack sprayer with a nozzle set to a coarse stream applied directly to each leaf surface to prevent the potential for drift. This method would only be used when wind is minimal and no rain is forecasted.

A maximum of 10 ac per year per large and small watershed would be treated by direct application of glyphosate throughout all of RNSP. Indirect (foliar) application maximums of 2 ac and 5 ac would be allowed annually in small and large riparian habitats, respectively. Together these two methods could result in a maximum total of 20 ac treated throughout all of RNSP in a year, equating to 0.22% of perennial and intermittent streamside riparian acres within the park.

Aminopyralid would be applied only via foliar application to control woody and non-woody broad-leaved species in upland areas away from riparian habitats and riparian/upland interfaces. Application by this method would use a backpack sprayer with a nozzle set to a coarse stream applied directly to each leaf surface to prevent the potential for drift. This method would only be used when wind is minimal and no rain is forecasted.

The other herbicide proposed for use, Garlon-4, is not approved for use in aquatic environments where it may persist due to its lack of water solubility. In the terrestrial environment it breaks down rapidly in soil to triclopyr acid which is considered by the EPA to be "practically non-toxic" to freshwater fish, invertebrates, and terrestrial vertebrates. This herbicide would only be used in a very few specific upland locations in the Bald Hills, well away from any perennial water sources and only in the early, dry summer season when rain is not anticipated.

Mardon Skipper

At present there are no known exotic plant species that are high priority for treatment in the Little Bald Hills in mardon skipper habitat. Should a high priority species become established treatment in suitable mardon skipper habitat would be limited to hand-pulling. Exotic plant management would not impact the mardon skipper.

Fisher

No fisher habitat would be removed or degraded by exotic plant management activities.

Using power tools or heavy equipment to control exotic plants has the potential to impact the fisher by generating noise above ambient levels in or within 500 ft of suitable habitat, including potential den and rest sites. However, in the vicinity of forested habitat heavy equipment use would be restricted to areas adjacent to roads or other hard surfaces, thus limited in area and extent of use. Heavy equipment and much of the power tool use would be around facilities,

trailheads, roadsides, and other previously disturbed sites, often in places where ambient background levels are already quite high. Thus, increased noise levels from exotic plant management activities are not expected to cause a measurable impact on the fisher from disturbance.

Herbicide use would not impact the fisher because two of the chemicals proposed for use, Aquamaster (glyphosate) and Milestone (aminopyralid), have been classified as “practically non-toxic” to birds and other animals. Glyphosate has a very short half-life of about 2 days and would degrade between applications; this coupled with the limited area of use (90 ac per year maximum in potentially suitable fisher habitat park-wide) decreases the likelihood of it completing the exposure pathway (e.g., taken up by fisher prey). Although aminopyralid has a longer persistence in the environment (a 30 day half-life) the amount of use is low at 7 oz/ac with a maximum of 90 ac of potentially suitable habitat treated per year park-wide. This would result in a low risk of concentration within fisher prey species. Garlon 4 (triclopyr BEE), has been shown to be practically non-toxic to mammals, birds, and other terrestrial fauna. Only four acres maximum would be treated in a five year period and treatments would be restricted to relatively unsuitable fisher habitat in the upper Bald Hills prairies. All three herbicides proposed for use would be applied under strict IPM guidelines by an Authorized Pesticide Applicator further reduces the risk of the chemicals making their way into soil or water.

American Peregrine Falcon

Exotic plant management activities, mainly beachgrass removal, on Gold Bluffs Beach may impact the peregrine falcons nesting in the Butler Creek area, or other cliff sites along this beach. For this reason, exotic plant management activities would be restricted between 1 March and 1 July or when young fledge, whichever is later. This would ensure that nest abandonment does not occur due to the presence of humans remaining for long periods of time within view of the eyrie. Due to the location of the Requa site (facing the ocean below) exotic plant management activities in this area, should they occur, should not cause disturbance to birds at this location.

Cumulative Effects

Cumulative effects are defined as all those state, tribal, local, and private actions that are reasonably certain to occur in the future that have the potential to impact listed species in the park. It is possible that county agricultural departments may introduce insects as biological control for noxious weeds in lands adjacent to the parks. This should have an indirect beneficial impact to park listed species and habitats by reducing the seed sources and spread of exotic plants into the parks.

VII. DETERMINATION

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

Due to the increase in quality of potentially suitable habitat, exotic plant management may affect, and is likely to beneficially affect, the beach layia.

Due to the potential for water seeping into excavated areas from potentially suitable tidewater goby habitat, exotic plant management may affect, but is not likely to adversely affect, the tidewater goby.

Due to the fact that recent surveys have not detected Oregon silverspots within potentially suitable habitat within the park, plus precautions taken to identify and protect patches of early blue violet, exotic plant management may affect, and is likely to beneficially affect, the Oregon silverspot butterfly.

Due to the potential for disturbance to birds present on the wave slope when vehicles and/or heavy equipment travel to and from a work area, exotic plant management may affect, but is not likely to adversely affect, the California brown pelican and western snowy plover.

Due to the potential for noise disturbance to occur after July 9 in or within 500 ft of suitable spotted owl habitat, exotic plant management may affect, but is not likely to adversely affect, the northern spotted owl.

Due to a limited amount of herbicide use in riparian habitats on an annual basis, exotic plant management may affect, but is not likely to adversely affect chinook salmon, coho salmon, or steelhead, nor is it likely to result in destruction or adverse modification of designated critical habitat for these species.

Due to the increase in people presence along stretches of beach in proximity to peregrine falcon eyries outside the nesting period, but when fledglings and adults may still remain in the area, exotic plant management may affect but is not likely to adversely affect, the peregrine falcon.

Exotic plant management would not affect the marbled murrelet, marbled murrelet designated critical habitat, or the bald eagle.

VIII. MANAGEMENT RECOMMENDATIONS

There are no management recommendations.

VIX. CONTRIBUTORS

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PERSONAL COMMUNICATIONS

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Anderson, David. Fishery Biologist. Redwood National and State Parks, Orick, CA

Chamberlain, Charles. Senior Fishery Biologist. Yurok Tribe, Hoopa, CA

Diller, Lowell. Research Biologist, Simpson Timber Co., Korbey, CA

Golightly, Rick. Professor, Humboldt State University, Arcata, CA

Goldsmith, Greg. Fishery Biologist. US Fish and Wildlife Service, Arcata, CA

Harris, Stan. Professor Emeritus. Humboldt State University, Arcata, CA

Hofstra, Terry. Resources Management and Science Division Chief. Redwood National and State Parks, Orick CA.

Mattoon, Sterling. Chico, CA

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Rovai, Phil. State Park Ranger. Orick, CA

Strachan, Gary. Chief Ranger. Ano Nuevo State Reserve, Pescadero, CA

Watkins, Jim. Biologist, US Fish and Wildlife Service, Arcata, CA

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

Zielinski, Bill. Research Ecologist, USDA Forest Service, Arcata, CA

Appendix A. Exotic Plant Control Strategy outline used to guide RNSP staff in setting priorities for exotic plant management.

1. *Present in region but not in park.*
 - Ask whereabouts from cooperating agencies and landowners.
 - Place on a Watch List -- Educate park staff to seek and report.
 - Track spread if near park.
 - Prevent establishment inside park.
 - Avoid need for later control.
2. *Present in park as individuals or small, localized populations.*
 - If infestation is new, alert cooperating agencies and landowners.
 - Remove by hand.
 - Maintain a record of actions.
 - Monitor removal sites.
 - Follow up as needed.
 - Diligence keeps costs low.
3. *Present as large infestations in parts of park. Native plant communities are disrupted and native species displaced from infested areas.*
 - Remove outliers first.
 - Eliminate seed bank in outlier areas after removing plants.
 - Map large infestations. Plan larger attack projects. Cost permitting, implement one or more large-scale projects, as follows:
 - Contain spread to within infested areas.
 - Reduce the number and size of infestations.
 - Restore native species to bared sites.
 - Minimize dispersal and re-infestation.
 - Treat smallest, furthest outlying areas. first.
 - Eliminate larger infestations, moving from fringes toward the source of seed dispersal.
4. *Present as continuous infestations within and beyond park boundaries. Displaces many or all native plants in areas of infestation.*

Complete control may be possible, but only by a coordinated, comprehensive effort between parks and neighboring agencies and land managers. Extensive planning and provision for public comment are needed. New and applied research may be required before control is possible or cost effective. Ways to share costs of eradication on a regional scale will be pursued. If costs are unreasonable, it may be possible only to restore and protect certain critical park areas from infestation. Control steps will be similar to 3.

Appendix B

HAZARDOUS SUBSTANCE CONTINGENCY PLAN

1. Precautions or preventative measures to be taken:

Heavy Equipment

Prior to daily operations, all equipment operators will visually inspect their machinery to identify potential sources for spills. Hoses, caps, etc. will be inspected to assess integrity. Any and all suspect situations will be remedied before the equipment is operated.

Equipment will be cleaned and repaired (other than emergency repairs) at an established maintenance facility. All contaminated water, sludge, or other hazardous compounds will be disposed of at a lawfully permitted or authorized destination.

Lubricating Oils

All lubricating oils and hydraulic fluids will be stored in proper, approved containers. All containers will be securely capped or sealed when in storage, and protected from the rain. Because of the presence of residuals, all empty hydrocarbon containers, oily rags, etc. are to be disposed of in accordance with existing hazardous material regulations.

Fuel

All fuel containers will be located in stable, secure locations that are chosen to minimize the potential for a spill and the impact to resources should a spill occur. Valves, caps, hoses, etc. will be routinely inspected. Any identified problems (or potential problems) will be promptly fixed.

Streams and Waterways

No maintenance or fueling activities shall be permitted within 200 ft of a stream.

Fueling and Servicing

Absorbent materials will be placed on the ground beneath the equipment to catch any fuel or lubricants that may leak during fueling.

2. If a spill occurs:

A spill kit will be readily available (on hand) in the event of a spill, and appropriate materials provided in the kit will be used to contain and absorb the spill. These materials will continue to be used until such time as the hazardous material is completely removed or a HAZMAT specialist takes over the spill treatment. Spills in the sand will be quickly contained by shoveling contaminated sand into large buckets. Once the spill is treated, all material used during cleanup will be removed from the site and disposed of in accordance to proper handling guidelines for hazardous material.

In the event of equipment breakage which results in a spill, repairs will be carried out in such a way as to prevent further spillage. Containers and absorbent materials will be used to capture fluids during hose removal and replacement, filter replacement, routine maintenance, etc. If equipment breaks proximal to or within a watercourse, the equipment is to be removed, if possible, from its proximity to the waterway before initiating repairs. If equipment cannot be removed, devices for total containment of potential spills associated with repairs will be in place to insure the protection of the watercourse. All captured material will be properly contained and disposed of.

Notification Requirements

The following authorities (as appropriate) shall be immediately notified of the release of hazardous substances into the environment. Notifications will normally be made by a Chief Ranger or project manager.

Redwood National & State Parks (707) 464-6101

Park Personnel Notification List

NPS Superintendent (Chaney)	465-7301
CDPR Superintendent (Lynn)	465-7330
Chief Ranger (Grediagan)	465-7302
Supervisory Ranger (Farley)	465-7750
Chief of Maint. (Cozby)	465-7303
Chief of Resources (Hofstra)	465-7700
Jason Haberman (HAZMAT Coordinator)	465-7375

County Agencies

Del Norte Sherriff, Crescent City, CA **911** or 707-464-4191
Humboldt Sherriff, Eureka, CA **911** or 707-445-7251
Del Norte County Health Dept. 707-464-7227
Humboldt County Health Dept. 707-445-6200

Fire Departments

Del Norte and Humboldt Fire Departments are dispatched by dialing **911**
Eureka FD (only public HAZMAT unit on North Coast) 707-441-4044

State Agencies:

California Highway Patrol (Arcata Dispatch)	707-822-5981
California Dept. of Fish and Game (M-F,8-5) (Eureka)	707-445-6493
CDF&G OSPR Dispatch (Office of Spill Prevention and Response)	916-445-0045
CALTRANS (Crescent City)	707-464-1751
DPR Northern Communications Center (NORCOM)	916-988-9830
Regional Water Quality Control Board	707-576-2220
California Office of Emergency Service	800-852-7550

Federal Agencies:

1. National Response Center 800-424-8802
2. Pacific Great Basin Support Office Environmental Management Program Coord. (EMPC) 510-817-1376
(Steve Mitchell)
3. Support Office Facilities Manager 510-817-1384 (Jack Williams)
4. DOI- Office of Environmental Policy and Compliance 510-817-1476 (Pat Port)
5. Deputy Regional Director 510-817-1305 (Patty Neubacher)
6. U.S. Coast Guard 707-464-2172 (day) 707-455-2055 (night)

Notification Information

To the extent possible, the following information should be obtained and provided to assisting agencies:

- 1) Date and time the incident occurred or was discovered.
- 2) Specific location of the spill.
- 3) Name (or placard number) of material spilled or released.
- 4) Source of the spilled material.
- 5) Cause of the release.
- 6) Total quantity released.
- 7) Whether the material was released to the air, ground, water or subsurface.
- 8) Amount spilled into water, if applicable.
- 9) Water conditions.
- 10) Weather conditions.
- 11) Name, address, and telephone number of reporting party.
- 12) Name of party and or individual responsible for the incident.
- 13) Mailing address of the responsible party.
- 14) Telephone number of the responsible party.
- 15) Identifying numbers of responsible vehicle, and vehicle information including the driver's name and address.
- 16) Name of carrier.
- 17) Number and type of injuries or fatalities, and expected exposure.
- 18) Whether evacuations have occurred or should occur.
- 19) Estimated dollar amount of property damage, and extent of damage.
- 20) Description of cleanup action taken and future plans.
- 21) Other agencies that have been notified or will be notified.

**Redwood National and State Parks
Exotic Plant Management Program
Project Tiering Form**

Today's Date:

Project Name:

Project Location:

Proposed Implementation Date(s):

Brief Description of Methods (include access, disposal, or any associated activities):

Project Leader (name and phone extension):



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Region
501 West Ocean Boulevard, Suite 4200
Long Beach, California 90802-4213

MAR 30 2007

In response refer to:
2006/07319

Mr. Steve Chaney
National Park Superintendent
Redwood National and State Parks
1111 Second Street
Crescent City, California 95531

Dear Mr. Chaney:

On March 1, 2007, NOAA's National Marine Fisheries Service (NMFS) received a February 20, 2007, letter and biological assessment (BA) from Steve Chaney, National Park Service (NPS) and Bruce Lynn, California Department of Parks and Recreation (CDPR), requesting informal consultation on Exotic Plant Management pursuant to section 7(a)(2) of the Endangered Species Act (ESA) and its implementing regulations, 50 CFR § 402. This letter constitutes completion of informal consultation on Exotic Plant Management for the following threatened species and their designated critical habitats under the ESA: (1) Southern Oregon/Northern California Coast (SONCC) coho salmon (*Oncorhynchus kisutch*) Evolutionarily Significant Unit (ESU; June 28, 2005, 70 FR 37160); (2) California Coastal (CC) Chinook salmon (*Oncorhynchus tshawytscha*) ESU (June 28, 2005, 70 FR 37160); (3) Northern California (NC) steelhead (*Oncorhynchus mykiss*) Distinct Population Segment (January 5, 2006, 71 FR 834); (4) critical habitat for SONCC coho salmon (May 5, 1999, 64 FR 24049); (5) critical habitat for CC Chinook salmon (September 2, 2005, 70 FR 52488); and (6) critical habitat for NC steelhead (September 2, 2005, 70 FR 52488). SONCC coho salmon, CC Chinook salmon, NC steelhead, and their designated critical habitats are likely to occur in the action area, and were considered in this consultation. The Project is proposed to be implemented throughout Redwood National and State Parks (RNSP) within Humboldt and Del Norte Counties, California.

CONSULTATION TO DATE

The continuation of the exotic plant management program was discussed at an interagency consultation team (ICT) meeting in 2006. The ICT is a part of the streamlining process established through a Memorandum of Understanding between NMFS, NPS, CDPR, and U.S. Fish and Wildlife Service to facilitate and encourage early involvement by the agencies. Other technical assistance was provided by NMFS in telephone conversations and review of a draft BA.



GENERAL DESCRIPTION OF THE PROPOSED ACTION

The following is a summary of proposed exotic plant management activities within the next 5 years, from 2007 through 2011. Control activities may occur year round, but would be seasonally restricted where necessary to protect threatened and endangered species or their habitats (see “Measures to Minimize Impacts” in the BA), or to protect sensitive resources. Treatment of exotic plants generally occurs in small areas throughout RNSP, and new locations are likely to be discovered and treated each year. Estimates of acreages covered and locations of exotic plant species are provided in the BA and incorporated by reference.

Mechanical Control with Heavy Equipment

Heavy equipment, including excavators, bulldozers, and backhoes would be used in areas where exotic plant densities are high, native species are few, impacts to other natural resources from use of heavy equipment would not occur, and manual removal is not feasible. A backhoe would remain on a hardened or disturbed surface at developed sites and along roads during exotic plant excavation. The treated cut bank would be mulched with either locally collected straw from the prairies or certified weed-free alfalfa hay, and allowed to revegetate naturally.

No heavy equipment would be used in riparian habitats in watersheds with listed salmonids, or in riparian areas with a hydraulic connection to salmonid-bearing watershed. The creeks flowing across Gold Bluffs Beach where heavy equipment would be used do not contain these species. No shade-producing exotic plant species would be removed from riparian habitats. All species targeted for treatment in these areas are shade tolerant, *e.g.*, English ivy (*Hedera helix*), or do not contribute substantial amounts of shade to a stream, *e.g.*, jubata grass (*Cortaderia jubata*).

Mechanical Control with Power Tools

Power tools such as chainsaws, weed whackers, mowers, wood chippers, and vehicle winches would be used where feasible to accomplish eradication. Chainsaws or other power tools may be used to remove thickets of Himalayan blackberry (*Rubus discolor*), jubata grass (*Cortaderia jubata*), or cotoneaster (*Cotoneaster franchetti* and *C. pannosa*). A chainsaw, weed whacker, or other hand tool would be used to cut back the saw-toothed leaves of jubata grass and permit access to the roots.

Manual Removal

Shovels, pulaskis, loppers, weed wrenches, grip hoists, and machetes would be used to manually remove herbaceous and shallow-rooted exotic species. European beachgrass (*Ammophila arenaria*) and jubata grass would be manually removed between the Redwood Creek estuary and Mussel Point, and along Gold Bluffs Beach outside of those areas requiring treatment with heavy equipment, or where sensitive plant species are present. Other invasive beach species would be manually removed, and on bluffs on non-rainy days when soils are likely to be most stable. Freshwater Spit, and the beach between Ossagon Creek and Carruther’s Cove are locations where manual removal will occur.

Burning is another manual control method that would be used to control a variety of species at Hiouchi Flat, Gold Bluffs Beach, and Lyon's Ranch/Coyote Creek. Burning entails a backpack housing, a propane tank, and a gas vapor torch to apply a flame that is used to pass intense heat over a plant's leaves, which kills it. It is used when the ground and vegetation are too wet to carry fire.

Herbicide Use

Herbicides are considered for control of high-priority invasive species, but only when all other control techniques (mechanical, manual, cultural, and biological) are considered ineffective, or not feasible. All proposals for herbicide use in the NPS must go through a review and approval process that includes the NPS' Integrated Pest Management (IPM) coordinator and regional IPM coordinator. Herbicide use would be conducted in compliance with NPS IPM guidelines [e.g., U.S. Department of the Interior (USDI 1991)] and CDPR state manuals and regulations. Herbicides would be applied under the direction of Certified Pesticide Applicators on staff at RNSP or other qualified NPS or CDPR personnel. RNSP proposes to use three herbicides: (1) glyphosate in the form of Aquamaster; (2) aminopyralid in the form of Milestone; and (3) triclopyr in the form of Garlon 4.

Glyphosate (Aquamaster)

Glyphosate would be applied in riparian areas of smaller watersheds, e.g., Prairie Creek, Wilson Creek, Espa Lagoon, Lagoon Creek), riparian areas of larger watersheds (e.g., Redwood Creek, Smith River), or in upland areas outside of riparian areas. Canada thistle (*Cirsium arvense*), bull thistle (*C. vulgare*), silver wattle (*Acacia dealbata*), bird cherry (*Prunus padus*), Jubata grass, Himalayan blackberry (*Rubus discolor*) and giant knotweed (*Polygonum sacalinense*) are species that occur in riparian areas that will be controlled by glyphosate. The total area to be treated per year will be limited, based on staffing and environmental conditions. A maximum of 10 acres per year for larger watersheds, and 10 acres per year for smaller watersheds, would be treated by direct application of glyphosate throughout RNSP. Foliar application of 2 acres and 5 acres maximum would be allowed annually in smaller and larger watersheds, respectively. Together these two methods result in a maximum total of 20 acres treated throughout RNSP in a year.

Direct Application

Hiouchi Flat is the primary location where glyphosate is proposed for use by direct application. Much of RNSP's use of glyphosate would involve this method, which involves either dabbing or applying it directly on to a cut surface, or by injecting it directly into a drilled hole in a woody stem or cane with a specialized needle. The herbicide is transported through the phloem to the plant's root system.

Foliar Application

Glyphosate would be applied to target exotic plant species using a backpack sprayer with the spray nozzle set to produce a coarse spray or stream, minimizing the potential for drift. This would be used to control grasses and some broadleaf woody and non-woody species in various

locations. Spraying is only conducted when wind is 5 miles an hour or less, and when imminent rainfall is not expected.

Prescribed Burning Followed by Herbicide Application

This method will be tested as a pilot project in the area of Espa Creek, which is not a fish-bearing stream, in the southern section of Gold Bluffs Beach, to eradicate beachgrass. Up to 15 acres of beachgrass may be included in the pilot project area. Additional acres, depending upon success of the pilot project, would be treated adjacent to the Carruther's Cove project area to increase the contiguous area of restored beach habitat treated. Sensitive resources, including wetlands and streams, would be excluded from the burn. A water tender or Type III engine would remain on Gold Bluffs Beach Road as a precaution in the event that the prescribed burn becomes a wildland fire. Other equipment used would include one four wheel drive pickup with a slip-on water tank parked close to the burn area, drip torches, and hand tools, including McLeods, shovels, pulaskis, and rakes. A second vehicle with a slip-on water tank would be parked on the waveslope. In more remote areas of the beach, *i.e.*, beyond the terminus of Gold Bluffs Beach Road, a 1,000 gallon fold-a-tank would be transported and left on site as a precaution in lieu of the water tender or larger engine.

After the beachgrass is burned (in the summer or fall), the grass would be allowed to grow to a height of at least 12 inches. Glyphosate, with a non-ionic surfactant and dye (to ensure complete coverage), would be applied by one or two Certified Pesticide Applicators using a backpack sprayer in accordance with directions on the manufacturer's label and when wind is 5 miles an hour or less.

Aminopyralid

Aminopyralid has been approved for use in upland habitats, seasonally dry wetlands, and transitional areas between upland and lowland sites. It would be applied on broadleaf weeds in upland locations (at least 0.25 miles away from the Redwood Creek estuary) in the Bald Hills, along coastal bluffs, and in seasonally dry wetlands. A non-ionic surfactant approved for use by the Environmental Protection Agency (EPA) would be added to enable the aminopyralid to penetrate the plant's waxy cuticle. Foliar application would be through a coarse spray when imminent rainfall is not expected, and during times when wind is 5 miles per hour or less, minimizing the potential for drift.

Triclopyr

Triclopyr has not been approved for use in aquatic environments; therefore, use would be restricted to a few very specific upland locations in the Bald Hills, well away from any perennial water sources and only in the early, dry summer season when rain is not anticipated. It would be used under limited circumstances to control Himalayan blackberry when mowing of thickets, and other methods such as grubbing and digging, are not effective or feasible. Approximately 4 acres in total would be treated incrementally over the 5-year duration of the Project. Foliar application would be through a coarse spray when imminent rainfall is not expected, and during times when wind is 5 miles per hour or less, minimizing the potential for drift.

EFFECTS OF THE ACTION

Potential sources of effects of the Project include: (1) sediment entering streams resulting from run-off being generated due to digging with hand tools, hand pulling, and burning plants with a gas torch in riparian areas; (2) petroleum products from heavy equipment and power tools entering the environment should a spill occur; (3) increased insolation and light levels resulting from riparian plant removal; and (4) chemical herbicide used in riparian habitats getting into ground or surface water.

The Project will be beneficial to the ecosystem in general. By eradicating non-native plants, native plants will be able to return and carry out ecosystem functions that support native wildlife, fish, and the food web.

Sediment and Turbidity

Use of heavy equipment to control exotic plant species could result in sediment mobilization into watercourses. However, because all heavy equipment would remain on a hardened or disturbed surface at developed sites and along roads, the treated cut bank would be mulched, and no heavy equipment would be used in riparian habitats in watersheds with listed salmonids or in riparian areas with a hydraulic connection to salmonid-bearing watershed, NMFS does not believe that any sediment will be delivered to streams that support listed anadromous species.

Most exotic species targeted for manual removal are in upland locations away from streams. In addition, bare ground that has been exposed after exotic plant removal by digging or hand-pulling would be covered with thatch consisting of dried grass stems and native plant seeds gathered by hand from the adjacent area. This will minimize erosion and sediment delivery to streams, ensure that exotic plants do not recolonize the site, and allow native species an opportunity to fill in the disturbed site. The amount of sediment that would be generated and delivered to watercourses by hand pulling and digging, and burning with a gas torch is expected to be negligible.

Pollution from Petroleum Products Used in Heavy Equipment and Power Tools

Spill plans and best management practices for managing petroleum products should minimize the probability of runoff of hazardous materials in the unlikely event of a spill associated with power tools or heavy equipment. See Appendix B of the BA (RNSP 2007) for the Hazardous Substance Contingency Plan, which details preventative measures, what to do if a spill occurs, and notification information.

Decreased Stream Shading and Increased Water Temperatures

Most of the exotic plants to be removed from streambanks and adjacent areas are shade tolerant, or contribute little shade (*i.e.*, jubata grass). Removal of the exotic plants will not result in decreases in stream shade, increases in stream temperatures, or increased insolation to the creeks.

Chemical Contamination

Because aminopyralid is relatively immobile in soil, with most of the chemical remaining within the upper 12 inches of the soil profile, and would only be applied in uplands and wetlands when they are seasonally dry, NMFS does not believe that any aminopyralid will be delivered to listed salmonid habitat.

Use of triclopyr will be limited to a few upland locations in the Bald Hills, well away from any perennial water sources. Because of lack of mobility, adsorption to soil with time, and short persistence, forestry applications of triclopyr have been found to be made without harm to nearby streams with the use of buffer zones (Ganapathy 1997). Therefore, NMFS does not believe that any triclopyr will be delivered to listed salmonid habitat.

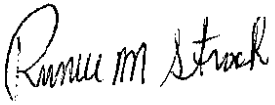
The glyphosate application methods proposed include direct application onto a plant by dabbing it onto cut surfaces, or injecting it into a drilled hole in the stem. Direct application reduces the likelihood of the herbicide contacting soil. The foliar application method is accomplished using a backpack sprayer set to a coarse stream which is applied directly to each leaf surface to minimize the potential for drift. This method would only be used when wind is minimal and no rain is forecasted. Glyphosate has been well-studied relative to its toxicity to fish and other animals. In general, the available field and laboratory data indicate glyphosate adsorbs strongly to soil and would not be expected to move vertically below the 6-inch soil layer (EPA 1993), making it unlikely to end up in surface or sub-surface runoff. Glyphosate degrades to aminomethyl phosphoric acid under aerobic soil conditions, with a half life of 1.85-2.06 days, which then degrades into carbon dioxide (Patterson 2004). Based on various tests, technical glyphosate ranges from slightly toxic to practically non-toxic to freshwater fish species (EPA 1993, Monsanto 2005).

CONCLUSION

For the reasons described above, NMFS concurs with RNSP's determination that Exotic Plant Management may affect, but is not likely to adversely affect, SONCC coho salmon, CC Chinook salmon, NC steelhead, or their designated critical habitats. This concludes informal consultation on Exotic Plant Management in accordance with 50 CFR § 402.14(b)(1). However, further consultation may be necessary if: (1) new information reveals effects of the action that may affect listed salmonids or their critical habitats in a manner or to an extent not previously considered, (2) the identified action is subsequently modified in a manner that causes an effect to listed species or critical habitat that was not considered, or (3) a new species is listed or critical habitat designated that may be affected by the identified action.

Please contact Ms. Wendy Cole at (707) 825-5169, or via email at wendy.cole@noaa.gov, if you have any questions regarding this consultation.

Sincerely,


 Rodney R. McInnis
 Regional Administrator

cc: B. Lynn - CDPR
 K. Schmidt - RNSP
 Copy to file – ARN 151422SWR2007AR00108

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