

**A Biological Assessment of Impacts to
Terrestrial Threatened and Endangered Species from the
Middle Fork Lost Man Creek Forest Restoration Plan
in Redwood National Park (RNP)**

November, 2011

I. INTRODUCTION

The purpose of this biological assessment (BA) is to review the Redwood National Park (RNP) Middle Fork Lost Man Creek Forest Restoration Plan to determine if the proposed action may affect any terrestrial or non-anadromous aquatic threatened, endangered or candidate species and/or their critical habitats. This biological assessment is prepared in accordance with legal requirements set forth under section 7 of the Endangered Species Act (19 U.S.C. 1536 (c), 50 CFR 402), and meets the criteria for formal consultation with the United States Fish and Wildlife Service (USFWS). It is expected that this assessment will have a life span of five years, from 2012 through 2017. The project will take two years to complete, but the exact funding years are uncertain.

II. CONSULTATION TO DATE

Redwood National Park (RNP) receives lists from the Arcata Fish and Wildlife Service Office identifying the endangered, threatened, and candidate species that may be present or may be affected by park activities. The most recent list is dated 31 May 2011, (Ref. Doc. No. 695620425-121457). This list includes 29 species currently listed as threatened, endangered or candidates in Humboldt and Del Norte Counties.

Critical habitat has been designated for ten species on the list. Critical habitat for chinook and coho salmon and steelhead trout occurs within RNP.

Anadromous Fish Species

Effects from proposed projects to California coastal chinook salmon (*Oncorhynchus tshawytscha*), southern Oregon/northern California coho salmon (*Oncorhynchus kisutch*) and northern California steelhead trout (*Oncorhynchus mykiss*) and their critical habitat and Southern eulachon (*Thaleichthys pacificus*), have been assessed through a separate consultation with NOAA Fisheries and will not be mentioned further in this document.

Other Ongoing and Recent Past Pertinent Consulted Management Actions in Action Area

Trail and Backcountry Management Plan (USFWS ref. no. 8-14-2003-1517). Visitor use of the Lost Man Creek Trail/Geneva Road/Holter Ridge Road.

Lost Man Creek Watershed Restoration Plan (USFWS ref. no. 8-14-2006-2836). Old logging road removal throughout entire project area.

Annual Maintenance Activities (USFWS ref. no. 1-14-98-24). Annual maintenance of the Lost Man Creek Trail/Geneva Road.

2010 Fire Management Plan (USFWS ref. no. 8-14-2008 and 81331-2009-I-0070).
Creation of a shaded fuel break along Lost Man Creek Trail/Holter Ridge Road.

South Fork Lost Man Creek Second Growth Management Plan (USFWS ref. no. 8-14-2004-2133 and 81331-2008-F-0027). Second growth forest thinning project cover approximately 2,000 acres immediately to the south of the proposed project area. Project was very similar to proposed action described in this document.

Current Consultation

RNP Supervisory Botanist Leonel Arguello and Forest Ecologist Jason Teraoka first presented the basic parameters of this plan to the USFWS and NOAA Fisheries at an interagency consultation team meeting on 2 February 2011. Primary concerns voiced by the USFWS were the preservation of residual old-growth redwood (*Sequoia sempervirens*) trees scattered throughout the project area and limiting noise disturbance in areas within 0.25 miles of the suitable, high quality marbled murrelet (*Brachyramphus marmoratus*) and northern spotted owl (*Strix occidentalis caurina*) habitat immediately to the northwestern corner of the project area.

III. CURRENT MANAGEMENT DIRECTION

RNP is managed as part of the Redwood National and State Parks (RNSP) complex. RNSP are located in Humboldt and Del Norte Counties in northwestern California and encompass 135,000 acres of land. Numerous federal and state laws, regulations, and policies guide management.

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

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

The General Management Plan/General Plan and Environmental Impact Statement/Report for Redwood National and State Parks (USDI and CDPR 2000) provides comprehensive guidance for managing the national and state parks as one complex with similar resources. The General Management Plan/ General Plan (GMP) provides overall vision and direction for the parks and identifies future planning needs. Under the GMP, the agencies will emphasize the protection of resources and will also provide a variety of opportunities for visitors to enjoy the parks. New visitor services and facilities will be provided to enhance the visitor experience if these services and facilities do not impact sensitive resources. The park agencies will cooperate with adjacent communities and landowners, local American Indian tribes, and other government agencies to accomplish long-range resource management planning to reduce threats to park resources. Hiking, mountain biking, and camping are currently important components of the activities available to people that visit RNSP. No areas within RNSP are closed to visitor use but many areas are managed to exclude public use of motor vehicles and bicycles.

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

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

Section 7(a)1 of the Endangered Species Act (ESA) of 1973, as amended, requires that federal agencies utilize their authorities in furtherance of the purposes of the ESA by carrying out programs for the conservation of endangered and threatened species. Section 7(a)2 of the ESA requires that a federal agency, in consultation with and with the assistance of the Secretary of the Interior, ensures that any action it authorizes, funds, or

carries out is not likely to jeopardize the continued existence of any listed species or results in the destruction or adverse modification of critical habitat. Specific management direction for each of the listed threatened, endangered, or proposed species considered in this document is reviewed in Section V, “Status and Distribution of Listed Species”.

IV. DESCRIPTION OF THE PROPOSED ACTION

Description of Action Area and Project Area—

The action area for this analysis is 0.25 miles beyond the proposed forest treatment area or project area area (Appendix 1). The action area for the proposed restoration project is approximately 2,106 acres (1,826 acres within RNP, and 280 acres occur on land owned and managed by Green Diamond Resource Company, Inc.). The project area is approximately 1,105 acres.

A. Existing Conditions

The Middle Fork Lost Man Creek Forest Restoration Plan (hereafter referred to as the FRP) project area is located within the redwood forest zone where natural, old-growth stands are dominated by redwood and lesser components of Douglas-fir (*Pseudotsuga menziesii*), tanoak (*Lithocarpus densiflorus*), western hemlock (*Tsuga heterophylla*) and grand fir (*Abies grandis*). The project area is also within the marine influence climate zone within RNP which is dominated by wet winters and relatively damp, foggy summers as compared to more inland portions of the parks. The project area was logged with a clear cut or seed tree prescription in the 1950’s through the 1960’s. Reforestation methods included either aerial seeding with Douglas-fir or natural, unassisted regeneration. No other forest management has occurred in the project area since the initial harvest and reseeded. Stands within the project area are now densely stocked with smaller trees (Table 1) with some areas containing various densities of scattered “legacy” old-growth redwood trees (Appendix 1) left as seed trees. Most of the project area is dominated by Douglas-fir with varying percentages of redwood, tanoak, western hemlock, grand fir and red alder. Unharvested, old-growth redwood forest is present along the northwestern corner of the action area. The eastern border of the action area extends onto private commercial timberlands that are comprised of second and third growth conifer stands ranging in age from 0 to 60 years. The northern border of the action area extends into stands that are identical in size class and composition to the project area (Appendix 1). The project area has been previously managed as part of the Lost Man Creek Watershed Restoration project (USFWS ref. no. USFWS ref. no. 8-14-2006-2836). That project removed 4.9 miles of old logging roads throughout the proposed action project area (Appendix 1).

Table 1. Estimated existing tree density and size in the Middle Fork Lost Man Creek Forest Restoration Plan project area. Residual old-growth trees are too scattered to be sampled accurately and are best represented on maps. Unit and old-growth residual locations shown in Appendix 1.

Stand Name	Estimated Number of Trees in Each DBH Size Class Per Acre		
	6-17 inches	18-36 inches (size of largest tree)	36+ inches (size of largest tree)
Unit S	424	45 (27)	0 (27)
Unit T	493	20 (20)	0 (20)
Unit U	342	43 (36)	1 (40)
Unit V – East	427	21 (31)	1 (40)
Unit V – West	380	31 (27)	0 (39)
Unit R2	326	48 (30)	1 (39)

B. Proposed Action

Please note - a summary list of minimization measures described in detail in the following paragraphs is located at the end of the Proposed Action section.

The goal of the FRP is to create conditions by which existing second-growth stands in the project area will attain old-growth redwood forest characteristics more quickly than would occur through unmanaged forest development. This goal will be accomplished by increasing tree growth rates through the thinning of existing stands as well as changing tree species composition by preferentially removing tree species which are non-native or are overly represented when compared to native, unmanaged old-growth redwood forest. Three major types of forest management operations, ground-based yarding/skyline cable yarding, variable density thinning, and lop and scatter will be used based primarily on steepness of slope and/or distance from access roads. Prescriptions generally vary by forest management operation type. Conservation based variations on these three major forest management operation types will be based on proximity to intermittent and permanent streams and wetlands, proximity to individual residual old-growth trees and proximity to contiguous stands of old-growth forest. A general description of the three management operations is given first followed by a description of minimization measures common to all or some of the three operation types.

1) Ground-Based and Cable Yarding Operations (with cable-yarding and lop-and – scatter options)

Ground Based Yarding

There will be two silvicultural methods used for ground-based operations: low thinning and variable-density thinning. These areas have slopes less than 35% and cover approximately 392 acres of the project area.

Table 2. Ground-based yarding with low thinning prescription units and their size. Unit locations are shown in Appendix 1.

Unit	Acres
R1	17.0
S1	36.1
T1	57.4
U	57.0
V1	124.6
W1	35.2
X	64.7
All	392

The primary silvicultural method used for most ground-based operations will be low thinning (thinning from below) which removes trees in the lower crown classes (i.e. suppressed, intermediate, and co-dominant crown classes) to benefit trees in the upper crown classes (i.e. co-dominant and dominant). A 40% reduction in basal area will be used. The intent is to reduce overall stand densities to levels that would primarily stimulate stand growth and development, to release dominant trees, to improve conditions for development of understory vegetation, improve stand level representation of redwood, and minimize woody debris accumulation on the forest floor.

Low thinning will primarily target Douglas-fir from 5” to 20” diameter-at-breast-height (dbh) (partial removals from 16” to 20” dbh) and would remove less than 300 trees per acre (average approximately 275 trees/ac). To meet the 40% basal area target, smaller diameter Douglas-fir will be culled from the stand by first removing trees 5 inches in diameter and working up the size classes until the target stand basal area is met. Selected overstory trees would be removed based on maximizing response and release of redwood trees and other desired conifers. Although redwoods are not specifically targeted for removal, some may be cut on skid trails to provide access for equipment into the stand. Small diameter tanoak (12” dbh or less) or other conifers (grand-fir and western hemlock) may also be cut on skid trails or within the unit to meet the stand basal area reduction target and release redwood. Tree removal on skid trails will count toward the stand basal area target reduction.

Biomass Treatment and Equipment Used for all Ground-Based Operations

All non-merchantable trees or trees that do not qualify as biomass fuel that are felled (Generally less than 5 inches dbh) will be lopped to get the wood in contact with the forest floor. This slash, along with limb wood from larger trees, will be used as ground cover after equipment operations are completed. All felled trees that qualify for saw timber or biomass fuel (generally trees larger than 5 inches dbh or greater) will be taken off-site to local mills or the cogeneration power plant. All trees will be felled using a fellerbuncher, harvester/processor or hand-felled with a chainsaw. Felled trees will be skidded whole-tree or in log lengths to a landing using a track skidder with grapple. Tire skidders may be used if appropriate (i.e. on a main non-rocked road or main skid trail corridors). Choker skidders may be used as long as the lead end of the logs are clear of the ground. At the landing, a processor will limb and buck the material into lengths appropriate for hauling to the mill or the cogeneration power plant. Tree tops and limbwood generated at the landing will be brought back out into the stand with a skidder and will be left on site. A loader will be used to load log trucks at the landing or a road.

Low thinning will be the silvicultural method used for cable-yarding operations. These areas have slopes greater than 35% and cover approximately 242 acres of the project area.

Table 3. Cable based yarding with low thinning prescription units and their size. Unit locations are shown in Appendix 1.

Unit	Acres
R2	93.5
T3	53.9
V2	43.3
V3	31.9
W2	19.3
All	241.9

Cable Based Yarding

The low thinning prescription outlined in “ground-based operations” will also be used in the cable yarder operations. The difference is heavy equipment and tree falling operations.

Biomass Treatment and Equipment Used for all Cable Yarding Operations

All felled trees that qualify for saw timber or biomass fuel (generally trees larger than 5 inches dbh or greater) will be taken off-site to local mills or the cogeneration power plant. All trees will be felled using chainsaws. Felled trees will be processed (cut to log length and limbed) using chainsaws prior to yarding. All non-merchantable trees, trees that do not qualify as biomass fuel that are felled, and all limb wood, tree tops and other material created from processing will be lopped to get the wood in contact with the forest floor. Merchantable trees or trees that qualify for biomass fuels will be cable yarded to a

landing, skid trail, or road using a cable yarder or yoader. Regardless of the type of skyline system used a slackpulling carriage will be used to skid felled trees to the main cable yarding corridor. Cable yarding corridors are generally not larger than 10 feet in width. Tailholds (anchors the end of a mainline) can be tree(s) or another piece of heavy equipment. If trees are used as a tailhold they will not be old-growth trees of any species; second-growth trees (preferable Douglas-fir) will be used. Heavy equipment may be used as a tailhold if appropriate. Guylines, which hold down larger yarders, will be anchored to old-growth stumps, second-growth stumps, or second-growth trees; old-growth trees of any species will not be used to anchor guylines).

Yoaders allow more flexibility for access and do not require the use of guylines. A yoader would use existing skid trails on flat areas (gentle slopes) to access steep areas (i.e. break-in-slope) for cable yarding. The general yarding distance would not exceed 600 feet. A track or tire skidder may be used to skid trees from the yoader station to a landing or road. A loader, at the landing site or road, will be used to load log trucks.

The traditional yarder to be use is called a “shovel yarder,” which allows more flexibility in access. Shovel yarders can be stationed at, and can yard from, small landings and road corridors (landing are not necessary if certain road conditions apply). The general yarding distance would not exceed 1,500 feet. A loader, at the landing site or road, will be used to load log trucks.

Regardless of skyline system, deflection, the vertical distance between the chord and the skyline measured at mid-span, will determine the amount of ground disturbance. In general, most of the ground disturbance will occur closer to the yarder as the wood drags along the break-in-slope.

2) Variable-Density Thinning (Ground-Based Yarding)

One unit, U – 57 acres (Appendix 1), will be treated using a variable-density thinning prescription. Variable-density thinning attempts to enhance spatial variability by varying the thinning intensity throughout the stand and inducing fine-scale variation the forest canopy. This is will be done by thinning at different intensities in patches at a scale of approximately 0.25 acres, which will create a mosaic of tree densities. The average basal area reduction within these patches will be 40% (leaving approximately 210 ft² basal area). True gaps, small areas where 100% reduction occurs will not be used; however, modified gaps, small areas less than 0.25 acre, will be created and will retain all redwoods regardless of size and any trees greater than 24” dbh (though the vast majority will be less than 20” dbh). For any modified gap that is created, a “skip” of the same size will be created. A skip is generally a zero percent reduction; however, a skid trail intersecting a patch selected as a skip may constitute up to a 10% reduction in basal area (by virtue of cutting the skid trail out).

Table 4. A summary of the percent basal area reductions (i.e. thinning intensity), the probability of selecting the thinning intensity, the approximate basal area retained (assuming 350 ft²/ac) and the corresponding # of acres to be treated (total acres = 57):

% Reduction in Basal Area	0 - 10 (Skip)	25	40	55	70 - 80 (modified gap)
Probability of Selection (%)	5	20	50	20	5
Approx. Basal Area Retained (ft ² /ac)	350 - 315	260	210	160	105 - 70
Approx # of acres to be treated	3	11	29	11	3

3) Lop-and-Scatter Prescriptions (with cable-yarding and ground-based options)

Crown thinning and/or low thinning will be the primary silvicultural methods used for lop-and-scatter operations. Alternatively, variable-density thinning (to be defined later) may be used if operational constraints can be overcome. If variable-density thinning is used, it will be similar in prescription as described in item 1, Table 2. These areas were defined because they may not be accessible either by ground-based operations or cable yarding operations, and thus slope classes throughout these areas vary. These areas cover approximately 414 acres of the project area.

Table 5. Lop and scatter crown thinning prescription units and their size. Unit locations are shown in Appendix 1.

Unit	Acres
R0	3.1
RV	75.9
TVX	68.5
VW	142.3
WX	123.9
All	413.7

Crown thinning (thinning from above) is a thinning method that removes trees in the upper crown classes (i.e. co-dominant and dominant trees) to benefit adjacent tree of the same crown classes. Up to 40% basal area reduction will be used in all areas regardless of slope and silvicultural method. Primarily, the intent is to stimulate growth and development (release) of dominant trees, improve stand level representation of redwood, and minimize fuel depth of woody debris.

Crown thinning would target the removal of Douglas-fir in the size class range from 8 to 20 inches dbh, and would remove, on average, 120 - 220 trees per acre. To meet the basal area reduction, larger diameter Douglas fir (up to 24" dbh, but the vast majority will

be restricted to 20" dbh and less) will be culled from the stand by first working down the dbh size classes until the target reduction is met. Selecting overstory trees to remove would be based on maximizing response and release of dominant redwood and/or other large conifers.

Low thinning would primarily target Douglas-fir from 5" – 20" dbh (partial removals from 16" – 20" dbh) and would remove less than 300 trees per acre (average 275 trees/acre). To meet the basal area target (up to 40%), small diameter Douglas-fir will be culled from the stand by removing most of the trees less 16" dbh. The selection of overstory trees for removal would be based on maximizing response and release of redwood trees and other desired conifers.

All tree felling will be conducted by contract hand crews using chainsaws. Trees to be cut will not be marked by park staff. Redwood trees are not targeted for removal for any lop and scatter operations. Some tanoak and conifers (not including redwood) may be removed, but only to release redwood. All felled trees will be limbed, bucked, and lopped so that the felled wood is in contact with the forest floor.

- Minimization Measures

Second growth trees under the dripline and out to 50 feet beyond the dripline of old-growth residual trees will not be treated if they extend to the lower branches of the old-growth tree. Trees under the height of the lowest live branch of residual old-growth trees can be cut according to the unit prescription. Where aggregates of residual trees occur, a polygon will be laid out around the outer edge of the outer trees' dripline and extend outward from there for 50 feet to demarcate where no treatment will occur. To be considered an aggregate, the residual tree canopies must be within 30 feet of each other. No damage from yarding activities (in units to be yarded) will be allowed to any tree within 50 feet of the dripline of any residual old-growth tree in order to provide further protection of the residual tree and the surrounding second-growth trees that will eventually provide cover for the canopy of the old-growth tree. No trees will be felled towards existing residual old growth trees or trees of outstanding character (i.e. broken tops, deformed tops, trees with obvious cavities, large hardwoods, redwood stump sprouts). No pre-existing woody debris will be removed from any unit. No broadcast burning or pile burning of slash will occur. Slash piling may occur with the intention of creating habitat for wood rats or other small mammals.

Crews with hand tools and heavy equipment will drive into the project area using existing roads, as close to project sites as possible. Hand crews will not be spike camping (i.e. establishing base camps) or staying on-site beyond normal work hours. Work is expected to occur year round with the exception of areas within 500 feet of the contiguous old growth forest and the two residual areas where occupancy was documented (based on past surveys) (Mad River Biologists 2001) in the northwestern portion of the project area (Appendix 1). No work will occur within these areas from March 24 through September 15. Work that generates above ambient noise levels will be conducted from 24 March

through 15 September and will be restricted to the time period from two hours after sunrise to two hours before sunset in the large residual old-growth cluster in the northeastern portion of the project area (Appendix 1). All contracts will contain language prohibiting the feeding of any wildlife and instructions to properly store and remove all human food and food waste. Protocol spotted owl and marbled murrelet surveys have been conducted in all areas containing suitable habitat in or within 0.25 mile of proposed work areas. Additional spotted owl surveys will be conducted if past surveys have passed the two year validation point. If spotted owls are detected during surveys then work that generates noises above natural ambient sound levels will not occur within 0.25 mile of the detection during the spotted owl noise restriction period (1 February through 31 July). If northern spotted owls are detected, then no thinning operations will occur during the period from February 1 through September 15 within the activity center stand or 70-acre core area surrounding the activity center.

Log trucks and equipment will access the project area via Bald Hills road, Holter Ridge road, A141, A121, A131. Roads may be watered to abate dust. Water tender operators will not be allowed to obtain water from creeks, springs, ponds, or other natural features in the park. No new roads will be constructed. Improvements to the A121 Road may occur, which would include rocking portions of the road that need armoring or rocking the entire road including pullouts. Rock would be taken from existing RNP quarries (i.e. Geneva Road borrow pit). Every attempt will be made to reoccupy existing skid trails to access trees in treatment units. All skid trails and landings will be decommissioned. There are three road corridors that will be reopened. All proposed corridors occur on flat ground. The Holter Ridge-to-A121-Connector needs to be reopened to allow log trucks access to the A121 road, and is 0.4 miles long. The A121 Spur Road needs to be reopened to allow access to northern section of the project area, and is 0.2 miles long. The Holter Ridge-to-A111-Connector needs to be opened to allow a yarder or yoader access to those units, and is 0.3 miles long. Reopening involves removing brush and small trees that have grown on the roadway. All existing roads will be decommissioned (mulched and winterized). All non-rocked road work and use will be completed during the normal operating season (NOS), that is, between June 15 and October 15 of each year. If more than 0.5 inches of rain is forecast during the NOS, project operations will temporarily cease and sites will be winterized. If periods of dry weather are predicted outside of the NOS, additional work may be done, if they can be completed within the window of predicted dry weather. Work sites will be winterized at the end of each day when significant rains are forecast that may cause exposed roads or landings to erode. Winterization procedures are supervised at all times by RNSP geologists and involve taking measures necessary to minimize erosion on exposed work surfaces. Winterization includes the following: grading exposed road and landing surfaces to allow water to freely drain across them without concentrating or ponding or rilling; installing rolling dips/drains to drain steeper sections of road; clearing clogged drains; and installing silt fences and other erosion control devices where necessary to convey concentrated water across exposed road and landing surfaces.

All hand tools and heavy equipment will be inspected daily to check for leaks. Equipment that may leak lubricants or fuels into a drainage will not be used until leaks

are repaired. All equipment will be stored, serviced and fueled outside of riparian areas and away from stream crossings. A spill plan and materials for spill containment will be available to onsite personnel and all personnel shall know how to use them. In the event of a spill, work will be stopped immediately, spill clean-up will begin immediately and the appropriate authorities will be notified as soon as practicable. Petroleum products, chemicals, deleterious materials, or water contaminated by the aforementioned will not be allowed to enter flowing waters.

Within 300 feet of old-growth forests in the northwestern corner of the project area, stand basal area will be reduced by $\leq 30\%$, primarily utilizing a uniform thin from below to reduce overall stem density. These areas cover approximately 9 acres of the project area (Appendix 1, Map 3). The intent is to maintain sufficient canopy cover to prevent rapid shrub proliferation and minimize the creation of food resources for corvids. Removal of trees would occur in the 5" to 15" dbh size classes, and would remove on average 150 trees per acre. It is anticipated that the average overstory cover will decrease from the existing 80% to 65% in the treated stand (J. Teraoka pers. comm.). Selection of canopy trees for removal would be based on maximizing release of dominant redwoods and other conifers to stimulate development of potential nest trees and nesting habitat components such as large branches and cover trees in this old-growth buffer area.

Post thinning sampling will be done in each of the various prescription areas to monitor shrub growth response. Sampling plots measuring 0.25 hectares will be placed randomly throughout the project area and shrub cover will be inventoried by species and relative abundance, and will be monitored for at least 5 years after thinning is completed.

Best management practices (BMP's) will be utilized in areas near streams and wetlands. The BMP's will be incorporated throughout the project area and will take place either in lieu of or in addition to the actions occurring in those areas.

BMP's to protect streams, riparian areas and wetlands will include:

- All trees contributing to channel and bank stability will be retained.
- All trees that lean towards a class 1 (third order) stream channel will be retained for large woody debris recruitment.
- All trees will be retained on unstable and potentially unstable areas, regardless of slope steepness and within the 50-foot-wide zone that surrounds the feature.
- Equipment will not operate in, long-line from, or cross channel features.
- Equipment will not operate in, long-line from, or cross swale features where slope steepness is greater than 30%.

Summary List of Minimization Measures –

Minimization Measures Common to All Prescription Areas:

- a) Surveys for presence of marbled murrelets have been conducted throughout action area.

- b) Surveys for presence of northern spotted owls have been and will be conducted throughout action area.
- c) During the marbled murrelet breeding season (24 March and 15 September), all chainsaw work occurring within 500 feet of unoccupied but suitable marbled murrelet habitat will occur only during the following daily time period: 2 hours after sunrise until 2 hours before sunset.
- d) Chainsaw work will not occur within 500 feet of known occupied or assumed occupied suitable marbled murrelet habitat during the marbled murrelet breeding season (24 March through 15 September).
- e) If northern spotted owls are detected during surveys, then all work that generates noises above natural ambient sound levels will not occur within 0.25 mile of the detection during the spotted owl noise restriction period (1 February through 31 July). If a northern spotted owl activity center is detected with chicks, then no tree removal will occur during the period from February 1 through September 15 within the activity center stand or 70-acre core area surrounding the activity center.
- f) No removal of any trees that extend to the lower branches of residual old-growth trees with 50 feet of the dripline of the residual old-growth tree. Where aggregates of residual trees occur, a polygon will be laid out around the outer edge of the outer trees' dripline and extend outward from there for 50 feet to demarcate the no treatment zone. To be considered an aggregate, the residual tree canopies must be within 30 feet of each other.
- g) No trees removed over 20 inches dbh and all trees with major top deformities will be retained.
- h) No trees will be felled towards residual trees or trees of outstanding character (deformed trees, large hardwoods, redwood stump sprouts).
- i) Felled trees and slash will not be broadcast or pile burned. Ground fuels will not exceed 24" in depth in any area unless intentionally creating a brush pile for wildlife.
- j) All existing downed woody material and snags will be retained.
- k) Thinning crews will not be spike camping within action area.
- l) All thinning crews will be instructed (and the provision will be incorporated into all contracts) to not feed any wildlife, not leave food scraps and to pack out all trash from action area and dispose of either outside of park or in wildlife proof trash containers.
- m) Best management practices will be used to prevent sedimentation of streams and stream bank instability.
- n) Road management will include a variety of measures to prevent sedimentation of streams.
- o) Before project activities begin, a qualified biologist will conduct a worker awareness training session, to alert forest restoration crew leaders of potential special-status species that may be present in the project area. The training will cover the natural history of marbled murrelet and northern spotted owl, their status, what they look like, and the measures being implemented to avoid adverse impacts. The trained crew leader(s) will act as the on-site biological monitor(s) during the proposed activities.
- p) If a northern spotted owl (live, dead or injured) is found in the project work area, the crew leader (acting as a biological monitor) will halt project activities and RNP and the USFWS will be contacted to determine how to proceed. Any northern spotted owl found in the project area will not be moved from where it was found, and forest restoration activities will resume only with the agreement of responsible agencies (i.e. RNP,

USFWS, California Department of Fish and Game).

V. STATUS AND DISTRIBUTION OF LISTED AND CANDIDATE SPECIES

Only northern spotted owls, marbled murrelets and Pacific fishers could potentially be impacted by the proposed action. No other non anadromous listed or candidate species potentially present within RNSP would be affected by the proposed action.

The status and distribution of three species potentially present within the action area are described after the general park-wide species accounts.

a. Northern Spotted Owl

A. Species Account

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

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

The first parks-wide inventory of suitable habitat was conducted between 1993 and 1995 (Tanner 1999). Up to 40 spotted owl territories were identified in Redwood National and State Parks (RNSP) during that original inventory. We currently track 39 territories (including three that were not part of the original inventory) in our spotted owl database. After 1995 park staff continued to survey some proportion of the suitable habitat in the parks annually. In each year 2001- 2004 approximately 50% of all suitable spotted owl habitat within the parks was surveyed, with approximately 65% of those acres in old-growth and 35% in second growth forests. The amount of suitable habitat surveyed declined beginning in 2005 and in 2007 only 10% of the suitable habitat acres in the

parks were surveyed. The reasons for the decline in survey coverage include indications from previous surveys that many of the historic owl territories are probably no longer occupied by spotted owls, or we are no longer able to detect them in their territories, and many of the historic spotted owl territories are now occupied by one or more barred owl (*Strix varia*) pairs or resident singles.

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

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

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

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

B. Habitat Status

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

developed intermediate and shrub canopy layers.

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

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

Within RNSP there are an estimated 41,000 ac (16,600 ha) of old-growth forest, all of which is considered suitable nesting, roosting, and foraging habitat. Many of the approximately 25,000 ac (10,117 ha) in the recently acquired Mill Creek watershed consist of a variety of second-growth stands in different age classes. There are 239 ac (97 ha) of old growth within the Mill Creek watershed. Approximately 37,100 ac (14,164 ha) of second growth forest is now ≥ 40 yrs old and may be suitable nesting, roosting, and foraging habitat. Two hundred and seventy acres (109 ha) of second-growth forest contain residual old growth trees in patches between 1 and 5 ac. Some proportion of these stands qualify as suitable nesting, roosting, and foraging habitat. Some proportion of the remaining 30,000 ac (12,140 ha) of second growth <40 yrs of age may be suitable for spotted owl foraging.

It should be noted that spotted owls also are known to successfully nest in previously harvested 30-80 year old redwood forests. Redwood stands are believed to develop characteristics of mature forests (thus, suitable spotted owl habitat) more rapidly than other stand types due to a variety of species-specific and coastal environment conditions (USDI 1990 and Thomas et al. 1990). In precommercially thinned forests on Green Diamond Resource Company (GDRC) land, including land adjacent to RNSP, spotted owls nested in stands with a median age of 59 years, with 83% of nesting pairs using stands between 30 and 80 years old (Foliard 1993). Conifer-dominated nest stands tended to have more basal area of large (>90 cm dbh) conifers and more vertical vegetation layers than in randomly sampled stands. Likewise nest trees in GDRC stands were usually dominant trees in the canopy or residual trees that were very large and older than the surrounding stand (Foliard 1993). In contrast, spotted owls are not known to use second growth stands for nesting in RNSP. Second growth in the parks differs from that

on GDRC land in that relatively few acres of previously harvested stands have been thinned. Many of the second growth redwood stands in RNSP are extremely dense, and are in a stem exclusion stage which causes mortality of smaller overstory trees and suppression of most understory regeneration and shrub communities (Bailey and Tappeiner 1998). These stands may not support spotted owl prey, supply adequate roost and nest sites, or allow for easy flight due to their high stem densities.

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

Specific to Action Area

There are approximately 1,800 acres of suitable habitat within the action area (excluding the private, Green Diamond Resource Company timber land to the east, which is of unknown quality and quantity). All of the action area will be surveyed for spotted owls from 2011-2012 and all of the area along the Lost Man Creek Trail/Holter Ridge Road has been continuously surveyed since 1998. Only barred owls have been recorded within the action area since 2005. The only spotted owl detections within the action area is the Lost Man Creek activity center (AC). The AC was discovered in 1993. No young have been recorded at this AC. A pair was present from 1993-1995 and in 2001. A single male was present in 1996, 1999-2000 and 2002. A barred owl pair was found in the AC in 2005-2006. The AC is considered inactive. Barred owls appear to occupy most of the action area (RNP unpub. data). It is unknown whether the lack of any historical spotted owl detections within the action is due to barred owl presence excluding spotted owls or whether the overall habitat quality of the project area stands.

The next closest AC is Little Lost Man Creek which is approximately one mile west of action area and approximately 1.25 miles from the project area. The AC was discovered in 1993. Two spotted owl young fledged in 1994 and 1998, one young fledged in 1993, a pair was present from 1999-97 and in 2000, a single male was present in 1999 and 2002 and the AC was vacant in 2001 and 2003-04. Single barred owls were present in 1993, 1999-2001 and 2004 (Schmidt 2005). A barred owl pair was present in 2005. The AC is considered active.

Approximately 1,800 acres of suitable spotted owl habitat exists within the action area. Suitable habitat is shown on Map 3 in Appendix 1. All of the project area to be thinned is considered to be suitable nesting, roosting and foraging spotted owl habitat according to RNP’s own definition (second growth stands >40 years of age) (USDI and CDPR 1999). The presence of residual old-growth trees in the suitable habitat areas dominated by conifers may contribute the suitability of the habitat. Conversely, the very high stem

densities and overall small average tree size of the conifers lack of heterogenous canopy structure and lack of terrestrial shrub growth (J. Taraoka pers. comm., RNSP unpub. data) of the surrounding second growth forest may lower the quality of the habitat.

Due to the lack of specificity on locations of current spotted owl activity centers, habitat “circle analyses” were run on the most recent, historic activity center location of the three known territories. All three of the activity centers are in contiguous old-growth west or southwest of the project area. The amount of potentially suitable habitat within the three territories is (please note that suitable habitat removed under the watershed restoration work being completed from 2006-2009 with the Lost Man Creek watershed has been subtracted from the totals - USFWS ref. no. 8-14-2006-2836):

- Little Lost Man Creek - 973 acres within 0.7 mile radius and 3,188 acres within 1.3 mile radius;
- South Fork Little Lost Man Creek - 884 acres within 0.7 mile radius and 3,027 acres within 1.3 mile radius.
- Lost Man Creek – 986 acres within 0.7 mile radius and 3,369 acres within 1.3 mile radius.

b. Marbled Murrelet

A. Species Account

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

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

The marbled murrelet recovery plan divided the range of the murrelet into six Conservation Zones (CZs) beginning with CZ 1 in northern Washington and ending with

CZ 6 in Santa Cruz County. Redwood National and State Parks (RNSP) fall in CZ 4. Zones 1-5 are in the area of effectiveness monitoring of the Northwest Forest Plan (NWP). In 2008, the estimated population of murrelets in CZs 1-5 was 17,700 ($\pm$ 3,200, 95% C.I.; Falxa et al. 2009). Estimates for 2007 and 2008 represent the smallest population estimates since monitoring began and indicate a population decline since 2000. At the scale of the CZ in the NWP area marbled murrelet at-sea density estimates in 2009 ranged from 0.767 birds/km² to 4.18 birds/km² in CZ 4 (no surveys were conducted in CZ5 in 2009; USFWS 2010). There was a loss of 490 (S.E. 241) to 870 (S.E. 129) birds per year or about 3,900 ($\pm$ 4,553, 95% C.I.) to 6,900 ($\pm$ 2,533, 95% C.I.) birds from 2000 to 2008 equating with an overall population decline of 19 – 34% (USFWS 2009).

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

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

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

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

Marbled murrelets' use of forests within RNSP is influenced by topography (Miller and

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

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

In 2001 RNSP became a cooperator in a multi-agency research project, the primary objectives of which were to locate marbled murrelet nests in RNSP, determine the relationship between nesting success and proximity to park trails and highways, and measure behavioral responses of murrelet adults and chicks at the nest to noise disturbance caused by trail users and maintenance activities. Thirty-eight nests were initiated (including re-nests) by radio-marked birds during the three year study. Reproductive success was very low, between 3% and 9% of initiated nests. The majority of the reproductive failures were attributed to predation of eggs and nestlings by corvids (Golightly pers. comm., Hebert and Golightly 2006). Results from trials with noise (from chainsaws), and people walking and talking in the vicinity of an occupied nest, indicated that these forms of disturbance may not directly influence nesting success. There was no significant difference between successful and unsuccessful nests in the vicinity of human presence (e.g., trails) or noise, however, Hebert and Golightly (2006) cautioned that these results were based on small samples and trials were run in the middle of the afternoon when murrelet activity is at low levels. In addition, seven murrelet nests found in RNSP in 2010 were located immediately adjacent to high use trails based on the presence of murrelet egg shells found at the base of suitable nest trees. The fate of the nestlings was

unknown (RNSP unpubl. data). In contrast, Hamer and Nelson (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).

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

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

In redwood forest habitat a variety of studies on real and simulated nests suggest that Steller's jays are the most significant predator on murrelet eggs and chicks (Carey et al. 2003). Steller's jays have been documented preying on murrelet eggs in RNSP (Hebert and Golightly 2006). In one study in redwood forest habitat (Brand and George 2001) Steller's jay counts were highest within 100 m of the forest edge. In the Headwaters

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

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

B. Habitat Status

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

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

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

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

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

Specific to Action Area

All suitable habitat areas within the project area were surveyed for murrelet presence/occupancy in 2003-2004 and 2006. Marbled murrelets were seen exhibiting occupied behavior at four of the 34 survey stations, all located in the far northwestern corner of the project area. Detections, but no occupied behaviors, were reported at five of the 34 stations (Mad River Biologists 2001) (Appendix 1).

All of the suitable habitat within the project area consists of residual old-growth single trees or clusters of trees which RNSP has equated to 240 acres of suitable habitat (if a 50m circle buffer is assumed around each individual residual tree or cluster). RNSP considers these individual residual trees and residual clusters to be of low to high quality, depending on the location of the residuals and the size of the clusters.

The total number of murrelets and their reproduction within the action area are currently impossible to estimate.

c. Pacific Fisher

A. Species Account

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

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

To date there have been 5 separate surveys for forest mesocarnivores in RNSP. Two were U.S. Forest Service surveys in areas of proposed highway construction at Cushing Creek (Gellman et al. 1993) and Wilson Creek (McKenzie et al. 1994), both in Del Norte county and both within a few of miles of the coast. In a state-sponsored distribution study, habitats were surveyed within 50 air km (31 mi) of the coast between the Oregon border and southern Humboldt County (Beyer and Golightly 1995). A park-sponsored survey took place in 2002 with the main objective of determining presence of the Humboldt marten (*M. americana* ssp. *humboldtensis*) in the parks (Slauson et al. 2003). And in 2010 study was conducted throughout the parks by U.S. Forest Service research in partnership with RNSP. Fishers were detected in all 5 of these surveys. Beyer and Golightly (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. Data from the 2010 study have yet to be

analyzed, but preliminary information indicates fishers were detected at many different track plate locations. There is a modest number of fisher observations in the parks' wildlife observations database; reliable observations were recorded in Lost Man Creek and Prairie Creek watersheds, near the Wolf Creek Education Center, and along Newton B. Drury parkway as well as from the A-9 Road, C-9 Road, Bald Hills Road, and Maneze Prairie. The survey results coupled with the reliable database records indicate that fishers are probably well-distributed throughout the parks.

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

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

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

B. Habitat Status

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

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

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

The only information on fisher habitat use in RNSP has been in association with detections at track plates. These sites may represent foraging locations, and in some instances may be in proximity to rest sites (Zielinski et al. 2004b). Beyer and Golightly (1996) found that canopy closure at detection sites in coastal habitats averaged 86.8% and tree diameters averaged 52.3 cm at breast height. Slauson et al. (2003) placed track plate

sample units throughout RNSP in old-growth and second growth forest and at the edges of these two types. Fishers visited track plates in 39-72 year old second growth more often than expected and stations in old growth less often than expected; most of the sites in second growth appeared to lack any residual old-growth trees. However, many of the detections in second growth were within 0.5 mi of old-growth. Fishers often were detected at stations on the edge of second growth and old growth. Detection sites in old growth had combined mean over- and understory tree canopy closures of approximately 60% and nearly 100% combined large and small shrub cover. A mean of 11 snags >90 cm dbh per hectare occurred at these sites along with a mean number of 55 logs >90 cm diam per hectare. Detection sites in second growth had a mean of almost 100% combined over- and understory tree canopy closure and an equally high amount of large and small shrub cover. A mean of 4.3 snags >90 cm dbh per hectare occurred at second growth sites along with a mean number of 12 logs >90 cm diam per hectare. Large stumps >90 cm also were present near detection sites in both old-growth and second growth.

Within RNSP there are an estimated 41,000 ac (16,600 ha) of old-growth forest, all of which may be considered suitable for occupancy by fishers for denning, resting, and foraging. There are approximately 33,100 (ha) (13,395 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.

Specific to Action Area

No forest carnivore surveys have taken place specifically within the action area. In 2002 Slauson et al. (2003) placed two sample units, with six track plate stations in each, along the northwestern and southern borders of the action area. These stations were set up in a circular array surrounding a central station, each separated by 0.3 mi (0.5 km). These sample units were part of a larger study designed to detect the Humboldt marten (*M. americana humboldtensis*) in RNSP. No fishers were detected at these stations. There are no incidental observations of fishers within the action area in the RNSP wildlife observations database.

There are approximately 1,800 acres of suitable fisher habitat exists within the action area. Suitable fisher habitat and suitable spotted owl habitat have been identified as the same in RNSP and so suitable fisher habitat is shown in Appendix 1 as suitable spotted owl habitat. All unsurveyed, suitable habitat within RNSP is assumed to be occupied but the total number of fishers, their distribution and their reproduction within the Action Area are currently unknown.

VI. IMPACTS TO THREATENED AND ENDANGERED SPECIES

A. Direct Effects

1. Disturbance

a. Northern Spotted Owl

The entire action area is considered suitable spotted owl nesting and roosting habitat of varying quality (Appendix 1). Above ambient noise originating from chainsaws, heavy equipment and log trucks will occur within the action area throughout the spotted owl noise restriction period (1 February through 31 July). Protocol spotted owl surveys will be conducted throughout the suitable nesting and roosting habitat in and within 0.25 mile of the project area previous to any actions taking place. If no owls are detected then there will be no possibility for noise disturbance to occur. It is unlikely that spotted owls will be present because no spotted owls have been detected within the action area during any previous surveys conducted within and along the edges of the action area (RNP unpub. records, Mad River Biologists 2004). In addition, barred owls have been detected throughout the action area during 2011 surveys (RNSP unpub. records). These barred owls may be excluding spotted owls from much or all of the action area.

If a northern spotted owl or owls are detected, then all work that generates noises above natural ambient sound levels will not occur within 0.25 mile of the activity center from February 1 through July 9.

b. Marbled Murrelet

High quality and assumed occupied contiguous old-growth redwood forest habitat exists in the northwestern corner of the action area. Potentially occupied residual nesting habitat also exists in the northwestern portion of the action area, based on past surveys (Mad River Biologists 2004) (Appendix 1). All work directly associated with thinning that generates noises above natural ambient sound levels (i.e. running chainsaws, yarding equipment, loaders and log trucks) will not occur within 500 feet of occupied habitat during the marbled murrelet noise restriction period (24 March through 15 September). As a best management practice, all equipment that generates noises above natural ambient sound levels will be operated between two hours after sunrise to two hours before sunset if the equipment is operated within 0.25 miles (for mechanical yarding) of presumed unoccupied residual stands or within 500 feet (if only lop and scatter felling) (Appendix I) (Mad River Biologists 2004).

Log trucks and hauling across the Holter Ridge Road - which is partially within 0.25 miles of suitable, assumed occupied habitat, during the noise restriction period (Appendix I). Noises originating from high revving log trucks making long, steep pulls up logging roads or “jake braking” down steep slopes have been determined to cause above ambient noise disturbance for up to 0.25 miles (USFWS 2006). It must be noted that the Holter

Ridge Road is within 0.25 miles of the Humboldt County owned and maintained Bald Hills Road. This 0.25 mile area has been excluded from the impact area calculation because of the high ambient noise levels originating from the year round public vehicle traffic on Bald Hills Road (Appendix 1). Therefore, no expected additional noise disturbance is expected from log haul trucks along Holter Ridge Road.

The remainder of the action area outside of the potentially occupied residual old-growth in the northwest portion of the project area will have above ambient noise producing work occurring during the murrelet noise restriction period including running chainsaws, heavy yarding equipment, log loading equipment and log trucks. Residual old-growth trees which provide moderate to low quality suitable habitat are scattered throughout the action area. The entire action area has been surveyed for marbled murrelets (Mad River Biologists 2004). No noise disturbance will occur in areas cleared of murrelet occupancy through these surveys. As an additional best management practice to further reduce the possibility of causing noise disturbance, residual stands in the the project area where presence was detected (Mad River Biologists 2004) will have the two hour/two hour daily noise restriction during the murrelet noise restriction period placed upon them and extend for either 500 feet (if chainsaw work or yarding is to occur) or 0.25 miles (if log loading or log hauling by logging trucks is to occur) (USFWS 2006).

c. Pacific Fisher

The entire action area is of low to medium quality suitable fisher habitat except for the old-growth redwood forest on the northwest corner of the action area which is high quality habitat. Much of the project area contains very little to no large downed woody debris with large cavities suitable for resting or denning sites. The residual old-growth trees, however, most likely contain suitable cavities for resting and denning. RNP will not be surveying the action area for fishers. RNSP assumes that all suitable fisher habitat is occupied. Noise disturbance caused by the proposed action will occur throughout the action area throughout the fisher noise restriction period (24 March to 31 July). Noise disturbance caused by the proposed action (running chainsaws, yarding equipment, logging trucks) could potentially cause a female fisher to abandon her den and kits but will mostly likely result in her moving her den to a new location. Resting fishers could also be displaced by project generated noises. Noise disturbance in any one location will be limited to one breeding season.

2. Injury, Harm or Death

a. Northern Spotted Owl

It is highly unlikely that northern spotted owls will be injured or harmed by project activities because of the protection measures included in the proposed action. The protection measures include all suitable nesting and roosting habitat without current protocol surveys will be surveyed prior to project implementation. If spotted owls are

detected during surveys, then no tree removal or felling will occur during the period from February 1 through September 15 within the activity center stand or 70-acre core area surrounding the activity center.

b. Marbled Murrelet

No marbled murrelets will be injured or harmed by the project activities because of the protection measures included in the proposed action.

c. Pacific Fisher

The proposed action contains three components which could potentially injure or kill fishers. Falling trees, moving heavy yarding equipment and moving log trucks could all potentially strike an adult or juvenile fisher that was outside of a den. Fishers are active all year and, if present in the action area, would presumably be actively foraging in the open during any time of the year. Tree felling will occur throughout the year but heavy yarding equipment and log trucks will only be operating during the summer and early fall months when soils are not saturated, therefore, the chances of being struck would be greater during those months. It is currently not possible to quantify the amount of impact this adverse effect may have on fishers except to generally assess the probability of such an accident occurring. The chances for such an accident are presumably low due to the likely probability that a healthy, mobile fisher would move out of a noisy area with work crews, active tree felling or mechanical yarding occurring. The probability of being struck by a log truck is also low because trucks will be moving relatively slowly (compared to highway speeds) on the haul roads within the action area. Slow moving vehicles on narrow roadways are less of a threat to fisher than are fast moving vehicles on wide roadways (USFWS 2004).

3. Loss and Modification of Suitable Habitat

a. Northern Spotted Owl

As stated in Section V.a. “Status and Distribution of Listed Species”, the entire project area to be treated is considered by RNP to be suitable spotted owl nesting, roosting and foraging habitat. Excepting the scattered residual old-growth trees (Appendix I), however, the quality of the habitat may be low due to the high stem density, small average tree size, overall lack of canopy structure and little to no terrestrial shrub growth over a large proportion of the project area (Table 1, J. Taraoka pers. comm., RNSP unpub. data, pers. obs.).

All three treatment types (ground-based/cable yarding, variable-density thinning, lop and scatter) will reduce basal area by approximately 40% and will effectively reduce the canopy cover across the entire project area from the current 80% – 100% to 55% – 65%

(J. Teraoka pers. comm., RNSP unpub. data). The units to be ground based/cable yarded – Tables 1 and 3, will be thinned from below and will most likely have a slightly higher canopy cover than the units to be treated using a lop and scatter fuel treatment – Table 4, which will have a combination of thin from above and below. The 43 acres to be thinned under a variable-density thinning prescription (unit U) will be functionally similar to other treatment areas because the “cells” used to vary the prescription across the unit are only 0.25 acres in size; thus, they aren’t large enough individually to fit in current spotted owl habitat models even though some cells (approximately 25% of all cells) will be thinned heavily enough to fall below spotted owl suitability. Across an area of an acre or more, the treatment will be functionally the same as the other prescriptions.

All of the project area is considered suitable nesting and roosting spotted owl habitat. The lowered canopy cover is at the very low end of suitability for spotted owls and thus will be a degradation of habitat. This condition will not be permanent and the stands should increase in suitability/quality as the canopy cover increases over the first decade (J. Teraoka pers. comm.). Canopy cover will increase as the stands respond to greater light penetration. The remaining individual trees will increase their canopy spread and depth along the bole of the tree. The decrease in stem density (Table 2) should provide for better flight paths and allow spotted owls greater access to the stands and thus greater foraging opportunities than are now present. No existing trees greater than 24 inches dbh and no existing snags will be removed so there will be little to no loss of any existing trees or snags which may provide suitable nest or roost structures. Existing residual old-growth trees, which currently provide high quality nest and roost platforms, may respond positively to the thinning treatment by increased vigor due to a decrease in space and water competition, thereby increasing their resistance to storm toppling and thus extending their life span (J. Teraoka pers. comm.). Greater light penetration should marginally increase terrestrial shrub and understory tree growth which may provide greater food sources and habitat for terrestrial mammalian prey. No existing downed wood will be removed that may provide prey habitat. Over the medium and long term, individual tree size is expected to increase and thus will increase the amount of available nest and roost structures and may increase habitat for arboreal mammalian prey. All of these longer term effects will result in higher quality spotted owl habitat than is now present and will accelerate habitat development more quickly than if the stands were left to develop without thinning.

Across the 777 acres to be either ground-based or cable yarded and the 43 acres to be treated using variable-density thinning, felled tree boles are going to be yarded out of the stands and thus won’t contribute additional forest floor structure. Tree tops and limbs will remain, but are expected to contribute to forest floor structure for less than a decade.

In the treatment areas with a lop and scatter prescription, there will be a temporary increase in the amount of downed woody material. There will be a temporary degradation of habitat quality by make foraging for terrestrial prey more difficult for owls. The conditions, however, will not be permanent. The smaller diameter slash will deteriorate over the first decade (J. Teraoka pers. comm.), while larger diameter slash will provide new downed woody debris. With only the small diameter slash gone, owls

will be able to see and pursue prey more easily. The additional downed woody debris may provide additional habitat for terrestrial mammalian prey.

b. Marbled Murrelet

Currently, the only trees containing suitable nest platforms within the project area are the scattered residual old-growth redwood trees. There are also many high quality, suitable nest trees in the solid block of old-growth just outside the northwestern corner of the project area (Appendix I). None of these trees will be removed and thus none of the existing suitable nest platforms will be removed. Second growth trees extending to the level of the lowest live branches of the residual and solid block of old-growth trees will not be removed. These second growth trees may provide cover for nest platforms on the residual trees and, by their retention, there should be no effect to the cover they may provide. However, some trees that do not extend up to the lowest live branches of the old-growth residual trees may be removed from the second growth canopy to encourage greater growth of the remaining second growth trees. No yarding equipment will be allowed within 50 feet of the dripline of the residual trees and thus the root systems and trunks of the residual will be protected from mechanical damage. These provisions will also prevent any damage to any potential nest platforms from felled second growth trees. All of these provisions were recommended in Franklin et. al. (2003).

The reduction in the second growth canopy, however, will temporarily degrade the quality of the stands surrounding the residual trees. A closed second growth canopy may provide some cover from below to murrelets as they fly in and out of nests. A 50m buffer area around each residual old-growth tree within the project area was used for the impact area based on analyses done on the Bureau of Land Management's Headwaters Reserve second growth redwood thinning program (R. Hamlin, pers. comm.). A total of 240 acres exists within this area that would be degraded. This amount of habitat degradation may affect marbled murrelet habitat suitability, but is not expected to adversely affect it.

Over the medium term, habitat conditions of the residual old-growth trees should improve as released second growth trees more rapidly extend into the canopy of the residual old growth trees, thus providing greater cover. Habitat conditions will also improve more rapidly in the long term as released second growth trees more rapidly increase branch girth and thus increase the number of potential nesting platforms. In addition, increased light penetration caused by the removal of some co-dominant second growth trees will promote epicormic branch development which will produce horizontal branch structures suitable for nest platforms (Franklin et. al 2003). Unfortunately, even with the accelerated growth resulting from the thinning, suitable nest platforms will most likely not develop on the second growth trees for at least one hundred years. However, over the long term, suitable nest platform producing sized trees will develop more quickly as a result of the proposed action than if no forest management were undertaken (Franklin et. al 2003, Taraoka pers. comm.).

c. Pacific Fisher

The short term effects to fisher habitat due to canopy cover change will most likely be somewhat similar to the effects to spotted owls. Canopy cover will be reduced to between 55% and 65% over the project area. It is unknown if these canopy levels will render the area unsuitable or degrade the quality of the habitat because no literature exists which addresses intermediate canopy cover levels and fisher habitat use. It can be assumed, however, that reduced canopy cover levels will make some areas of the project area temporarily less useful to fisher. Alternately, the heterogeneity of the canopy reduction throughout the project area will most likely improve the likelihood that fisher will find the project area suitable to some extent. Key denning and resting habitat components, i.e. large downed wood and snags (Seglund 1995, Zielinski et al. in press b), will remain at pre-treatment levels throughout the project area because no existing downed wood or snags will be removed. Downed woody structure will increase in all treatment areas where no yarding will occur (i.e. all areas excepting those with slopes less than 30% outside of riparian protection and tanoak areas – or 1,346 of 1,711 treatment acres). Again, as with spotted owls, the medium to long term effects to fisher habitat from the proposed action will result in quicker habitat quality improvements than if the stands were left untreated. Canopy cover will recover to pre-treatment levels in 20 to 30 years. Large tree recruitment rates will increase which will ultimately result in more suitable denning and resting structures. Canopy and forest floor structure and composition complexity will increase more quickly and result in greater fisher prey habitat.

B. Indirect Effects

a. Northern Spotted Owl

Spotted owls may be indirectly affected by the proposed action through an inadvertent improvement of barred owl habitat suitability. Barred owls already exist in the action area (RNP unpublished data). Barred owl habitat suitability within the project area will improve over the medium and long term for the same reasons that it will improve for spotted owls. This improved habitat suitability may attract more barred owls and thus decrease the potential for spotted owls to reoccupy the area. Barred owls appear to have supplanted spotted owls on a number of activity centers throughout RNSP. Barred owls also appear to more readily occupy old-growth forest areas than second growth areas in the parks (Schmidt 2011). The proposed action will increase old-growth forest characteristics more quickly in treated areas than in non-treated areas. The proposed action may then, over time create habitat conditions favorable to barred owls. Currently, no existing published studies address this issue.

The overall fire risk within the action area is low to very low based on past ignition history and micro climate regime. No greater-than-one acre fires have ever been recorded within the action area (RNSP unpub. data). The close proximity to the coast

and subsequent frequent immersion in summertime marine air masses lowers the area's average summertime temperature and subsequent drying intensity. The area also receives high amounts of rainfall (80 plus inches) over a protracted rainy season. In addition, summertime lightning strikes are less frequent in these coastal areas because cool marine air masses prevent the formation of thunderstorms. Year round high fuel moisture and moist understory vegetation combined with low frequency natural ignition has resulted in very long fire intervals (100 plus years) and thus an overall, naturally low fire risk in this area of the redwood ecosystem (Stuart and Stephens, 2006). Increased fuel loading will be very minimal and short lived over the 777 acres where tree will be yarded and removed. All felled tree boles will be removed from these stands. Only tree tops and limbs will remain on site. All increase in fuels will be completely decomposed within 7-11 years post treatment (Pillars and Stuart, 1993) or even quicker in areas using ground-based yarding equipment that will crush the slash upon return to the stand thus increasing ground contact and fungi inoculation. In lop and scatter treatment areas, all boles will be bucked and all limbs and tops will be lopped to get them in contact with the ground and allow for maximum decomposition. Fine fuels, as stated previously, will decompose in approximately a decade. Tree boles will take longer, up to a few decades. Crown fire risk will be decreased immediately post treatment because dead, toppled, suppressed trees will be felled to the forest floor thus decreasing the amount of ladder fuels and the ability of a ground fire from reaching the canopy. The combination of the low fire frequency, micro-climate regime of the action area and proposed fuel treatments makes the short term increased fire risk low within the action area. Over the medium term, fire intensity and fire spread risk will be decreased to below existing conditions because of the reduction in fuel continuity across the stands.

b. Marbled Murrelet

Experiments with gray jays have shown that even the mere presence of humans can attract gray jays and cause them to linger in an area (Gutzwiller et al. 2002). Whether this holds true for Steller's jays is unknown but Suddjian's (2004) study as well as anecdotal observations and small sample studies made in RNSP seem to indicate that Steller's jays may react in a similar manner (Wallen et al. 1999, Wallen et al. 1998). However, four years of corvid monitoring of deep forest areas within RNSP has shown the opposite, that there is no apparent effect of mere human presence, even on high use trails (RNSP 2011). The use of a murrelet limited operating period (24 March to 15 September) which prohibits human activities within 500 feet of the solid block of suitable and occupied habitat in the northwestern corner of the action area may reduce the potential for attracting additional corvids to the area and thus reduce the potential risk of predation.

Canopy cover will be reduced throughout the project area which will allow greater light penetration to the forest floor in some areas. Greater light penetration may produce greater amounts of understory shrubs than is currently present, particularly in areas that have no residual old-growth trees and are dominated by even aged trees and uniform canopy heights. These areas have very little to no understory shrubs whereas residual

old-growth areas have more existing shrubs due to greater canopy complexity and thus greater light penetration (pers. obs., RNSP unpub. data). Any increase in understory shrub growth will be relatively minor and short lived. As the canopy increases every year after treatment, decreasing light penetration will slow understory shrub growth concomitantly.

It is unknown whether a small, temporary increase in understory shrubs will result in more corvids becoming attracted to the action area and thus increase the potential for murrelet predation. Research linking shrub growth to corvid density and increased murrelet and other bird predation has been tied to “hard” ecological edges such as the boundary between clear cuts or roads and forest patches (McShane et al. 2004, Nelson and Hamer 1995). The thinning planned for the project area will not create hard edges. Nelson and Hamer (1995) found that successful murrelet nests were a mean of 545 ft (166 m) and a minimum of 180 ft (55 m) away from a forest edge, defined in their study as “unnatural openings, including...roads and clearcuts”. All nests that failed because of predation were located within 210 ft (64 m) of an edge. Additionally, Franklin et al. (2003) posit that variable-density thinning as described in the proposed action will make the stands *less* hospitable to predators like corvids by reducing foliage volume in trees, mechanically destroying understory vegetation and disrupting forest floors and their foods webs, thereby reducing the amount of food available to corvids. They state that thinning under similar prescriptions described here are not heavy enough to promote greater growth of food sources such as acorn producing hardwoods or fruiting shrubs. This will have the added benefit of providing a *greater* predator buffer to the existing murrelet nesting habitat in the solid block of old-growth and the occupied residual old-growth trees.

Shrub growth response will be monitored for at least five years after thinning in each of the prescription areas. These additional data will provide a greater understanding of corvid food source shrub response to the forest restoration activities described in the proposed action and provide insight to the potential effects of future forest restoration work in RNP.

It should be noted that any potential impacts related to corvid attraction via the removal of vegetation on access roads and landings that will be used during this project, has already been consulted upon under the Lost Man Creek Watershed Restoration consultation and so were not included in this analysis (USFWS ref. no. 8-14-2006-2836).

The short term increased fire risk from the proposed action to the occupied and unoccupied suitable murrelet habitat areas within the project area is low for the same reasons stated above for spotted owls. In addition, the risk of fire destroying and suitable habitat components in the contiguous old-growth forest to the west of the project area is low because historically, fires in coastal old-growth forests tend to be ground fires with little to no effect on the canopy (Stuart and Stephens, 2006, pers. obs.). There will be an immediate indirect benefit from the proposed action because of the significant reduction in ladders fuels due to the thinning treatments. Fire will have a much lower probability of reaching the second growth canopy and spreading to the old-growth canopy than

currently exists under the untreated conditions.

c. Pacific Fisher

No indirect effects are expected from the proposed action for fishers.

C. Cumulative Effects

Cumulative effects are those state and private actions in the action area that may occur in the future that have the potential to impact listed species in the park. Much private timber company land occurs immediately to the east of the park and action area boundary. A county road (Bald Hills Road) exists immediately to the south of the south end of the action area and within the park. Timber will presumably continue to be harvested on the private timber company lands immediately to the east of the action area primarily using a clear cut regime based on a 40 year crop rotation. RNSP engages in consultations with the adjacent private timber company land owner if actions are planned that could occur within the Special Treatment Area (STA) which extends 200 feet beyond the boundary of the park as required under the California state forest practice rules. During those consultations the park provides input to timber harvest plans that limits the impacts to RNSP resources, including listed species. RNSP main goal within the STA adjacent to this action area is to limit harvest prescriptions to either no cutting within the STA or very light thinning in order to provide a wind and habitat buffer to second growth forest stands within the park. RNSP does not have legal jurisdiction to influence actions outside of the STA and the private logging company usually clear cuts stands outside of the STA on this portion of its property. Public vehicle traffic and logging truck traffic does and will presumably continue to drive along the Bald Hills Road and be a continuous source of noise disturbance.

VII. DETERMINATION

Based on the nature and timing of the proposed action, it has been determined that the RNP Middle Fork Lost Man Creek Forest Restoration Plan will have the following effects on the threatened, endangered and candidate species assessed in this document:

Threatened and Endangered -

Northern spotted owls may be affected but will not be adversely affected by a short term reduction in forest canopy cover within the project area. Marbled murrelets may be affected but will not be adversely affected by minor degradation of unsuitable nesting second growth trees that may provide a minor cover contribution to surrounding suitable, but unoccupied, residual nest trees scattered throughout the project area.

Candidate -

The Pacific fisher may be negatively affected and these effects are expected to be measurable within the local population due to noise disturbance caused by project activities and by a low likelihood for injury or harm.

VIII. MANAGEMENT RECOMMENDATIONS

There are no management recommendations beyond the impact minimization measures described in the proposed action.

VIX. CONTRIBUTORS

Bensen, Keith – RNP. Overall analysis and writing.

Wartella, Judy – RNP. GIS analysis and map production.

Powell, Scott – RNP. Map production.

Teraoka, Jason - RNP. Proposed action draft.

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Personal Communications:

Aubry, Keith. Research Biologist, USDA Forest Service, Olympia, WA.
 Diller, Lowell. Research Biologist, Simpson Timber Co., Korb, CA
 Golightly, R.T., Humboldt State University, Dept of Wildlife, Arcata, CA
 Thompson, Joel. Wildlife Biologist, Simpson Timber Co., Korb, CA.
 Zielinski, Bill. Research Ecologist, USDA Forest Service, Arcata, CA.

Appendix 1

Maps



United States Department of the Interior

FISH AND WILDLIFE SERVICE

Arcata Fish and Wildlife Office

1655 Heindon Road

Arcata, California 95521

Phone: (707) 822-7201 FAX: (707) 822-8411



In Reply Refer To:
AFWO-12B0009-11I0011

DEC 09 2011

FILE COPY

Memorandum

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

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

Subject: Informal Consultation on Middle Fork Lost Man Creek Forest Restoration Plan,
Redwood National Park, Humboldt County, California

This memorandum responds to your letter, dated November 14, 2011, and received November 17, 2011, requesting the Fish and Wildlife Service's (Service) concurrence with your determination of effects for the proposed Middle Fork Lost Man Creek Forest Restoration Plan, Redwood National Park (RNP), Humboldt County, California. You determined the action may affect, but is not likely to adversely affect, the federally threatened northern spotted owl (*Strix occidentalis caurina*) and marbled murrelet (*Brachyramphus marmoratus*). This response is prepared in accordance with the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*) (Act), and its implementing regulations (50 CFR §402).

This consultation is based on information provided in your November 14, 2011, biological assessment and other sources of information. The biological assessment contains a complete description of the proposed action and a description of the project's effects on the northern spotted owl and marbled murrelet, and is hereby incorporated by reference. Documents related to this consultation are on file in this office.

The goal of the Middle Fork Lost Man Creek Forest Restoration Plan (the proposed action) is to create conditions by which existing second- and third-growth redwood (*Sequoia sempervirens*) stands in the project area will attain old-growth redwood forest characteristics more quickly than would occur through unmanaged forest development. This will be accomplished by increasing tree growth rates by thinning existing stands, as well as changing tree species composition by preferentially removing tree species which are non-native or are overly represented when compared to native, unmanaged old-growth redwood forest. Three major types of forest management operations will be used: ground-based yarding/skyline cable yarding, variable-density thinning, and "lop and scatter." Use of these various operations will be based primarily

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on steepness of slope and/or distance from access roads. Prescriptions generally vary by forest management operation type. Conservation-based variations on these three major forest management operation types will be implemented based on proximity to intermittent and permanent streams and wetlands, proximity to individual residual old-growth trees, and proximity to contiguous stands of old-growth forest. Restoration activities would affect approximately 1,050 acres of second- and third-growth redwood forest habitat.

RNP proposes to implement the following measures to avoid adverse effects to marbled murrelets and northern spotted owls:

- Surveys for northern spotted owls will be conducted throughout the action area (surveys for presence of marbled murrelets have been conducted throughout the action area).
- Chainsaw work occurring within 500 feet of unoccupied, but suitable, marbled murrelet habitat will occur only during the following daily time period: 2 hours after sunrise until 2 hours before sunset, during the marbled murrelet breeding season (24 March and 15 September).
- Chainsaw work will not occur within 500 feet of known occupied, or assumed occupied, suitable marbled murrelet habitat during the marbled murrelet breeding season (*i.e.*, 24 March through 15 September).
- Work that generates noise above natural ambient sound levels will not occur within 0.25 mile of a northern spotted owl detection from 1 February through 9 July. If a northern spotted owl activity center is found to have chicks, no tree removal will occur during the period from February 1 through September 15 within the activity center stand, or within a 70-acre core area surrounding the activity center.
- Trees will not be removed that are within 50 feet of the drip-line of residual old-growth trees. Where aggregates of residual trees occur, a polygon will be drawn around the outer edge of the outer trees' drip-line and will extend outward from there for 50 feet to demarcate the no treatment zone. To be considered an aggregate, the residual tree canopies must be within 30 feet of each other.
- Trees over 24 inches diameter-at-breast-height (dbh) will not be removed. The majority of trees removed will be limited to those 20 inches dbh and under.
- Trees will not be felled towards residual trees or towards trees of outstanding character (*e.g.*, deformed trees, large hardwoods, redwood stump sprouts).
- Felled trees and slash will not be broadcast or pile burned. Ground fuels will not exceed 24 inches in depth in any area, unless intentionally creating a brush pile for wildlife.
- All existing downed woody material and snags will be retained.

- Thinning crews will not be spike-camping within the action area.
- Thinning crews will be instructed (and the provision will be incorporated into all contracts) to not feed any wildlife, not leave food scraps, and to pack out all trash from action area and dispose of either outside of park or in wildlife proof trash containers.
- Best management practices will be used to prevent sedimentation of streams and stream bank instability.
- A qualified biologist will conduct a worker awareness training session before project activities begin, to alert restoration crew leaders of potential special-status species that may be present in the project area. The training will cover the natural history of marbled murrelet and northern spotted owl, their status, what they look like, and the measures being implemented to avoid adverse impacts. The trained crew leader(s) will act as the on-site biological monitor(s) during the proposed activities.
- The crew leader (acting as biological monitor) will halt project activities if a northern spotted owl (live, dead, or injured) is found in the project work area, and RNP and the Service will be contacted to determine how to proceed. Any northern spotted owl found in the project area will not be moved from where it was found, and restoration activities will resume only with the agreement of responsible agencies (*i.e.*, RNP, Service, California Department of Fish and Game).

There are approximately 1,800 acres of habitat suitable for nesting or roosting by northern spotted owls in the action area, and one northern spotted owl activity center, "Lost Man Creek Activity Center" occurs within 0.7 mile of the action area. This activity center has not been observed as occupied by northern spotted owls since 2002, and barred owls (*Strix varia*) occupy the entire action area, based on recent surveys by RNP personnel. Post-treatment forested stands in the action area would comprise greater than 60 percent canopy cover of trees that are greater than 11 inches dbh, and would have a basal area greater than 100 square feet per acre of trees greater than 11 inches dbh. Thus, post-treatment stands would retain characteristics definitive of northern spotted owl nesting-roosting habitat.

Habitat suitable for nesting by marbled murrelets occurs in the action area only as isolated pockets of residual single old-growth redwood trees, or small groups of residual trees, surrounded by mature residual trees. All suitable habitat areas within the action area were surveyed for presence/occupancy of marbled murrelets in 2003-04 and 2006. Occupied behavior was observed at 4 of 34 stations and only in the northwestern corner of the action area, and presence-only behavior was observed at 5 of 34 stations. Residual old-growth or mature trees would not be removed; thus, nesting habitat for marbled murrelets would not be removed.

Concurrence

Northern Spotted Owl

The Service has determined that the proposed forest restoration activities may affect, but are not likely to adversely affect, the northern spotted owl, based on the following factors:

1. Nesting habitat for the northern spotted owl will not be removed.
2. Northern spotted owl nesting/roosting habitat will be retained post-treatment (*i.e.*, post-treatment forest stands will be comprised of 60 percent canopy cover of trees that are greater than 11 inches dbh, and will have a basal area greater than 100 square feet per acre of trees greater than 11 inches dbh).
3. Noise associated with proposed restoration activities is unlikely to disturb nesting northern spotted owls, due to seasonal noise restrictions that will be implemented.
4. Due to the likely presence of barred owls, northern spotted owls may not nest at the only known northern spotted owl activity center, located within 0.7 mile of the action area.

Marbled Murrelet

The Service has determined that the proposed forest restoration activities may affect, but are not likely to adversely affect, the marbled murrelet, based on the following factors:

1. Nesting habitat for the marbled murrelet will not be removed.
2. Noise generated in association with proposed restoration activities are not likely to disturb nesting marbled murrelets, because of the seasonal noise restrictions that will be implemented.

This concludes informal consultation on the Middle Fork Lost Man Creek Forest Restoration Plan in RNP. Unless new information reveals that the proposed actions: (1) may affect listed species in a manner, or to an extent, not considered in your correspondence; (2) the actions are modified in a manner that causes an effect on the listed species or critical habitat not considered in your correspondence; or (3) a new species is listed or critical habitat is designated that may be affected by the proposed actions no further action pursuant to the Act is necessary.

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

cc:

Redwood National and State Parks, Orick, CA (Attn: Keith Bensen)
California Department of Parks and Recreation, Eureka (Attn: Jay Harris)
California Department of Fish and Game, Eureka (Attn: Tony LaBanca)