

**A Biological Assessment of Impacts to
Terrestrial Threatened and Endangered Species from the
South Fork Lost Man Creek
Second Growth Forest Management Plan
in Redwood National and State Parks (RNSP)**

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I. INTRODUCTION

The purpose of this biological assessment (BA) is to review the Redwood National and State Parks (RNSP) South Fork Lost Man Creek Second Growth Forest Management 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 or through 2012. The project will take two years to complete, but the exact funding years are uncertain.

II. CONSULTATION TO DATE

Redwood National and State Parks receive 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 7 November 2006, (Ref. Doc. No. 107503385-145521). This list includes 24 species currently listed as threatened or endangered and four species listed as candidates in Humboldt and Del Norte Counties.

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

Anadromous Fish Species

Effects from proposed projects to California coastal chinook salmon, southern Oregon/northern California coasts coho salmon and their critical habitat, and northern California steelhead trout have been assessed through a separate consultation with NOAA Fisheries and will not be mentioned further in this document.

Other Ongoing 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.

2004 Fire Management Plan (USFWS ref. no. 1-14-2005-2389). Creation of a shaded fuel break along Lost Man Creek Trail/Holter Ridge Road.

Current Consultation

RNSP Supervisory Botanist Leonel Arguello and Forest Ecologist Jason Teraoka first presented the basic parameters of this plan to the USFWS and NOAA Fisheries at a scoping session in the fall of 2005. Primary concerns voiced by the USFWS were the preservation of residual old growth redwood trees scattered throughout the project area and limiting noise disturbance in areas within 0.25 miles of the suitable, high quality marbled murrelet and spotted habitat immediately to the west of the project area. More detailed proposed activities were presented at an interagency consultation team meeting at RNSP's South Operation Center on 15 February 2006. No new significant concerns were raised at that meeting.

III. CURRENT MANAGEMENT DIRECTION

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

The *General Management Plan/General Plan and Environmental Impact Statement/Report for Redwood National and State Parks* (USDI and CDPR 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 National Park Service signed the Interagency Memorandum of Understanding implementing the *Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl* (USDA and USDI 1994; Northwest Forest Plan ROD). National Park lands within the range of the northern spotted owl are designated as congressionally reserved. Redwood National and State Parks 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. Redwood National and State Parks policies and guidelines relative to watershed restoration are similar to those outlined by the Aquatic Conservation Strategy in the Northwest Forest Plan ROD.

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 (AA) (Maps 1 and 2, Appendix 1) for this analysis is the maximum effect area

of all species potentially impacted by the proposed action which for this analysis is 0.25 miles beyond the proposed forest treatment area or project area. The AA is approximately 2,714 acres. The project area is approximately 1,687 acres.

A. Existing Conditions

The South Fork Lost Man Creek Second Growth Management Plan (hereafter referred to as SGMP) project area is located within the redwood forest zone where natural, unmanaged stands are dominated by redwood and lesser components of Douglas-fir, western hemlock and Sitka spruce. The project area is also within the marine influence climate zone within RNSP 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 (with tiny scattered areas – less than 10 acres total - reseeded with exotic Monterey pine) 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, Map 3) left as seed trees. Some ridge top areas in the southern part of the project area naturally regenerated as dense stands of tanoak (Appendix 1, Map 3) but all other areas are dominated by Douglas-fir with varying percentages of redwood, western hemlock, Sitka spruce and red alder.

The eastern and southern border of the action area extends onto private commercial timberlands and is entirely made up of regenerating 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. The western border of the action area is entirely old growth redwood forest (Appendix 1, Map 3).

Table 1. Estimated existing tree density and size in the South Fork Lost Man Creek Second Growth Forest Management 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 on Map 3, 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)
A	378	41 (26)	0
AB	332	44 (27)	1 (37)
B	324	39 (25)	0
C (tanoak dominated)	437	5 (22)	0
D (tanoak dominated)	366	24 (35)	1 (38)
E (tanoak dominated)	447	10 (31)	0

F (tanoak dominated)	498	8 (20)	0
G	452	43 (30)	0
H	449	4 (28)	0
I (tanoak dominated)	551	20 (21)	0
J	340	23 (24)	0
JO	429	18 (25)	0
K	377	38 (24)	1 (38)
L North	496	21 (25)	0
L South	510	19 (36)	0
M	494	14 (28)	0
N	507	61 (29)	0
O	495	15 (25)	0
P	413	22 (36)	0
North Buffer	196	53 (27)	0
South Buffer	481	10 (33)	0

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 SGMP is to move the stands towards old growth redwood forest characteristics to the project area 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. Five types of forest management prescriptions will be used depending on slope, existing tree species composition, proximity to intermittent and permanent streams and wetlands, and proximity to contiguous stands of old growth forest.

1) Areas with greater than 30% slope – thin and leave

A 25% basal area reduction prescription will be used in all areas with slopes greater than 30% or located in areas without serviceable, existing logging roads. These areas cover approximately

960 acres of the project area (Appendix 1, Map 3). The intent is to primarily stimulate growth and development (release) of dominant trees, to create snag habitat, improve stand level representation of redwood, and minimize fuel depth of woody debris.

Thinning from above would target Douglas-fir in the size class range from 8 to 20 inches dbh, and would cut, on average, 90 trees per acre (Table 2). To meet the 25% basal area reduction, larger diameter Douglas-fir (excluding trees over 20" dbh) will be culled from the stand by first working down the dbh size classes until the target reduction is met. Approximately 50% of each diameter size class of Douglas-fir will be removed. It is anticipated that the average overstory canopy cover will decrease, on average, from the existing 80% canopy cover to 60% canopy cover in the treated stands. Selecting overstory trees to remove would be based on maximizing response and release of dominant redwood and/or other large conifers. No redwoods are planned for removal under this prescription. Some tanoak may be removed, but will not exceed 15% of total trees removed in any unit.

Table 2. Estimated basal area and tree density reduction in areas with greater than 30% slope. Unit locations shown on Map 3, Appendix 1.

Unit Name	Basal area per acre (ft ²)					Number of trees per acre				
	Unthinned			Thinned		Unthinned			Thinned	
	PSME ¹	SESE ²	Total	PSME ¹	Total	PSME ¹	SESE ²	Total	PSME ¹	Total
Unit AB	143	85	301	68	226	219	84	524	123	427
Unit JO	123	53	275	55	206	244	33	603	113	471
Unit KS	113	68	276	44	207	147	87	396	72	321
Unit LS	125	100	280	56	211	172	128	422	89	339
Unit MS	171	162	365	80	274	179	196	439	87	347
Unit NS	86	159	307	46	291	67	231	329	28	291
Unit O	128	61	297	55	225	228	88	569	116	456

¹PSME = Douglas-fir (*Psuedotsuga menziesii*)

²SESE = Coastal redwood (*Sequoia sempervirens*)

Second growth trees under the dripline of old growth residual trees will not be treated. No trees from the dripline out to 50 feet which extend to the height of the lowest live branch of the existing old growth residual trees will be. 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 drawn 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.

All tree felling will be conducted by hand crews using chainsaws. Trees to be cut will be marked by park staff. All felled trees will be limbed, bucked, and lopped to get the wood in contact with the forest floor. No trees will be yarded or moved from the areas treated under this prescription. Approximately 15 to 20 trees per acre will be girdled to provide snag habitat for wildlife. No trees will be felled towards residual trees or trees of outstanding character (deformed trees, large hardwoods, redwood stump sprouts). Felled trees and slash will not be piled or burned. Ground fuels will not exceed 24" in depth in any area. Chipping of slash may occur along the first 50 feet of forest bordering ridge roads in the project area including the portions of the A170, A141, and A140 Roads (Appendix 1, Map 3).

Hand crews will drive into the project area using existing roads, as close to project sites as possible. Crews will not be spike camping 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 on the west side of the project area 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, Map 4). No work will occur within these areas from March 24 through September 15. Above ambient noise producing work conducted from 24 March through 15 September will be restricted to the time period from two hours after sunrise to two hours before sunset in residual old growth areas where marbled murrelet presence was detected in the middle portion of the project area (Appendix 1, Map 4). 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 then no above ambient noise producing work will occur within 0.25 mile of the detection during the spotted owl noise restriction period (1 February through 31 July). If 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.

2) Areas Less Than 30% Slope – thin and remove

A 40 % basal area reduction prescription will be used in all areas with slopes less than 30% and that do not occur near intermittent or perennial streams or wetlands. These areas cover approximately 365 acres of the project area (Appendix 1, Map 3). The intent is to reduce overall stand densities to levels that would 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.

For 40% basal area reduction areas, thinning would target removal of primarily Douglas-fir in the 5" to 15" dbh size class, and would remove on average 261 trees per acre (Table 3). Thinning from below would be utilized to reduce overall stem density of Douglas-fir. 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 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. No trees over 20" dbh will be cut. Sample plot extrapolations indicate that the average overstory canopy cover will decrease from the existing 80% to 55% in the treated stands (J. Teraoka pers. comm.). 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" or less) may also be cut along skid trails and within the unit to meet the stand basal area reduction target. Tree removal on skid trails will count toward the stand basal area target reduction.

Table 3. Estimated basal area and tree density reduction in areas with less than 30% slope. Unit locations show on Map 3, Appendix 1.

Unit Name	Basal area per acre (ft ²)						Number of trees per acre				
	Unthinned			Thinned			Unthinned			Thinned	
	PSME	SESE	Total	PSME	Total		PSME	SESE	Total	PSME	Total
Unit A	161	59	287	45	171		340	85	602	31	293
Unit B	214	45	321	102	209		256	54	546	52	343
Unit G	126	54	281	37	166		233	96	575	27	326
Unit K	136	68	284	44	173		260	90	529	30	208
Unit L	162	74	326	51	197		272	92	578	33	262
Unit M	208	120	346	86	224		341	223	635	64	358
Unit ML	139	112	283	26	170		250	119	370	20	139
Unit N	182	229	442	50	309		210	340	624	24	438
Unit P	157	54	271	53	168		303	47	487	36	220

¹PSME = Douglas-fir (*Pseudotsuga menziesii*)

²SESE = Coastal redwood (*Sequoia sempervirens*)

Second growth trees under the dripline of old growth residual trees will not be treated. No trees within 50 feet of the dripline which extend to the lowest live branch of old growth residual trees will be removed. Smaller trees that don't extend to the lowest live branches of residual trees within this area may be removed according the unit prescription. Where aggregates of residual trees occur, a polygon will be drawn around the outer edge of the trees to demarcate the no treatment zone. No felling or yarding heavy equipment will be allowed within the dripline of any residual old growth trees or aggregate areas in order to prevent damage to trunks and root systems. To be considered an aggregate, the residual tree canopies must be within 30 feet of each other. No damage from yarding activities 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.

All felled trees < 8 inches dbh will be limbed, bucked, and 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 or before the onset of winter rains.

All felled trees 8 inches dbh or greater will be limbed, bucked to log lengths and yarded offsite utilizing ground based equipment (skidders or fellerbunchers). Tree tops and limbwood will be left on site. Because these areas have minimal slope (< 30%), cable yarding is not an option for tree removal. Helicopters will not be used. Trees felled will be yarded to pre-existing landings (created during the initial commercial logging era previous to establishment of the park) adjacent to the units on haul roads. Equipment or long line operations will not be allowed to cross most riparian features (i.e. wetland or channelized stream) or landslide feature. Equipment may operate in and across swale features providing slope steepness is less than 30%, but no skip construction would occur. No pre-existing woody debris will be removed from any unit. Approximately 5 trees per acre will not be removed but will be girdled to provide snag habitat for wildlife. No trees will be felled towards residual trees or trees of outstanding character (deformed trees, large hardwoods, redwood stump sprouts). No piling or burning of slash will occur. Trees

to be cut will be marked by park staff.

Log trucks and equipment will access the project area via Bald Hills road, Holter Ridge road, A141, A140, A170, A160, A150, and A100 roads (Map 3, Appendix 1). Roads may be watered to provide for dust abatement. 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. Every attempt will be made to reoccupy existing skid roads to access trees in treatment units. All project work 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.

Equipment, both 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, clean up will begin and the appropriate authorities will be notified. Petroleum products, chemicals, deleterious materials, or water contaminated by the aforementioned will not be allowed to enter flowing waters.

No new roads or landings will be constructed. Equipment would use the existing skid trail network for interior access to project sites and existing roads and landings for processing and staging the wood prior to removal off site. Approximately 26 miles of existing skid roads, 15 miles of administrative roads, and up to 46 existing landings would be reoccupied during the project. All haul roads and landings will be removed under the scheduled road removal program to be completed in FY10. The unit schedule for completing operations is shown in Table 4. All descriptions of second growth vegetation removal from existing roads and landings were covered previously under the Lost Man Creek Watershed Restoration Plan consultation (USFWS ref. 8-14-2006-2836).

Crews will not be spike camping or staying on-site beyond normal work hours. Crews will leave in reserve the 0.25 mile zone closest to the old growth forest edge untreated until after 15 September but before 24 March. Portions of the A150, A160, A170, and Holter Ridge roads that cross the old growth forests and the 0.25 mile buffer, will be utilized by trucks to haul logs or equipment during the summer months. Above ambient noise producing work, including running log trucks, conducted from 24 March through 15 September will be restricted to the time period from two hours after sunrise to two hours before sunset. 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 or will be conducted in all areas containing suitable habitat in or within 0.25 mile of proposed work areas. If spotted owls are detected then no above ambient noise producing work will occur within 0.25 mile of the detection during the spotted owl noise restriction period (1 February through 31 July).

If spotted owls are detected, then no tree removal or yarding 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.

Table 4. Proposed schedule for heavy equipment operations in less than 30% slope units. Unit locations shown on Map 3, Appendix 1.

Stand Name	Timeframe for Operations	Acres	# Trees felled/Unit
Stand G	Year 1 July – Oct	71	17,608
Stand K	Year 1 Sept 1	52	16,692
Stand P	Year 1 July, Aug	58	15,486
Stand M	Year 2 July, Aug	25	6,950
Stand L	Year 2 July – Oct	54	17,064
Stand N	Year 1 Sept 1	21	1,911
Stand B	Year 3 July, Aug	27	5,508
Stand A	Year 3 Aug (60) Sept 1 (40)	57	17,613
SUMS		365	98,832
		Year 1 = 104 acres	
		Year 2 = 125 acres	
		Year 3 = 136 acres	

3) Thinning Adjacent to Old Growth Forests

Within 300 feet of old growth forests, 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 105 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 (Table 5). 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.

Table 5. Estimated basal area and tree density reduction in areas within 300 feet of contiguous old growth forest. Unit locations show on Map 3, Appendix 1.

	Basal Area per acre (ft ²)					Tree per acre				
	Unthinned			Thinned		Unthinned			Thinned	
Unit Name	PSME ¹	SESE ²	Total	PSME ¹	Total	PSME ¹	SESE ²	Total	PSME ¹	Total
North Buffer	121	60	262	55	196	232	113	545	67	380
South Buffer	95	39	270	55	198	250	98	568	168	433

¹PSME = Douglas-fir (*Pseudotsuga menziesii*)

²SESE = Coastal redwood (*Sequoia sempervirens*)

All tree felling will be conducted by hand crews using chainsaws. Trees to be cut will be marked by park staff. All felled trees will be limbed, bucked, and lopped to get the wood in contact with the forest floor. No trees will be yarded or moved from the areas treated under this prescription. Approximately 15 to 20 trees per acre will be girdled to provide snag habitat for wildlife. No trees will be felled towards residual trees or trees of outstanding character (deformed trees, large hardwoods, redwood stump sprouts). Felled trees and slash will not be piled or burned. Ground fuels will not exceed 24" in depth in any area.

Residual old growth trees are uncommon in this area. Second growth trees under the dripline of old growth residual trees will not be treated. No trees within 50 feet of the dripline which extend to the lowest live branch of an old growth residual tree will be removed. Smaller trees that don't extend to the lowest live branch may be cut according to the prescription in the rest of the unit. Where aggregates of residual trees occur, a polygon will be drawn around the outer edge of the trees to demarcate the no treatment zone. No felling will be allowed beneath the dripline of any residual old growth trees or aggregate areas in order to prevent damage to trunks and root systems. To be considered an aggregate, the residual tree canopies must be within 30 feet of each other.

Crews will drive into the project using existing roads, as close to project sites as possible. Crews will not be spike camping or staying on site beyond normal work hours. Crews will only work in this area between 16 September and 31 January in order to avoid the marbled murrelet and spotted owl noise restriction period.

4) *Thinning Within Tanoak Thickets*

Tanoak thickets dominate approximately 172 acres of the project area, primarily along the southwestern ridge within the project area (Appendix 1, Map 3). Tanoak sprouts profusely from cut stumps, which has resulted in dense tanoak stands. To release conifers while minimizing the sprouting response in tanoak, removal of some trees is proposed around suitable conifers to provide for release and canopy development of retained trees. Trees removed may include both hardwoods and other conifers and will be selected to maximize growth and development of the retained conifers. Priority would be given to releasing redwood trees, then dominant Douglas-fir, and lastly other dominant conifers. No target basal area reduction is proposed, but the amount

will not exceed 30% reduction. Canopy cover is difficult to estimate because the thinning will be patchy, but the overall effect to stand will be that cover will not measurably decrease.

Residual old growth trees are uncommon in these tanoak-dominated areas. Second growth trees under the dripline of old growth residual trees will not be treated. No trees within 50 feet of the dripline which extend to the lowest live branch of an old growth residual tree will be removed. Smaller trees that don't extend to the lowest live branches within this area may be removed according to the prescription in the rest of the unit. All other trees beyond the dripline will be treated according to the unit prescription. Where aggregates of residual trees occur, a polygon will be drawn around the outer edge of the trees to demarcate the no treatment zone. To be considered an aggregate, the residual tree canopies must be within 30 feet of each other.

Crews will drive into the project using existing roads, as close to project sites as possible. Crews will not be spike camping or staying on site beyond normal work hours. Work is expected to occur year around with the exception of areas within 0.25 miles of old growth forest and the two areas of potential murrelet nesting (based on past surveys) (Mad River Biologists 2001) in the north and middle of the project area. Crews will only work in these areas between 16 September and 31 January in order to avoid the marbled murrelet and spotted owl noise restriction period.

5) Streamside and wetland areas

Varying thinning prescriptions and best management practices (BMP's) will be utilized in areas near streams and wetlands. Variations will be based on stream type (ephemeral, intermittent and perennial), stream power (channel development, stream order), and geomorphic setting (slope steepness of streamside areas, presence of unstable areas). These varying prescriptions and BMP's will be incorporated throughout the project area in the four different treatment areas just described and will take place either in lieu of or in addition to the actions occurring in those areas. Approximately 109 acres of the project area may fall into this category, based on GIS analysis of slope.

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

- All trees in the bankfull width of a channel will be retained.
- All trees contributing to channel and bank stability will be retained.
- All trees will be retained and equipment will not operate in streamside areas where slope steepness exceeds 45%.
- All trees that lean towards a 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%.
- An RNSP staff geologist will assess streamside buffers in thinning units for slope stability.

For wetlands, protection zones will be at least 100 feet wide from the outer edge of the riparian vegetation. Thinning treatments will retain a 70% or more post-treatment tree canopy.

Swales are topographic depressions on the hillslope that show no evidence of surface flow or

channel development. On gentle ($\leq 30\%$) slopes, there will be no restrictions on vegetation treatments except as outlined above. On steeper ($> 30\%$) slopes, thinning treatments will retain a 60% or more post-treatment tree canopy throughout the feature or within a 50-foot-wide zone (each side of swale), whichever distance is greater.

For intermittent and ephemeral streams on gentle ($\leq 30\%$) slopes, streamside protection zones will be a minimum 50 feet wide or to the break-in-slope, whichever distance is greater. Thinning treatments will retain a 60% or more post-treatment tree canopy. For intermittent and ephemeral streams on steeper (31% to 45%) slopes, streamside protection zones will be at least 100 feet wide or to the break-in-slope, whichever distance is greater. Thinning treatments will retain a 70% or more post-treatment tree canopy.

For perennial and 3rd-order and above streams, streamside protection zones will be 300 feet wide from the outer edge of the channel or floodplain, or to the break-in-slope, whichever distance is greater. On slopes $\leq 30\%$ steepness, thinning will retain a 70% or more post-treatment tree canopy. On slopes $> 30\%$, thinning will retain an 80% or more post-treatment tree canopy.

Second growth trees under the dripline of old growth residual trees will not be treated. No trees within 50 feet of the dripline which extend to the lowest live branches of old growth residual trees will be removed. Smaller trees that don't extend to the lowest live branches of old growth residual trees may be removed according to the prescription of the surrounding unit. Where aggregates of residual trees occur, a polygon will be drawn around the outer edge of the trees to demarcate the no treatment zone. No felling or yarding heavy equipment will be allowed beneath the dripline of any residual old growth trees or aggregate areas in order to prevent damage to trunks and root systems. To be considered an aggregate, the residual tree canopies must be within 30 feet of each other.

6) *Shrub Response Monitoring*

Post thinning sampling will be done in each of the various prescription areas to monitor shrub growth response. Quarter-hectare plots will be placed randomly throughout the project area. Shrub cover by species will be measured for at least five years after thinning is completed.

Summary List of Minimization Measures –

Minimization Measures Common to All Prescription Areas:

- a) Surveys for presence of marbled murrelets have been conducted throughout AA.
- b) Surveys for presence of spotted owls have been and will be conducted throughout AA.
- c) Two hour post sunrise/two hour pre sunset limited operating period in all areas within 500 feet (chainsaw only work) of unoccupied but presence detected suitable marble murrelet habitat areas during marbled murrelet noise restriction period (24 March through 15 September).
- d) No above ambient noise producing work within 500 feet (chainsaw only work) of assumed occupied suitable marbled murrelet habitat during marbled murrelet noise restriction period (24 March through 15 September).
- e) If spotted owls are detected during surveys, then no above ambient noise producing work will occur within 0.25 mile of the detection during the spotted owl noise restriction period (1 February through 31 July). If a 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 tree removal within the dripline of residual old growth trees or contiguous block of old growth trees.
- g) No removal of any trees that extend to the lowest live branch of any residual or contiguous old growth trees within 50 feet of the dripline of the residual or contiguous old growth trees. Where aggregates of residual trees occur, a polygon will be drawn 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.
- h) No trees removed over 20 inches dbh.
- i) No trees will be felled towards residual trees or trees of outstanding character (deformed trees, large hardwoods, redwood stump sprouts).
- j) Felled trees and slash will not be piled or burned. Ground fuels will not exceed 24" in depth in any area.
- k) All existing downed woody material and snags will be retained.
- l) Approximately 5 trees per acres will be girdled to create snags.
- m) Thinning crews will not be spike camping within AA.
- n) 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 AA and dispose of either outside of park or in wildlife proof trash containers.

Minimization Measures Specific to Areas With Less Than 30% Slope Prescription:

- a) No yarding heavy equipment will be allowed within the dripline of any residual old growth trees or aggregate areas in order to prevent damage to trunks and root systems. No damage from yarding activities 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.
- b) Helicopters will not be used.
- c) Portions of the A150, A160, A170, and Holter Ridge roads that cross the old growth forests and the 0.25 mile buffer, will be utilized by trucks to haul logs or equipment during the summer months. Above ambient noise producing work, including running log trucks, conducted from 24 March through 15 September will be restricted to the time period from two hours after sunrise to two hours before sunset.

Minimization Measures Specific to Thinning Adjacent to Old Growth Forests Prescription:

- a) Lighter thinning regime to minimize shrub proliferation and creation of food resources for corvids within 300 feet of contiguous old growth forest.
- b) No above ambient noise producing work will occur within 500 feet (chainsaw work only) of contiguous old growth forests from 24 March through 15 September.

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. Please refer to Sakai (2003) and the 2004 and 2005 addendums for RNSP general species accounts and park wide habitat status descriptions for spotted owls, marbled murrelets and fishers.

Effects to yellow-billed cuckoo and Xantus's murrelet will also not be assessed in this document or any future RNSP biological assessment. Neither candidate species occurs in or near RNSP and thus they cannot be affected by ongoing or proposed actions. RNSP believes these candidate species were erroneously placed on the list of potential listed and candidate species that could occur within the parks. Refer to RNSP memo to the USFWS Arcata office (28 February 2005).

The status and distribution of listed and candidate species potentially present within the Action Area are described below.

a. Northern Spotted Owl

There are 2,464 acres of suitable habitat within the action area (AA). Much of the AA (1,815 acres, 67% of AA or 108% of project area) was surveyed for spotted owls from 2003-2006 and all of the area along the Lost Man Creek Trail/Holter Ridge Road has been continuously surveyed since 1998. No spotted owl activity centers (AC) or spotted owls have ever been found within the AA. Barred owls appear to occupy three different areas dispersed across the AA. The farthest north detection area was of a barred owl pair and most likely represents a barred owl territory. The other two detection areas were of single barred owls and may or may not be barred owl territories (Schmidt 2005). It is unknown whether the lack of any historical spotted owl detections within the AA is due to barred owl presence excluding spotted owls or whether the overall habitat quality of the project area stands, as shown in Tables 1, 2 and 4, is precluding spotted owls from occupying the area.

The SF Little Lost Man Creek AC is the closest activity center to the AA and is located approximately 0.25 miles from the far southwestern edge of the AA and 0.5 miles from the project area. The AC was discovered in 1993. One spotted owl young fledged the AC in 1993, 1994 and 1998, a spotted owl pair was present from 1995-97, a single male was present 2003 and a single female was present in 2005. The AC was vacant from 1999-2001 and in 2004. Single barred owls were present in 1996-97, 1999 and 2005. The single male barred owl present in 2005 was not detected on the same day as the female spotted owl in 2005 and so they are not considered a pair. A barred owl pair was present in the AC in 2003. The AC is considered active.

The next closest AC is Little Lost Man Creek which is approximately 0.35 miles from the AA and approximately 0.6 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.

The farthest AC from the project is Lost Man Creek which is approximately 0.45 miles from the AA and approximately 0.7 miles from the project area. 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. No other known activity centers occur within 1.3 miles of the AA.

2,464 acres of suitable spotted owl habitat exists within the AA. 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 RNSP's own definition (second growth

stands >40 years of age) (USDI and CDPR 1999) except for the 172 acres of the project area dominated by dense stands of regenerating tanoak in the southwestern portion of the project area. Almost all of this area is unsuitable spotted owl habitat because of extremely high tanoak stem density. 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 (Table 1), lack of heterogeneous 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 north 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/will be 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.

Please see Sakai (2003) and the 2004 and 2005 addendums for a discussion on the species status within RNSP as a whole.

b. Marbled Murrelet

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) (Map 4 Appendix 1).

Seven hundred and forty-eight acres of suitable marbled murrelet habitat exists within the AA; of which, 338 acres were within 0.25 miles of survey stations with occupied behavior (Mad River Biologists 2001) (Map 4 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 94 acres of suitable habitat. 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 (17 high quality acres, 68 moderate quality acres, 9 low quality acres) (Map 4 Appendix 1). The total suitable habitat within the AA minus the residual suitable habitat equates to 654 acres and represents the contiguous old growth 0.25 mile wide strip of habitat on the west side of the AA (Map 3 and 4, Appendix 1) that is not going to be treated. The contiguous habitat is considered to be high quality.

The total number of murrelets and their reproduction within the Action Area are currently impossible to estimate. Please see Sakai (2003) and the 2005 addendum for a discussion on the species status within RNSP as a whole.

c. Pacific Fisher

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 2,635 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. Please see the 2004 addendum to Sakai (2003) for a discussion on the species status within RNSP as a whole.

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 (Map 3, 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 (RNSP unpub. records, Mad River Biologists 2004). In addition, barred owls have been detected in three separate portions of the action area, one of which was a pair. These barred owls may be excluding spotted owls from much or all of the action area (Schmidt 2005).

If a spotted owl or owls are detected, then no above ambient noise producing work will 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 along the western side of the action area. Potentially occupied residual nesting habitat also exists in the northwestern portion and middle of the action area, based on past surveys (Mad River Biologists

2004) (Map X Appendix 1). No above ambient noise producing work directly associated with thinning (i.e. running chainsaws, yarding equipment, loaders and log trucks) will occur within 0.25 miles of habitat during the marbled murrelet noise restriction period (24 March through 15 September) except for the area noted below. As a best management practice, no above ambient noise producing equipment will be operated between two hours after sunrise to two hours before sunset within 0.25 miles of residual stands with detected presence located in the middle of the project area (Appendix I, Map 2) (Mad River Biologists 2004).

Log trucks and log loaders, however, will be loading and hauling across the A150, A160, A170 and Holter Ridge Roads - which are partially within the contiguous old growth area or within 0.25 miles of it, during the noise restriction period. 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). Log trucks will be restricted to driving on these roads between two hours after sunrise to two hours before sunset to minimize noise impacts. In addition, log trucks will only be hauling on the A150 and A160 Roads during one breeding season (year two of the project) in order to temporally minimize the impacts. Log trucks will be running on the short section of the A170 within 0.25 miles of the contiguous old growth over three breeding seasons (years one, two and four of the project). Noise disturbance impacts associated with the A150 and A160 Roads cover approximately 237 acres of suitable habitat while noise impacts associated with the A170 cover 30 acres of suitable habitat – all of which are assumed to be occupied. It must be noted that the very southern end of the A170 and Holter Ridge Roads are 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 (Map 4, Appendix 1).

The remainder of the action area outside of the 0.25 mile contiguous old growth buffer zone along the west side of the project area and 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 outside of the two buffer zones 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 middle of 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 contiguous old growth redwood forest on the west side 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. RNSP 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

No 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, 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. The protection measures include no tree felling taking place during the breeding season (24 March through 15 September) in the contiguous old growth on the west side of the project area or the occupied residual old growth areas in the northwest portion of the project area (Map 4, Appendix I).

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 RNSP to be suitable spotted owl nesting, roosting and foraging habitat. Excepting the scattered residual old growth trees (Map 3, 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. Teraoka pers. comm., RNSP unpub. data, pers. obs.).

The treatment prescription for the 960 acres to be thinned on slopes greater than 30% (Map 3, Appendix I) will reduce the average canopy cover from 80% to 60%. The lower canopy cover is on the very low end of suitability for spotted owls but is still considered suitable; however, the thinning will result in habitat degradation in the short term because of the reduction in canopy cover which will result in more open forest stands. The temporary increase in the amount of downed woody material will also temporarily degrade habitat quality by making foraging for terrestrial prey more difficult for owls. The conditions, however, will not be permanent. 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. Canopy cover should increase in the first decade after treatment and reach pre-treatment levels in two to three decades (J. Teraoka pers. comm.). 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 20 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 and felled trees will remain on site. 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. 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.

The treatment prescription for the 365 acres to be thinned on slopes less than 30% (Map 3, Appendix I) will reduce the average canopy cover from 80% to 55%. All of the area is considered suitable nesting and roosting spotted owl habitat. The lower canopy cover is just below the very low end of suitability for spotted owls and thus is a removal of habitat. As with the stand treatments just described, this condition will not be permanent and the stands should cross back over into the realm of suitable canopy cover within the first decade (J. Teraoka pers. comm.). 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. However, for that first decade there will be a probable loss of habitat function for nesting and roosting and thus will be a temporary removal of suitable habitat. All of the other expected effects for the stands on slopes greater than 30% described above also will occur in these stands except that there won't be additional downed woody debris added to the forest floor. Felled tree boles are going to be yarded out of these 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. *No known spotted owl activity centers occur within 0.7 miles of the less than 30% slope prescription areas.* Thus there will be no habitat loss in any of the core areas of any known activity centers. Three activity centers, Little Lost Man Creek, South Fork Little Lost Man Creek and Lost Man Creek are within 1.3 miles of these areas. Approximately 129 acres, 168 acres and 0 acres of suitable habitat will be temporarily removed within the Little Lost Man Creek, South Fork Little Lost Man Creek and Lost Man Creek activity center non-core areas, respectively. There will still be 3,138 acres of suitable nesting and roosting habitat in the Little Lost Man Creek activity center after tree removal and thus the temporary removal of suitable habitat is not an adverse impact. There will still be 2,884 acres of suitable nesting and roosting habitat in the South Fork Little Lost Man Creek activity center after tree removal and thus the temporary removal of suitable habitat is not an adverse impact. The Lost Man Creek activity center is within 1.3 miles of the project area, but none of the less than 30% slope units with the greater canopy removal are within the 1.3 miles radius area. Thus, there will be no areas of habitat removal within the Lost Man Creek activity center. Temporary habitat loss within 1.3 miles of the three known AC's is summarized in Table 6. As stated previously, after ten years, all areas treated will cross back into nesting and roosting suitability. After this period, effects to habitat will be the same as in those areas thinned under the prescription for areas with a greater than 30% slope. Please note that vegetation removed from roads and landings and its effect on spotted owl habitat were analyzed in a previous consultation covering the Lost Man Creek Watershed Restoration Program (USFWS ref. # 8-14-2006-2836) and have been subtracted from these habitat totals.

Table 6. Summary of suitable habitat removal within 1.3 miles of the three known spotted owl activity centers affected by the proposed action.

Activity Center Name	Suitable Habitat Pre-Treatment	Suitable Habitat Post-Treatment
Little Lost Man Creek	3,188 acres	3,059 acres
South Fork Little Lost Man Creek	3,027 acres	2,859 acres
Lost Man Creek	3,369 acres	3,369 acres

Alternately, this level of thinning may not represent a removal of habitat. New research by Irwin et al. (in press) has indicated that California spotted owls appear to move immediately into thinned forests and forage more often in recently thinned forests than in adjacent unthinned forests. These researchers found that areas retaining 35-55 m²/ha of basal area maintained

continuous use by California spotted owls. The most heavily thinned stands in this proposed action will retain approximately 40 m²/ha of basal area. It must be noted, however, that Irwin et al. were studying California spotted owls in mixed Douglas-fir/white fir or white fir forests, not northern spotted owls in mixed Douglas-fir/redwood forests. 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.

The treatment prescription for the 105 acres to be thinned adjacent to the contiguous old growth on the west side of the project area (Map 3, Appendix I) will reduce the average canopy cover from 80% to 65%. The lower canopy cover is on the low end of suitability for spotted owls but is still considered suitable. Forest thinning in these areas will result in a short term degradation of habitat quality but will result in a more rapid increase in higher quality habitat over the longer term, as described previously for other thinning prescriptions. All other effects, short and long term, in these stands are expected to be the same or less than the 960 acres to be treated on slopes greater than 30% due to the lower overall thinning regime.

The treatment prescription for the 172 acres to be thinned in tanoak thickets (Map 3, Appendix I) will not measurably reduce average canopy. The 20% basal area reduction for these stands will also not significantly change their structure. Almost all of these stands currently provide little to no habitat for spotted owls due to a lack of sizeable conifers or tanoaks themselves (Table 1, RNSP unpub. data) and very high tanoak stem densities. The proposed action in these stands will have a negligible effect on spotted owl habitat.

The varying prescriptions for the 109 acres of riparian areas scattered throughout the project area will cause a spectrum of effects similar to the effects just described above for the four different treatment types, only to a much lesser extent. In general, effects will be none to little in areas adjacent perennial streams, intermittent streams and ephemeral streams on steep slopes and wetland areas because thinning treatments will be none to very light. Canopy cover will not measurably change (average canopy is 70-80% pretreatment, and will become 60-70% post treatment (RNSP unpub. data)), flight ways will not open up, residual old growth tree vigor will not change, terrestrial and arboreal prey habitat will not change, and average tree size will not increase as quickly as in the more heavily treated areas and thus the number of nest platforms and roosts will not increase as quickly.

In areas next to swales and ephemeral and intermittent streams on shallow slopes, effects will be similar to the surrounding stand depending on its treatment prescription. These areas were *not* included in the 109 acres to be manipulated under the riparian prescription. The swale, ephemeral and intermittent streams on shallow slope areas were analyzed as if they were the same as the surrounding, non riparian areas because these small landscape features have not been mapped, and thus could not be accounted for.

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 sold block of old growth just outside the western edge of the project area (Map 3, 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 that are within 50 feet of the dripline of the residual/old growth trees will not be removed. However, some trees that do not extend up to the lowest live branches of the old growth residual and solid block trees may be removed from the second growth canopy to encourage greater growth of the remaining second growth trees. No trees, regardless of size, will be removed within the dripline to the trunk of the residual or solid block old growth trees. These second growth trees may provide cover for nest platforms on the residual and solid block old growth trees and, by their retention, there should be no effect to the cover they may provide. No yarding equipment will be allowed within 50 feet of the dripline of the residual or solid block old growth trees and thus the root systems and trunks of the residual and solid block old growth trees 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 and solid block old growth trees and forest. A closed second growth canopy may provide some cover from below to murrelets as they fly in and out of nests and potentially prevent some wind throw of residual second growth trees (the old growth trees most likely are not protected from wind throw by the second growth trees because the old growth trees extend half again higher than the second growth and presumably have become somewhat “wind hardened”). A 50m buffer area around each residual old growth tree within the project area and along the solid block of old growth forest along the western edge of 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 1,151 acres exists within this area that would be degraded, of which 80 acres are within a quarter mile of survey stations where occupied behaviors were recorded. 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 and solid block 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.).

Marbled Murrelet Critical Habitat

The proposed action will not be occurring within designated marbled murrelet critical habitat areas.

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 much of the project area with the remaining areas at higher canopy covers. 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 and the maintenance of riparian canopy levels 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 (Schmidt 2005). 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 2005). The proposed action will increase old growth forest characteristics more quickly in treated areas than in non treated areas. The proposed action may then, ironically, improve habitat conditions for barred owls more quickly as well and thus increase their rate of invasion. 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 AA (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 365 acres to be thinned under the less than 30% slope prescription. All felled tree boles will be removed from these stands. Only tree tops and limbs will remain on site. The limbs and tops will be crushed by yarding equipment which will ensure maximum contact with the ground. Increased ground contact increases the rate of decomposition,

particularly in the cool, damp climate of the AA. All increase in fuels will be completely decomposed within 7-11 years post treatment (Pillars and Stuart, 1993) or even quicker due to mechanical crushing in these stands. In all other 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 AA. 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). The use of a murrelet limited operating period (24 March to 15 September) which prohibits human activities within 500 feet of the occupied residual stands in the north of the project area and the contiguous block of suitable murrelet habitat to the west of project 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. Thinning will be lightest and the most canopy will be retained within 300 feet of the contiguous old growth on the west side of the project area which should keep shrub growth to a minimum near the highest quality murrelet habitat in the action area. 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. It is reasonable to assume then, that the 300 foot contiguous old growth forest buffer will considerably reduce increased predation risk. 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 food 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 RNSP.

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 AA 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 ladder 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.

Marbled Murrelet Critical Habitat

The proposed action will not be occurring within designated marbled murrelet critical habitat areas.

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 is my determination that the RNSP South Fork Lost Man Creek Second Growth Management 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 and are likely to be adversely affected by noise disturbance caused by log trucks operating within 0.25 miles of suitable nesting habitat during the murrelet noise restriction period. Approximately 267 acres of suitable and presumed occupied murrelet nesting habitat will be disturbed by noise during one breeding season and 30 acres of suitable and presumed occupied habitat will be disturbed by noise during two additional seasons.

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

Wartella, Judy – Redwood National and State Parks. GIS analysis and map production.

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Appendix 1

Maps



United States Department of the Interior



FISH AND WILDLIFE SERVICE

Arcata Fish and Wildlife Office

1655 Heindon Road

Arcata, California, 95521

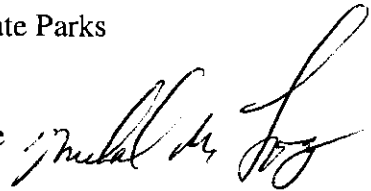
Phone: (707) 822-7201 FAX: (707) 822-8411

In Reply Refer To:
8-14-2004-2133
81331-2008-F-0027

DEC 19 2007

Memorandum

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

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

Subject: Formal Consultation on the South Fork Lost Man Creek Second Growth
Forest Management Plan, Redwood National and State Parks, Humboldt
County, California

This document transmits the U.S. Fish and Wildlife Service's (Service) biological opinion based on our review of the proposed South Fork Lost Man Creek Second Growth Forest Management Plan for Redwood National and State Parks (Parks), Humboldt County, California, and its effects on the federally threatened marbled murrelet (*Brachyramphus marmoratus*) and northern spotted owl (*Strix occidentalis caurina*). This document was prepared in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.) (Act). Your request for formal consultation was received on August 6, 2007.

This biological opinion is based on information provided in the August 2, 2007, biological assessment and other sources of information. Documents related to this consultation are on file in this office.

Consultation History

Streamlined Consultation Process

The proposed project was discussed with agency representatives during a scoping meeting on June 8, 2005. The project was presented at an interagency consultation team meeting on February 15, 2006. A draft biological assessment was submitted to the

Service on November 7, 2006. The Service provided comments on the draft biological assessment on January 23, 2007. The Parks submitted the final biological assessment to the Service on August 6, 2007.

Other Services' Conclusions

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

Protocol northern spotted owl surveys were conducted in all suitable habitat in or within 0.25 mile of all proposed work areas. During implementation of this project, additional owl surveys will be conducted when the existing surveys are more than 2 years old. To date, no spotted owl activity centers have been located within the project area. Home ranges of three northern spotted owl activity centers overlap the project area. Barred owls (*Strix varia*) have been detected at all three of these activity centers, and appear to have taken up residence at two or possibly all three of these sites. The three activity centers are located in the contiguous block of old growth forest to the west of the project area.

The Parks are proposing to thin 1,711 acres of second growth forest in the South Fork of Lost Man Creek. The proposed thinning will alter approximately 1,539 acres of suitable northern spotted owl habitat.

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

Disturbance

1. No project generated noise will occur in or within 0.25 mile of nesting and roosting habitat from February 1 through July 31, unless surveys determine the site to be unoccupied or the owls to be non-nesting. Due to the implementation of this operating restriction, the Service does not anticipate any project-generated disturbance to nesting owls.

Habitat

1. The function of northern spotted owl habitat will be maintained post-project in the 1,539 acres proposed for treatment (i.e., nesting and roosting habitat pre-treatment will remain nesting and roosting habitat post-treatment).
 - a. Post-canopy closure will be at least 60 percent in 1,174 of the 1,539 acres proposed for treatment.

old growth forest. This treatment will be a uniform thin from below with the intent to maintain sufficient canopy cover to prevent rapid shrub proliferation and minimize the creation of food resources for corvids. Trees removed will be in the 5 to 15 inch dbh size classes. It is expected that the average canopy cover will decrease from 80 to 65 percent. All tree falling will be conducted by hand crews with chainsaws. All felled trees will be limbed, bucked, and lopped to get the wood in contact with the forest floor. No trees will be yarded or removed from the units. Felled trees and slash will not be piled or burned. Ground fuels will not exceed 24 inches in depth in any area.

Thinning within Tanoak Thickets. The basal area reduction will be less than or equal to 30 percent in the 172 acres treated with this prescription. Trees removed may include both conifers and hardwoods that will be selected to maximize growth and development of the retained conifers. It is expected that canopy cover will not be measurably decreased.

Streamside and Wetland Areas. Varying thinning prescriptions will be utilized in the 109 acres near streams and wetlands. All the prescriptions will maintain at least a 60 percent post-treatment tree canopy cover.

Conservation Measures

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

Recovery Measures

The marbled murrelet recovery plan identifies using silvicultural techniques to increase the rate of developing new habitat as an action that must be taken to prevent a significant decline in population or habitat quality (U.S. Fish and Wildlife Service 1997). The primary objective of the proposed action is to accelerate the development of late-seral conditions thus promoting the development of marbled murrelet nesting habitat in 1,711 acres of second growth forest.

Also as part of this proposed action, the Parks are proposing to include the following specific measure to further the recovery of the marbled murrelet:

1. Quarter-hectare plots will be placed randomly throughout the project area to monitor shrub response following the treatments. The plots will be monitored annually for at least 5 years after the thinning is completed. The data will be used to determine whether or not treatments result in post-treatment increase in shrubs which provide food for corvids and if so, the duration and extent of the shrub response.

Minimization Measures

The Parks will implement the following minimization measures:

1. In units where trees will be left on-site within 500 feet of locations where marbled murrelet presence has been determined during surveys, work producing above ambient noise will be restricted to the period between 2 hours after sunrise and 2 hours before sunset during the murrelet breeding season (March 24 through September 15).
2. In units where trees will be left on-site within 500 feet of the contiguous old growth forest and within 500 feet of the two residual areas where marbled murrelet occupancy was determined during surveys, work producing above ambient noise will not occur during the murrelet breeding season (March 24 through September 15).
3. In units where trees will be removed off-site within 0.25 mile of the contiguous old growth forest and within 0.25 mile of the two residual areas where marbled murrelet occupancy was determined during surveys, work producing above ambient noise will not occur during the murrelet breeding season (March 24 through September 15).
4. Log trucks using the portions of the A150, A160, A170, and Holter Ridge roads in or within 0.25 mile of the old growth forest will be restricted to the period between 2 hours after sunrise and 2 hours before sunset during the murrelet breeding season (March 24 through September 15).
5. No trees under the dripline of old growth trees will be cut.
6. No trees that extend to the height of the lowest live branch of old growth trees located in the area from the dripline out to 50 feet will be cut. Trees that do not reach the height of the lowest live branch of the old growth tree may be cut according to the unit prescription. Where aggregates of residual old growth trees occur, a polygon will be drawn around the outer edge of the outer trees' dripline and extend outward from there for 50 feet to demarcate the treatment restriction zone. To be considered an aggregate, the residual tree canopies must be within 30 feet of each other.
7. No trees over 20 inches dbh will be cut.
8. No trees will be felled toward old growth trees or trees of outstanding character (e.g., deformed trees, large hardwoods, redwood stump sprouts).
9. No felling or yarding heavy equipment will be allowed within the dripline of any old growth trees or aggregate areas of residual old growth trees.

10. No damage from yarding activities will be allowed to any tree within 50 feet of the dripline of any old growth tree.
11. All existing down woody material and snags will be retained.
12. Approximately 5 trees per acre will be girdled to create snags.
13. No new roads or landings will be constructed.
14. All thinning crews will be instructed to not feed any wildlife, not leave food scraps, and pack out all trash.
15. Crews will not spike camp or stay on-site beyond normal work hours.

Action Area

For purposes of this biological opinion, the action area includes a 0.25 mile zone around the proposed treatment areas. The action area includes approximately 2,714 acres in the South Fork of Lost Man Creek.

Time-frame of Biological Opinion

This biological opinion is valid from the date of issuance through December 31, 2012.

Status of the Species: Marbled Murrelet

Legal Status

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

In 2004, the Service completed a 5-year status review of the marbled murrelet. As part of the status review process the Service contracted the task of compiling all new and relevant information available on the species. The contractor produced a report summarizing information relevant to the status of the species (McShane et al. 2004). Based on this report, the Service concluded that the California, Oregon and Washington distinct population segment of the marbled murrelet should remain listed as a threatened species. The Service also determined that the California, Oregon, and Washington distinct population segment of the marbled murrelet does not meet the criteria set forth in the Service's 1996 distinct population segment policy (61 FR 4722) (USDI Fish and Wildlife Service 2004). Currently, the marbled murrelet remains listed and retains its' protected status as a threatened species under the Act until the original 1992 listing decision is revised through formal rule-making procedures.

Life History

Marbled murrelets are long-lived seabirds that spend most of their life in the marine environment, but use old growth forests for nesting. Accounts of the taxonomy, ecology, and reproductive characteristics of the marbled murrelet are found in the following publications: Ecology and Conservation of the Marbled Murrelet (Ralph et al. 1995a), the Final Recovery Plan Marbled Murrelet (*Brachyramphus marmoratus*) Washington, Oregon, and California Populations (Recovery Plan) (USDI Fish and Wildlife Service 1997), the Final Supplemental Environmental Impact Statement on Management of Habitat for Late-successional and Old growth Forest Related Species Within the Range of the Northern Spotted Owl (USDA Forest Service and USDI Bureau of Land Management 1994), the Status of the Marbled Murrelet in North America: with Special Emphasis on Populations in California, Oregon, and Washington (Marshall 1988), Marbled Murrelet (*Brachyramphus marmoratus*) (Nelson 1997), and in the Evaluation Report in the 5-Year Status Review (McShane et al. 2004). Information from these sources is incorporated by reference and summarized as follows.

Current and Historical Range

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

Marine Environment

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

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

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

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

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

Terrestrial Environment

Marbled murrelets generally nest in old growth forests, characterized by large trees, multiple canopy layers, and moderate to high canopy closure. Marbled murrelet nests have been located at a variety of elevations from sea level to 5,020 feet (Burger 2002). However, most nests have been found below 3,500 feet. In California, nest stands are typically composed of low elevation conifers, which include coastal redwood and

Douglas-fir. These forests are located close enough to the marine environment for the birds to fly to and from nest sites. The furthest known inland occupied site is in Washington, about 52 miles from the coast. However, marbled murrelets have been detected up to 70 miles from the coast in the southern Cascade Mountains (Evans Mack et al. 2003).

Radar and audio-visual studies have shown marbled murrelet habitat use is positively associated with the presence and abundance of mature and old growth forests, large core areas of old growth, low amounts of edge and fragmentation, proximity to the marine environment, total watershed area, and increasing forest age and height (McShane et al. 2004). In California and southern Oregon, areas with abundant numbers of marbled murrelets were farther from roads, occurred more often in parks protected from logging, and were less likely to occupy old growth habitat if it was greater than 3 miles from other nesting marbled murrelets (Meyer et al. 2002). Meyer et al. (2002) also found at least a few years passed before birds abandoned fragmented forests.

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

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

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

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

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

Known predators of adult marbled murrelets in the forest environment include the peregrine falcon (*Falco peregrinus*), sharp-shinned hawk (*Accipiter striatus*), common raven (*Corvus corax*), northern goshawk (*Accipiter gentilis*), and bald eagle (*Haliaeetus leucocephalus*). Common ravens and Steller's jays (*Cyanocitta stelleri*) are known to take both eggs and chicks at the nest, while sharp-shinned hawks have been found to take chicks. Suspected nest predators include great horned owls (*Bubo virginianus*), barred owls (*Strix varia*), Cooper's hawks (*Accipiter cooperi*), northwestern crows (*Corvus caurinus*), American crows (*Corvus brachyrhynchos*), and gray jays (*Perisoreus canadensis*) (Nelson and Hamer 1995a, Nelson 1997). Predation by squirrels and mice has been documented at artificial nests and cannot be discounted as potential predators on eggs and chicks (Luginbuhl et al. 2001, Raphael et al. 2002a, Bradley and Marzluff 2003).

Reproductive Biology

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

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

Threats

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

Habitat loss

Marbled murrelets prefer late-successional and old growth forests for nesting. Loss of this type of habitat due to timber harvest was the primary reason for listing the species (USDI Fish and Wildlife Service 1992). Loss of nesting habitat exacerbated by poor reproductive success in remaining habitat are the primary factors responsible for a decline in the marbled murrelet population, compared to the historical population level in the early 1800's (USDI Fish and Wildlife Service 1997).

Predation

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

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

Disturbance

Marbled murrelets may be sensitive to human-caused disturbance in the terrestrial environment due to their secretive nature and their vulnerability to predation. There are few data concerning the marbled murrelet's vulnerability to disturbance effects, however research on a variety of other species, including other seabirds, indicates an animal's response to disturbance follows the same pattern as its response to encountering

predators. Anti-predator behavior has a cost to other fitness enhancing activities, such as feeding and parental care (Frid and Dill 2002).

Anecdotal researcher observations indicate that marbled murrelets typically exhibit a limited, temporary behavioral response to noise disturbance at nest sites and are able to adapt to auditory stimuli (Singer et al. 1995 cited in McShane et al. 2004, Long and Ralph 1998). Responses by marbled murrelet adults and chicks to calls from corvids and other potential predators include no response, alert posturing, and aggressive attack. Adults may temporarily leave a nest (McShane et al. 2004). However, the most typical behavior of chicks and adults in response to the presence of a potential predator is to flatten against a tree branch and remain motionless (Nelson and Hamer 1995a, McShane et al. 2004). In addition, there may be physiological responses researchers cannot account for with visual observations. Corticosterone studies have not been conducted on marbled murrelets, but studies on other avian species indicate chronic high levels of this stress hormone may have negative consequences on reproduction or physical condition (Wasser et al. 1997, McShane et al. 2004).

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

Gill-net fishing

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

Oil spills and marine contaminants

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

The primary consequence from the exposure of marbled murrelets to contaminants is reproductive impairment. Reproduction can be impacted by food web bioaccumulation

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

Reduced prey availability

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

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

Disease

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

Genetics

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

Conservation Needs

Recovery objectives for the marbled murrelet include the following (USDI Fish and Wildlife Service 1997): (1) stabilize and then increase population size, changing the current downward trend to an upward trend throughout the listed range; (2) provide conditions in the future that allow for a reasonable likelihood of continued existence of viable populations; and (3) gather the necessary information to develop specific delisting

criteria. Stabilizing and increasing habitat quality and quantity on land and at sea are the primary means for stopping the current population decline and encouraging future population growth (USDI Fish and Wildlife Service 1997).

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

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

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

Zone 4 extends from North Bend, Coos County, Oregon, south to the southern end of Humboldt County, California. It includes marbled murrelet populations in National and State Parks and land of the Pacific Lumber Company, as well as large blocks of suitable habitat critical to recovery of marbled murrelet populations in Washington, Oregon, and California over the next 100 years (USDI Fish and Wildlife Service 1997). The amount of suitable habitat protected in parks is probably not sufficient by itself to guarantee long-term survival in this Zone. Private land at the southern end of the Zone is important for maintaining the current distribution of the species (USDI Fish and Wildlife Service 1997). A gap of 300 miles exists in the distribution of suitable habitat between the southern portion of Zone 4 and the northern portion of Zone 6. Expansion of this gap should be avoided. Actions in Zone 4 should focus on preventing the loss of occupied nesting habitat, minimizing the loss of unoccupied but suitable habitat, and decreasing the time for development of new suitable habitat (USDI Fish and Wildlife Service 1997).

Maintaining marbled murrelet populations on private lands is critical for arresting the population decline in the next 50 to 100 years, especially where additional nesting habitat

will not be available on nearby Federal lands. The demographic bottleneck that the murrelet population may experience during the next 50 to 100 years makes the maintenance of populations found on private lands an important component to improve viability and the likelihood for recovery. On private lands, the maintenance of all occupied sites should be the goal where possible.

Conservation Strategy

The conservation strategy is to conserve as much of the remaining suitable or occupied habitat on Federal land (i.e., the NWFP) and on key non-Federal lands. These habitats would provide a system of long-term habitat reserves which are needed to stabilize and eventually recover the declining population. This approach assumes that marbled murrelet populations have not already declined below an extinction threshold from which recover is not possible (USDA Forest Service and USDI Bureau of Land Management 1994). It also assumes that marbled murrelet populations will respond positively to a long-term reversal in the trend of habitat loss (Raphael et al. 2002a). Our ability to predict extinction thresholds for the marbled murrelet is still quite crude (National Research Council 1995). In addition, our ability to estimate the size and trend in the marbled murrelet population is limited (Becker et al. 1997).

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

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

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

Current Condition

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

Marine environment

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

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

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

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

Terrestrial Environment

Habitat Amount. The precise amount of suitable marbled murrelet habitat within the listed range is unknown at this time. However, based on recent agency estimates and the Service's internal files, the best estimate of potentially suitable habitat for the marbled murrelet within the listed range is approximately 2.2 million acres of which approximately 155,000 acres or 7 percent are classified as remnant habitat (USDI Fish and Wildlife Service 2003). Approximately 93 percent of the suitable habitat occurs on

Federal land. Suitable habitat is distributed among the three States as follows: Washington, approximately 1 million acres; Oregon, approximately 800,000 acres; and California, approximately 400,000 acres (USDI Fish and Wildlife Service 2003). Though our ability to quantify suitable habitat has improved recently, the current estimates likely overestimate the amount in many areas because of the lack of detail on the presence of nesting structure. In fact, northern spotted owl habitat was used as a surrogate for marbled murrelet habitat in some areas. Marbled murrelet habitat quality depends on its proximity to marine waters, landscape context, and stand size. This information is needed to refine estimates of total suitable habitat. Quality habitat must meet basic nesting requirements, provide refuge from predators, and be relatively stable against catastrophic disturbances. It is not possible at this time to estimate the amount of high quality habitat which contributes to long-term nesting success.

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

Occupied habitat is defined as that portion of potentially suitable habitat which is occupied by nesting marbled murrelets (Evans Mack et al. 2003), or expected to be occupied, based on survey history in the area and the application of an occupancy index to unsurveyed areas. At least 483,919 acres of potentially occupied marbled murrelet habitat exist within the listed range of the species (Table 2); data are not available for Washington. Marbled murrelets may not occupy a large portion of potentially suitable habitat, due to the absence of nesting structure or its spatial configuration. As a result, the 2.2 million acres of suitable habitat likely overestimates the amount of actual occupied marbled murrelet habitat (USDI Fish and Wildlife Service 2003). For example, about 100,000 acres of late-seral forests occur on the Siskiyou and Rogue River National Forests and the Medford District of the Bureau of Land Management. Survey results in the area closest to the coast suggest that marbled murrelets actually occupy approximately 26 percent of the suitable habitat, based on existing survey data and assumptions about areas not adequately surveyed. Where published data were lacking, the Service solicited professional judgments from agency biologists and considers these simple estimates as the best available information (USDI Fish and Wildlife Service 2003).

Approximately 68,000 acres of occupied marbled murrelet habitat occur in the California portion of Zone 4 (Table 2). The agencies were unable to separate habitat estimates for Zones 3 and 4 in Oregon. In general, much of the habitat varies in quality. In California, high quality habitat occurs primarily in unmanaged redwood forests which are found

close to the coast. Lower quality habitat occurs inland in managed Douglas-fir forests. In California, the estimated 360,000 acres of potentially suitable habitat far exceeds the estimated 68,000 acres of occupied habitat (USDI Fish and Wildlife Service 2003). This discrepancy exists largely as a result of our incomplete understanding of the inland distribution of the marbled murrelet. For example, most habitats previously thought to be suitable on Forest Service lands in California are likely not occupied (Hunter et al. 1998). Comparisons or analyses using the larger amount of suitable habitat may underestimate the potential impacts of a proposed action and, therefore, should not be used to analyze the impacts of a proposed action.

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

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

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

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

Habitat Quality. Overall, the quality of existing marbled murrelet habitat has diminished, compared to conditions which existed prior to logging (USDI Fish and Wildlife Service 1997). Total habitat area is greatly reduced, and remaining habitat is often fragmented and located further from the marine environment. In California, a large amount of remaining habitat occurs on National, State, and County Park lands which are subject to a high degree of recreation and its associated effects on marbled murrelet populations.

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

Population

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

Monitoring to determine a trend in marbled murrelet populations began in 2000 and has continued annually since, as part of effectiveness monitoring for the NWFP (Bentivoglio et al. 2002, Huff ed. in press) (Table 3). A separate population monitoring effort is conducted each year in Zone 6, which is not part of the NWFP area. The population point estimates from the effectiveness monitoring are as follows: 2000, 18,571 birds; 2001, 22,180 birds; 2002, 23,673 birds; 2003, 22,217 birds; 2004, 20,578 birds; 2005, 20,223; and 2006, 18,622 (excluding Zone 5) (Table 3). It is premature to determine if biologically meaningful trends in population size exist, given that we only have 7 years of population monitoring data. Depending on the desired minimum power (80 or 95 percent) to detect annual decreases, at least 8 to 10 years of surveys are required for an overall population estimate (Huff ed. in press).

Four of the six Zones must be functional to effectively recover and maintain a well-distributed, viable marbled murrelet population, both in the short- and long-term (USDI Fish and Wildlife Service 1997). Based on the new estimates of population size it appears that Zones 1 through 4 contain relatively robust numbers of marbled murrelets (Table 3). However these robust populations continue to be affected. For example, both Zones 3 and 4 have experienced oil spills within the last 5 years, resulting in significant

murrelet mortality. Recent radio telemetry work in Zone 4 indicates nest success is very low (Hebert et al. 2003a).

Population Trend. Since 1995, four demographic modeling efforts have provided information on predicting population trends, and in one case, extinction probabilities of marbled murrelets into the future: Population Trends of the Marbled Murrelet Projected from Demographic Analyses (Beissinger 1995); Population Trends of the Marbled Murrelet Projected from Demographic Analyses (Beissinger and Nur 1997 in USDI Fish and Wildlife Service 1997); a subsequent analysis by Beissinger and Peery in 2003; and the Evaluation Report for the 5-Year Status Review of the Marbled Murrelet in Washington, Oregon, and California by McShane et al. (2004).

These efforts employed a Leslie Matrix modeling structure using estimates for demographic parameters such as survival and fecundity. Estimates of survival were derived from life history analyses of similar species. Estimates of fecundity (i.e., number of female young produced per adult female) were generated from estimates of nest success, either from radio-telemetry studies or from juvenile-to-adult ratios obtained in the marine environment. Table 4 lists the four latest murrelet Leslie Matrix models and the values for common demographic parameters used in each.

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

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

In 2004, radio telemetry data were used to estimate nest success (McShane et al. 2004). Using a stochastic Leslie Matrix model for each Zone with estimates for immigration, a range of values for survival, and what was considered higher estimates of nest success from radio telemetry data rather than juvenile-to-adult ratio data, McShane et al. (2004)

found all zone populations were declining at a mean annual rate of between 2.1 and 6.2 percent per decade (McShane et al. 2004). McShane et al. (2004) predict the highest rate of decline for Zone 6 and the lowest rate of decline for Zone 2.

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

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

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

Threats in the terrestrial environment

Habitat loss

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

Predation

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

Disturbance

Although detecting effects of sub-lethal noise disturbance at the population level in marbled murrelets is difficult, the potential for effects of noise disturbance on marbled murrelet fitness and reproductive success remains a concern and should not be discounted (McShane et al. 2004). As such, the Service has concluded in recent biological opinions that the potential for injury associated with visual and auditory disturbance to marbled murrelets in the terrestrial environment includes flushing from the nest, aborted feeding, and postponed feedings. These responses by individual marbled murrelets to disturbance stimuli may reduce productivity of the nesting pair, as well as the entire population (USDI Fish and Wildlife Service 1997).

Disease

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

Current condition of each conservation zone

Zone 1

Zone 1 contains the largest, most robust population in the listed range. Most of the marbled murrelet population in Washington occurs in Zone 1 (Bentivoglio et al. 2002, Jodice et al. 2002, USDI Fish and Wildlife Service 1997).

Effects to marbled murrelet population in Zone 1 occur in both the marine and terrestrial environments. Mortality due to net fisheries is most prevalent in Zone 1, compared to other zones, and a high threat of oil spills and other marine pollution exists in this zone (USDI Fish and Wildlife Service 1997). Between 1984 and 1991 three moderate oil spills occurred in this Zone resulting in an estimated 30 to 60 marbled murrelet mortalities (McShane et al. 2004).

Most suitable marbled murrelet habitat in Zone 1 occurs in northwest Washington primarily on Forest Service and National Park Service lands, and to a lesser extent on State lands. The majority of historic habitat along the eastern and southern shores of Puget Sound has been replaced by urban development resulting in the remaining suitable habitat being farther inland from the marine environment than what occurred historically (USDI Fish and Wildlife Service 1997). Lands considered essential for the recovery of the marbled murrelet within Zone 1 include any suitable habitat in a LSR; all suitable habitat located in the Olympic Adaptive Management Area; suitable habitat on State lands within 40 miles of the coast; and habitat within occupied marbled murrelet sites on private lands (USDI Fish and Wildlife Service 1997).

Zone 2

Point estimates of population size in Zone 2 are difficult to interpret, due to the high degree of variation. However, Zone 2 contains the fourth largest marbled murrelet population in the listed range.

Effects to the marbled murrelet population in Zone 2 have occurred both in the terrestrial and marine environment. Two large oil spills occurred in 1988 and 1991 resulting in estimated marbled murrelets mortalities ranging from 205 to 630 birds (McShane et al. 2004).

Suitable marbled murrelet habitat north of Gray's Harbor in Zone 2 occurs largely on State, Forest Service, National Park Service, and Tribal lands, and to a lesser extent on private lands. Alternatively, the majority of habitat in the southern portion of Zone 2 occurs primarily on State lands, with a small amount on privately owned lands. These lands were extensively harvested in the last century (USDI Fish and Wildlife Service 1997). Some of the privately owned lands were purchased and put into the Federal refuge system. The absence of Federal lands in southwestern Washington dictates that conservation of the marbled murrelet is largely dependent on contributions from non-Federal lands in that area. Lands considered essential for the recovery of the marbled murrelet within Zone 2 include any suitable habitat in a LSR, suitable habitat located in the Olympic Adaptive Management Area, suitable habitat on State lands within 40 miles of the coast, and habitat within occupied marbled murrelet sites on private lands (USDI Fish and Wildlife Service 1997).

Zone 3

Along with Zone 1, Zone 3 appears to contain a larger, more robust population than Zones 5, or 6. Strong (2004) continues to assert that marbled murrelet population numbers have declined since the early 1990's, but they appear to have stabilized at a lower level in recent years. The highest marbled murrelet density occurs off the central Oregon coast or the southern portion of Zone 3. Alternatively, the northern Oregon coast and northern portion of Zone 3 contains much lower densities of marbled murrelets.

Effects to the marbled murrelet population in Zone 3 occur both in the marine and terrestrial environment. In February and March of 1999, the M/V New Carissa oil spill occurred in Zone 3 near Coos Bay, Oregon; an estimated 262 marbled murrelets were killed, about 4 percent of the population in Zone 3 (Ford et al. 2001a). Prior to 1999, four additional oil spills resulted in marbled murrelet mortalities (McShane et al. 2004).

High quality suitable marbled murrelet habitat in Zone 3 occurs primarily in central Oregon on Forest Service and Bureau of Land Management lands. These lands are currently protected in LSRs. Alternatively, northwest Oregon contains less suitable habitat that is generally of lower quality and is found in small scattered patches. The remaining suitable habitat is largely found on State and private lands; it has a long history of timber harvest and wildfire.

Zone 4

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

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

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

Suitable marbled murrelet habitat in Zone 4 is fairly well distributed across the zone. Habitat in southwest Oregon is generally of high quality, occurring largely on Forest Service lands, and to a lesser extent on Bureau of Land Management lands. These lands are currently protected in LSRs. Northern California contains several large Parks and Reserves, and to a lesser extent some privately owned lands that are known to contain marbled murrelets. The Pacific Lumber Company HCP, located in northern California, permitted loss of nearly 5,000 acres of occupied marbled murrelet habitat. Though large amounts of habitat occur on Bureau of Land Management and Forest Service lands further inland, they contain few marbled murrelets.

Zone 5

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

Effects to the marbled murrelet population in Zone 5 have occurred largely in the terrestrial environment. A limited amount of suitable marbled murrelet habitat occurs in Zone 5. It is largely limited to State, County, and National Park lands. Most of the habitat that occurred historically in this Zone was harvested. The remaining habitat is of low quality and found in scattered small patches in Parks and on private lands.

Zone 6

Monitoring of the NWFP does not cover Zone 6, but independent research conducted in Zone 6 provides reliable population estimates. Like Zone 5, population size in Zone 6 is also quite low. New information from a radio-telemetry study in this Zone indicates the marbled murrelet population is highly endangered. A juvenile-to-adult ratio of 0.02 derived from surveys at sea is alarmingly low and further indicates a general failure in reproduction (Peery et al. 2002). Although Zone 6 is highly vulnerable, it was expected to contribute to recovery of the marbled murrelet in the short-term (i.e., 50-100 years)

(USDI Fish and Wildlife Service 1997). Recent evidence in Peery et al. (2002) suggests this may not occur.

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

Suitable marbled murrelet habitat is restricted to small pockets of State and County Park lands and private lands in San Mateo and Santa Cruz Counties. Like Zone 5, most suitable habitat was harvested; remaining habitat is of lower quality, found in smaller patches, and highly affected by human recreational activity.

Environmental Baseline (in the Action Area): Marbled Murrelet

Regulations implementing the Act (50 CFR §402.02) define the environmental baseline as the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation process. As stated earlier, the action area for this consultation includes 0.25 mile around the proposed treatment areas in the South Fork of Lost Man Creek.

Conservation Strategy in the Action Area

The Parks are located in murrelet conservation Zone 4. The primary conservation needs of the marbled murrelet in the Parks, as identified in the recovery plan, are to implement short-term actions to stabilize the population and longer-term actions to increase population growth and distribution (U.S. Fish and Wildlife Service 1997). Short-term actions applicable to the Parks include: (1) maintaining occupied habitat; (2) maintaining and enhancing buffer habitat; (3) decreasing risks of loss of nesting habitat due to fire and windthrow; (4) minimizing disturbance and reducing predation at nest sites; (5) increasing recruitment; and (6) initiating research to determine impacts of disturbance in terrestrial environments. Long-term actions include: (1) increasing the amount, quality, and distribution of nesting habitat; and (2) decreasing fragmentation. The recovery plan recommends that recovery actions in Zone 4 should focus on preventing the loss of occupied nesting habitat, the loss of unoccupied but suitable habitat, and decreasing the time for development of new suitable habitat (U.S. Fish and Wildlife Service 1997). It also recommends considering the need to maintain high quality murrelet habitat when planning recreational projects in the Parks. Recreational facilities may present threats to murrelets through loss of habitat, nest disturbance, and/or increased predation from corvids (U.S. Fish and Wildlife Service 1997).

The Parks' conservation strategy identifies the following management goals for marbled murrelets (Redwood National and State Parks 2003): 1) minimize, reduce, or eliminate the potential for incidental take due to noise disturbance, habitat loss, habitat degradation,

and corvid predation of nests; and 2) provide, enhance, and protect nesting habitat. The strategy also identifies the following murrelet recovery goals (Redwood National and State Parks 2003): 1) implement short-term actions that protect and restore habitat; 2) coordinate research to increase knowledge of murrelets; and 3) treat the Parks' 50,000+ acres of second growth forest to increase the amount, quality, and distribution of nesting habitat.

Current Condition in the Action Area

Habitat: Amount, Distribution, and Quality

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

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

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

Approximately 748 acres of suitable marbled murrelet nesting habitat occur within the action area. This includes 654 acres of contiguous old growth forest and 94 acres of residual old growth. Residual old growth trees are scattered throughout the action area. The quality of the residual trees as murrelet nesting habitat depends on the density of residual trees, density and size of surrounding trees, and proximity to contiguous old growth stands.

Population: Numbers, Distribution, and Reproduction

Since 2000, monitoring to determine marbled murrelet population trend has occurred annually in Zone 4 as part of the effectiveness monitoring for the NWFP (Huff et al. 2003). For sampling purposes, Zone 4 was divided into two strata. The northern strata includes the area from Coos Bay, Oregon to Big Lagoon, California and the southern strata the area from Big Lagoon south to Shelter Cove, California. The northern strata occurs offshore of National Forest lands in Oregon and the Parks in California. At-sea locations of radio-marked marbled murrelets captured offshore from the Parks ranged from Punta Gorda, Mendocino County north to Newport, Oregon; however, most of the detections occurred in the northern strata (Hebert et al. 2003b). In 2000, the murrelet population point estimate for the northern strata of Zone 4 was 4,400 birds with a 95

percent confidence interval (CI) of 3,000-8,700. In 2001, the point estimate was 3,400 with a 95 percent CI of 2,400-5,900; in 2002, 3,800 birds with a CI of 2,600-5,000; in 2003, 3,700 with a CI of 2,600-5,700; in 2004, 3,200 birds with a CI of 2,000-7,800; in 2005, 3,300 with a CI of 2,200-5,400; and in 2006, 3,600 with a CI of 2,700-4,900. At this point these data are insufficient to estimate statistically valid population trends; however, they provide a useful baseline estimate of the marbled murrelet population (Huff et al. 2003).

In 2003, the rate of population change was estimated for Zone 4 with a stage-based Leslie matrix model (Beissinger and Peery 2003). The rate of population decline for this zone ranged from 2.5 to 13.2 percent per year depending on the values used for adult and juvenile survival. All combinations of adult and juvenile survival, even the most optimistic, produced a negative rate of population change indicative of a declining population (Beissinger and Peery 2003).

From 1989 through 2002, personnel from the Forest Service's Redwood Sciences Laboratory conducted inland audio/visual surveys at three sites in or near the Parks. Miller et al. (2003) reported a "generally decreasing trend from . . . inland forest morning surveys over the past thirteen years" with the mean numbers of detections in 2002 at ". . . the lowest levels observed in any year for Lost Man Creek and James Irvine Trail". For example, in 1989 the mean number of detections at the James Irvine Trail was 74.5 ($\pm$ 36.18); by 2002 the mean number of detections was 38.5 ($\pm$ 25.5). Similarly, at Lost Man Creek, in 1989 the mean number of detections was 128.4 ($\pm$ 74.5); by 2002 the mean number was 39.4 ($\pm$ 19.9).

In lieu of nest site data, murrelet at-sea observations of juvenile-to-adult ratios are used as an indirect index of breeding success (McShane et al. 2004). Beissinger (1995) estimated that a juvenile-to-adult ratio of 0.18 to 0.28 is needed to result in a stable population, given an annual survivorship of 0.85 to 0.90. From 2000 through 2003, Miller et al. (2003) reported juvenile-to-adult ratios from 0.0 to 0.094 offshore of Del Norte Coast Redwoods State Park and from 0.003 to 0.021 offshore of Redwood National Park.

In 2001 and 2003, 84-94 percent of the 78 known marbled murrelet nesting attempts in the Parks failed (Golightly pers. com. 2006). At least 56 percent of the nest failures were due to predation. For comparison, murrelet nest failure in the Santa Cruz area has been estimated at 84 percent (Peery et al. 2004), 54 percent in British Columbia (Bradley et al. 2004 as cited in Peery et al. 2004), and 67 percent rangewide (McShane et al. 2004). During the 3-year period, the average proportion of breeders in the Parks, as estimated with radiotelemetry, was 34 percent (Golightly pers comm. 2006). For comparison, the average proportion of breeders in the Santa Cruz population was 31 percent (Peery et al. 2004) and 65 percent in Desolation Sound, British Columbia (Bradley et al. 2004 as cited in Peery et al. 2004).

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

All residual old growth stands within the action area were surveyed for murrelets in 2003-2004 and 2006. According to the biological assessment, murrelet occupancy was documented at four of the 34 survey stations and detections were reported at five of the 34 stations. Based on these survey results and the known use of residual habitat elsewhere in the murrelet's range, the Parks assume that all stands with trees providing nesting opportunities have the potential to be occupied unless surveys indicate probable absence.

Effects of the Action

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

Likelihood of the Species Presence

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

Direct Effects - Habitat Modification

Scientific Basis for Habitat Modification

Activities such as timber harvest may reduce the quantity and quality of suitable marbled murrelet nesting habitat. Timber harvest may result in the complete removal of nesting habitat or the degradation of components of nesting habitat. Degraded habitat may retain nesting structure, but overall habitat quality and nesting function is reduced. Forest management practices may alter nest site characteristics such as the availability of platforms or deformities, and canopy cover over platforms. Management activities that remove individual nest platforms and nest trees likely result in the abandonment of the site for nesting and the loss of several future breeding attempts by the displaced breeders. Furthermore, as nest sites continue to be lost, competition for remaining sites likely is increased.

Management activities that remove or degrade components of suitable habitat within a nest stand, such as live trees with or without nest platforms that contribute to the overstory canopy, may alter stand structure, complexity and integrity, and adversely affect reproduction. Timber harvest activities may result in changes in habitat microclimate by reducing overall canopy closure within a stand. A reduction in canopy closure can result in exposure to environmental factors such as increased temperatures that may impact both the species and nest stand structure. Marbled murrelets nest in older forests subject to marine influences such as fog, presumably because these forests provide a suitable microclimate for nesting and for the development of the most commonly used nest substrates such as moss and lichen (Hamer and Nelson 1995b, USDI Fish and Wildlife Service 1997).

Harvest of suitable unoccupied habitat may adversely affect both survival and recovery of the marbled murrelet depending upon its quality and location relative to currently occupied habitat. Meyer et al. (2002) found that murrelets were less likely to occupy old growth habitat if it was isolated (>3.1 miles) from other nesting murrelets. Suitable unoccupied habitat that is in close proximity to currently occupied habitat is more likely to be used by dispersing or colonizing birds, especially as occupied habitat is degraded or removed.

Harvest of habitat that is not yet suitable, but that will become suitable within the next 2 decades is described as recruitment habitat in the recovery plan (USDI Fish and Wildlife Service 1997). Removal of recruitment habitat may adversely affect recovery of the marbled murrelet depending upon its quality and location relative to currently suitable habitat. Recruitment habitat that is located within 0.5 mile of currently occupied habitat is more likely to be used by murrelets, thus providing for recovery opportunities in the future (USDI Fish and Wildlife Service 1996).

Effects of the Proposed Action – Habitat Modification

The proposed treatments will occur in suitable murrelet nesting habitat (residual stands) and adjacent to suitable murrelet nesting habitat (old growth stands). The following operating restrictions will minimize potential damage to existing nest trees and structure: 1) no cutting of trees within 50 feet of the dripline of the residual/old growth tree that extend to the level of the lowest live branches of residual/old-growth trees; 2) no cutting of trees within the zone from the dripline of a residual/old growth tree to its trunk; and 3) no yarding equipment allowed within 50 feet of the dripline of residual/old growth trees.

No treatments will occur in old growth forest. However, second growth forest within 300 feet of old growth forest will be treated. The proposed treatment for the second growth forest near old growth will be a uniform thin from below with the intent to maintain sufficient canopy cover to prevent rapid shrub proliferation and minimize the creation of food resources for corvids. Trees removed in these units will be in the 5 to 15 inch dbh size classes. It is expected that the average canopy cover in this area will decrease from 80 to 65 percent.

The proposed treatment of second growth forest may subject adjacent old growth forest to increased predation and environmental effects. Kremsater and Bunnell (1999 as cited in McShane et al 2004) reported that microclimate effects can extend up to 328 to 492 feet into the forest. To quantify short-term habitat modification that may occur in these old growth stands, as a result of the proposed thinning in adjacent second growth, a 164-foot buffer was placed around the proposed treatment areas and the amount of old growth in the buffer estimated. This narrow buffer is considered appropriate for assessing potential impacts from the proposed action because the treatment prescription will maintain canopy cover and only remove small trees. Masselink (2001 as cited in McShane et al. 2004) found Steller's jays to be most abundant within 164 feet of an edge; Nelson and Hamer (1995a) found that all successful murrelet nests were greater than 180 feet from an edge; and Raphael et al. (2002b) also found successful murrelet nests were greater than

164 feet from an edge. An estimated 70 acres of occupied old growth forest occur within the 164-foot buffer. Murrelets nesting in these acres may experience, for the short-term, increased edge-related effects. However, it is anticipated that the functionality of the old growth for use by marbled murrelets will remain intact post-treatment.

The proposed action will also modify second growth forest containing scattered residual old growth trees. Within the action area, there are 94 acres of residual trees and clusters of residual trees scattered throughout the second growth forest. The proposed thinning will result in an initial reduction in canopy density and stand volume in the second growth forest. These stands contribute to nesting success by protecting nests from weather, supporting adequate microclimate conditions, and minimizing predation. Areas with residual old growth trees have the potential to become high quality nesting habitat much faster than areas lacking potential nest trees. Short-term habitat modification will occur to 5 acres of occupied residual stands and 89 acres of unoccupied residual stands. The proposed treatment will alter forest stand characteristics; however, it is anticipated that the functionality of habitat for use by marbled murrelets will remain intact post-treatment and long-term changes are expected to result in higher quality nesting habitat.

We do not anticipate that this short-term modification of suitable murrelet habitat (old growth forest and residual stands) will be significant for the following reasons:

- a. Post-canopy closure in the second growth forest will be at least 55 percent. According to the biological assessment, it is anticipated that canopy cover should increase in the first decade after treatment and reach pre-treatment levels (around 80 percent) in two to three decades.
- b. No prescriptions will be applied to the old growth forest; however, second growth forest adjacent to the old growth forest will be treated. Within 300 feet of the old growth forest, the proposed treatment will be a uniform thin from below with the intent to maintain sufficient canopy cover to prevent rapid shrub proliferation and minimize the creation of food resources for corvids.
- c. No trees over 20 inches dbh will be cut.
- d. The removal or damage of nest trees or adjacent trees that extend to the level of the lowest live branches of potential nest trees will be avoided.
- e. According to the biological assessment, the combination of low fire frequency, micro-climate regime, and proposed fuel treatments make the short-term increased fire risk from the proposed treatment low.

It is anticipated that the long-term result of the proposed treatments will be to accelerate the development of late-successional forest structure and murrelet nesting habitat. Approximately 1,710 acres of second growth forest will benefit from the proposed treatments and as a result it is expected that the amount, quality, and distribution of murrelet nesting habitat within the Parks will increase over the long-term.

Direct Effects - Disturbance

Scientific Basis for Disturbance

Management activities that require use of heavy equipment, chainsaws, or large vehicles introduce noise and visual disturbances into the environment. The effects of auditory and visual disturbances on birds are extremely difficult to determine (Knight and Skagen 1988). Confounding factors include the tolerance level of individual birds, type and frequency of human activity, ambient sound levels, how sound reacts with topography and vegetation, and differences in how species perceive noise and human presence. Regardless of these difficulties, research conducted on a variety of bird species does suggest that the effects of human disturbance can have a negative impact on reproductive success (Carney and Sydeman 1999, Frid and Dill 2002, Marzluff and Neatherlin in review). Disturbance can affect productivity in a number of ways, including interference of courtship (Bednarz and Hayden 1988), nest abandonment (White and Thurow 1985), egg and hatchling mortality, due to exposure and predation (Drent 1972, Swensen 1979), and altered parental care (Fyfe and Olendorff 1976, Bortolotti et al. 1984).

Disturbance is defined as noise in excess of ambient levels in or adjacent to suitable nesting habitat or as the reaction of nesting birds to human presence or activity, resulting in disruption of essential breeding behaviors. Disturbance during the breeding season may potentially disrupt the species' essential breeding behaviors by: 1) causing abandonment of the breeding effort by failure to initiate nesting or to complete incubation; 2) disrupting nesting activity such as feeding young; and 3) causing premature dispersal of juveniles.

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

Effects of the Proposed Action - Disturbance

The Service assumes that disturbance to marbled murrelets may occur during the breeding season when large chainsaws are used within 500 feet of occupied nesting habitat and when logging activities (e.g., felling large trees, hauling, and yarding) occur within 0.25 mile of occupied nesting habitat.

Hauling will occur during the breeding season, March 24 through September 15, within 0.25 mile of suitable habitat along the A150, A160, A170, and Holter Ridge roads. Log trucks will use the A150 and A160 roads during one breeding season (second year of the project). Approximately 237 acres of occupied nesting habitat occurs within 0.25 mile of these two roads. Log trucks will use a short section of the A170 road within 0.25 mile of 30 acres of occupied nesting habitat during three breeding seasons (project years one, two,

and four). Therefore, any murrelets nesting in these two areas will be subject to harassment. Hauling will result in 237 acres of occupied murrelet nesting habitat being subject to disturbance during one breeding season and 30 acres during three breeding seasons. To minimize this disturbance, from March 24 through September 15 hauling within 0.25 mile of the old growth forest will be restricted to the period between 2 hours after sunrise and 2 hours before sunset.

The southern end of the A170 and Holter Ridge roads are also within 0.25 mile of occupied nesting habitat. However, the hauling on these two roads is not expected to produce project-generated noise significantly above background levels because the regularly used Bald Hills Road is also within 0.25 mile of this suitable habitat. Murrelets nesting in this habitat are expected to be habituated to traffic noise. Therefore, any disturbance to nesting murrelets as a result of hauling in this area is expected to be insignificant.

Chainsaws will be used during the breeding season within 500 feet of survey stations where murrelet presence was noted. The work will be limited to the period between 2 hours after sunrise and 2 hours before sunset. The probability of murrelets occupying these sites is expected to be low based on the limited number of detections, nature of the detections (high fly-overs), and quality of habitat (scattered residual trees). Therefore, it is unlikely that nesting murrelets will be disturbed as a result of the proposed work during the breeding season at these locations.

Direct Effects - Injury or Mortality

Scientific Basis for Injury or Mortality

Timber harvest activities such as tree felling, helicopter yarding, and prescribed burning of occupied or unsurveyed suitable habitat during the breeding season could directly injure or kill adults, eggs, or young. Murrelets may be struck and killed or injured by falling trees during harvest or stand improvement, although such risk is likely confined to the area relatively close to the nest tree. Adults can reasonably be expected to move from the area and avoid injury or death. However, eggs and flightless young are vulnerable to injury or death for approximately 60 days (Nelson and Hamer 1995b).

Effects of the Action – Injury or Mortality

The proposed project will not expose murrelets to the risk of direct injury or mortality due to tree-felling because tree cutting will not occur in occupied or unsurveyed marbled murrelet nesting habitat during the breeding season, March 24 through September 15. Consequently, it is not likely that the proposed action will result in direct injury or mortality of murrelets, particularly to young or the loss of eggs.

Indirect Effects - Increased Risk of Predation

Indirect effects are defined as those effects that are caused by or will result from the proposed action at a later time, but are still reasonably certain to occur (50 CFR 402.02).

Scientific Basis for Increased Risk of Predation

Corvids have been implicated as the main predator of murrelet nests (Nelson and Hamer 1995b). Corvids are extremely intelligent and efficient predators that use a highly refined

search image for locating prey (McShane et al. 2004). Common ravens and Steller's jays are known to take both murrelet eggs and chicks at the nest. Common ravens account for the majority of egg depredation, as they appear to be the only predator capable of flushing incubating or brooding adults from a nest (Nelson and Hamer 1995b). Suspected nest predators include northwestern crows, American crows, and gray jays (Nelson and Hamer 1995b, Nelson 1997). Populations of several corvid species have increased dramatically in the west as a result of forest fragmentation, increased agriculture, and urbanization (McShane et al. 2004).

Predation has consistently been the most significant cause of recorded nest failure at murrelet nests (McShane et al. 2004). Recent studies have shown that most monitored nests have failed (43 to 85 percent) and most failures (78 percent) are due to predation (McShane et al. 2004). In general, studies of avian predation have found: 1) higher nest predation in areas with high predator densities; 2) increased abundance or diversity of predators with increased variety and complexity of habitats; 3) increased abundance of some corvid species along edges or in forest fragments near human activities; 4) high nest predation by corvids along edges near human activities or in areas of low forest cover; and 5) high predation by small mammals in a variety of habitat including interior forests and along non-natural edges (McShane et al. 2004).

Effects of the Action – Increased Risk of Predation

Thinning second growth forest may indirectly impact murrelet reproduction by causing an increase in Steller's jay abundance. Thinning reduces canopy cover which allows greater light penetration to the forest floor. Greater light may result in an increase in the density and aerial extent of shrubs that provide food for jays. A number of studies in Oregon and Washington (cited in McShane et al. 2004) found Steller's jays to be most abundant along forest edges bordered by early seral vegetation with berry-producing shrubs. It is not anticipated that any of the proposed thinning prescriptions are heavy enough to promote the production of acorns, nuts, or berries in the understory in levels that would attract large numbers of jays. The proposed thinning will be the lightest within 300 feet of the old growth forest. Shrub response will be monitored for at least 5 years after thinning in each of the prescription areas to determine if this assumption is correct.

Summary of Project Effects on Numbers, Distribution, and Reproduction

The Service anticipates the proposed action will result in direct adverse effects to murrelets in the form of harassment of murrelets associated with 237 acres of occupied nesting habitat for one breeding season and 30 acres of occupied habitat for three breeding seasons. An additional 164 acres of nesting habitat will be modified due to the proposed thinning (5 acres of occupied residual stands, 89 acres of unoccupied residual stands, and 70 acres of occupied old growth forest).

In the short-term, conservation needs of the marbled murrelet are protection of occupied habitat, minimization of disturbance, and reduction of predation at nest sites. The proposed project will result in limited short-term (one breeding season) disturbance to marbled murrelets nesting in 237 acres of occupied habitat and limited short-term (three

breeding seasons) disturbance to marbled murrelets nesting in 30 acres of occupied habitat. The Parks have minimized the number of acres subject to disturbance by implementing limited operating periods for projects located in the vicinity of the majority of the occupied habitat in the action area. The proposed project will also result in habitat modification of 164 acres of suitable nesting. This is not expected to change the functionality of these nesting stands over the short-term.

Over the long-term, the conservation needs of the marbled murrelet focus on the retention or development of suitable habitat to stop population decline and increase population growth. The primary objective of the proposed project is to accelerate the development of late-successional forest structure and murrelet nesting habitat in the action area. Approximately 1,710 acres of second growth forest will benefit from the proposed treatments and as a result it is expected that the amount, quality, and distribution of murrelet nesting habitat within the Parks will increase over the long-term. Development of the second growth forest may increase murrelet reproductive success by reducing the effects of edge along the old growth forest, increasing the quality of the residual stands, and reducing predation at the nest.

Cumulative Effects

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

The action area borders private industrial timber land on its eastern edge. Future timber harvest will likely occur on this private land adjacent to the action area. The California Department of Fish and Game (CDFG) has listed the marbled murrelet as endangered in California. Logging of private lands can exacerbate the previously described adverse effects, however, logging on private land is currently reviewed by the CDFG to ensure that no take of marbled murrelets will occur. The majority of private forest land is used for timber production, and very little murrelet habitat remains on these lands. Murrelets nesting in the Parks may be subject to increased noise disturbance and/or increased predation threats because of timber harvest on these private lands. In addition, a county road (Bald Hills Road) exists in the Parks immediately to the south of the action area. Private vehicles and logging trucks utilize this county road.

Conclusion

After reviewing the current status of the marbled murrelet, the environmental baseline, the effects of implementing the proposed action, and the cumulative effects, it is the Service's biological opinion that implementation of the South Fork Lost Man Creek Second Growth Forest Management Plan is not likely to jeopardize the continued existence of the marbled murrelet. Critical habitat for the marbled murrelet has been

designated in the state parks, however, this action does not affect that area and no destruction or adverse modification of that critical habitat is anticipated.

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

1. The proposed action will not remove suitable marbled murrelet nesting habitat.
2. The proposed project will modify 164 acres of suitable nesting habitat due to habitat modification. This relatively short-term impact is not expected to have a long-term influence on murrelet numbers and reproduction.
3. Over the long-term the proposed treatment of approximately 1,710 acres of second growth forest is expected to accelerate the development of late-successional forest structure and murrelet nesting habitat in the action area.
4. Nesting marbled murrelets associated with 237 acres of occupied habitat will be subject to harassment during one breeding season and murrelets associated with 30 acres of occupied nesting habitat will be subject to harassment during three breeding seasons. This is a short-term disturbance that is not expected to influence future reproduction.

INCIDENTAL TAKE STATEMENT

Introduction

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

The measures described below are non-discretionary, and must be undertaken by the Parks so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, for the exemption in section 7(o)(2) to apply. The Parks have a continuing duty to regulate the activity covered by this incidental take statement. If the

Parks (1) fail to assume and implement the terms and conditions or (2) fail to require the (applicant) to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the Parks must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement. [50 CRF §402.14(i)(3)]

Amount or Extent of Take: Marbled Murrelet

The Service anticipates incidental take of murrelets could occur as a result of this proposed action. Incidental take of marbled murrelets is difficult to quantify because murrelets occur in habitat that makes detection difficult and they are behaviorally secretive. Because the precise number of marbled murrelets taken cannot be determined, take is best measured in terms of the number of acres of suitable nesting habitat that will be subject to direct and indirect effects as a result of the proposed action. The incidental take is expected to be in the following forms:

Harassment of all murrelets associated with a total of 237 acres of occupied nesting habitat due to the operation of heavy equipment during one breeding season, March 24 through September 15. Equipment operation during this period will be restricted to the period between 2 hours after sunrise and 2 hours before sunset.

Harassment of all murrelets associated with a total of 30 acres of occupied nesting habitat due to the operation of heavy equipment during three breeding seasons, March 24 through September 15. Equipment operation during this period will be restricted to the period between 2 hours after sunrise and 2 hours before sunset.

Effect of the Take

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

Reasonable and Prudent Measures

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

Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Endangered Species Act, the Parks must comply with terms and conditions which implement reasonable and prudent measures. Terms and conditions are nondiscretionary. As mentioned above, the Service considers the measures incorporated in the project design to be sufficient to minimize take of marbled murrelets; therefore, no terms and conditions are necessary.

The Service has determined that murrelets in no more than 237 acres of occupied nesting habitat will be harassed due to the operation of heavy equipment during one breeding season and murrelets in no more than 30 acres of occupied nesting habitat will be harassed due to the operation of heavy equipment during three breeding seasons. If during the course of the action, this level of incidental take is exceeded, such incidental take represents new information requiring reinitiation of consultation and review of the need to include reasonable and prudent measures. The Parks must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of reasonable and prudent measures.

Monitoring Requirements

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

Prior to January 31 of each year, for the duration of the proposed action, the Parks shall provide annual monitoring reports describing the work completed.

The report should include the following: 1) dates of operation in or within 0.25 mile of suitable murrelet nesting habitat; 2) results of shrub response monitoring; and 3) results of any marbled murrelet surveys completed during the past year.

Reporting Requirements

Any dead or injured marbled murrelet must be reported to the Service's Law Enforcement Division (916-979-2987) or the Arcata Fish and Wildlife Office as soon as possible, and turned over to the Law Enforcement Division or a game warden or biologist of the California Department of Fish and Game for care or analysis. The Service is to be notified in writing within three working days of the accidental death of, or injury to, a marbled murrelet or of the finding of any dead or injured marbled murrelets during implementation of the proposed action. Notification must include the date, time, and location of the incident or discovery of a dead or injured marbled murrelet, as well as any pertinent information on circumstances surrounding the incident or discovery. The Service contact for this written information is the Field Supervisor for the Arcata Fish and Wildlife Office at (707) 822-7201.

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

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

CONSERVATION RECOMMENDATIONS

Sections 2(c) and 7(a)(1) of the Act direct Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species and the ecosystems upon which they depend. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

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

1. Coordinate with the Service in the project planning phase of future projects to develop guidelines for avoiding or mitigating adverse effects of the Parks' management activities on listed species.
2. Survey and monitor federally listed species within the Parks' boundaries.
3. Implement experimental treatments of individual trees to stimulate the development of potential murrelet nesting platforms.
4. Monitor the relative abundance of Steller's jays before, during, and after the proposed thinning.

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

REINITIATION NOTICE

This concludes formal consultation on the South Fork Lost Man Creek Second Growth Forest Management Plan. As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operation causing such take must cease pending reinitiation. If you have any questions regarding this biological opinion, please contact Robin Hamlin of my staff at (707) 822-7201.

cc:

RNSP, Orick, CA (Attn: K. Bensen)

CDFG, Eureka, CA (Attn: W. Condon)

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TABLES

Table 1. Acres of suitable northern spotted owl habitat within the 0.7 and 1.3 mile analysis areas for the home ranges within the project area, Redwood National Park, Humboldt County, California.

<i>Activity Center</i>	<i>0.7 mile</i>	<i>1.3 miles</i>
Lost Man Creek	701	2,508
Little Lost Man Creek	973	3,188
South Fork Little Lost Man Creek	884	3,027

Table 2. Estimated acreage of potentially occupied marbled murrelet nesting habitat at various landscape scales within the species' listed range (USDI Fish and Wildlife Service 2003).

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

¹ MMCZ = Marbled Murrelet Conservation Zone.

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

Table 3. Marbled murrelet population point estimates and associated 95 percent confidence intervals (CI) by Zone within the listed range.

	2000 Population Point Estimate	95 % CI	2001 Population Point Estimate	95 % CI	2002 Population Point Estimate	95 % CI	2003 Population Point Estimate	95 % CI
Zone 1 ¹	5,600	2,700 – 8,900	8,900	5,800 – 11,900	9,700	6,000 – 13,800	8,500	5,700 – 11,700
Zone 2 ¹	800	500 – 1,200	1,700	500 – 3,800	2,600	800 – 3,800	3,300	2,000 – 5,000
Zone 3 ¹	6,700	4,000 – 10,100	7,500	5,500 – 9,300	6,300	4,000 – 10,000	5,900	3,900 – 7,600
Zone 4 ¹	4,900	3,800 – 9,500	3,900	3,000 – 6,700	4,900	3,500 – 6,400	4,500	3,400 – 6,700
Zone 5 ¹	100	0 – 300	100	18 - 300	300	30 - 400	50	0 - 90
Zone 6 ²	474	337 -668	615	515 - 733	619	476 - 805	699	567-860
TOTAL	18,574		22,715		24,419		22,949	

¹ Data for Zones 1 through 5 as follows: years 2000 through 2002 from Huff et al. 2003. Year 2003 from Huff ed. in press. Year 2004 from Huff, pers. comm. Numbers are rounded to nearest 100.

² Data for Zone 6 as follows: years 2000 and 2001 from Peery et al. 2002; year 2002 from Peery et al. 2003a; year 2003 from Z. Peery, pers. comm. 2004. No survey in 2004, 2005, and 2006.

Table 3 (continued). Marbled murrelet population point estimates and associated 95 percent confidence intervals (CI) by Zone within the listed range.

	2004 Population Point Estimate	95% CI	2005 Population Point Estimate	95% CI	2006 Population Point Estimate	95% CI
Zone 1 ¹	5,500	3,000 – 7,400	8,000	4,800- 11,600	5,900	4,000- 8,200
Zone 2 ¹	3,100	1,700 – 4,600	2,500	1,600- 3,600	2,400	1,700- 3,400
Zone 3 ¹	7,800	5,900 – 9,800	5,800	3,600- 7,300	6,400	4,600- 7,400
Zone 4 ¹	4,200	3,100 – 9,200	3,600	2,700- 6,000	4,000	3,200- 5,500
Zone 5 ¹	80	20-200	300	100-500	---	---
Zone 6 ²	---	---	---	---	---	---
TOTAL	20,680		20,223		18,622⁴	

¹ Data for Zones 1 through 5 as follows: years 2000 through 2002 from Huff et al. 2003. Year 2003 from Huff ed. in press. Year 2004 from Huff, pers. comm. Numbers are rounded to nearest 100.

² Data for Zone 6 as follows: years 2000 and 2001 from Peery et al. 2002; year 2002 from Peery et al. 2003a; year 2003 from Z. Peery, pers. comm. 2004. No survey in 2004, 2005, and 2006.

⁴ Zones 1 through 4 only.

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

Demographic Parameter	Beissinger 1995	Beissinger and Nur 1997--cited in USDI ¹ 1997	Beissinger and Peery 2003	McShane et al. 2004
Juvenile to Adult Ratio	0.10367	0.124 or 0.131	0.089	0.02 - 0.09
Annual Fecundity	0.11848	0.124 or 0.131	0.06-0.12	(See nest success)
Nest Success			0.16-0.43	0.38 - 0.54
Maturation	3	3	3	2 - 5
Estimated Adult Survivorship	85 - 90%	85 - 88%	82 - 90%	83 - 92%

¹Fish and Wildlife Service

