

**A Biological Assessment of Impacts to
Threatened Anadromous Salmonids from the
Middle Fork Lost Man Creek Forest Restoration Plan
in Redwood National Park**

March, 2012

I. INTRODUCTION

The purpose of this biological assessment (BA) is to review the proposed Redwood National Park (RNP) Middle Fork Lost Man Creek Forest Restoration Plan. The aim of this document is to review, in sufficient detail, whether these current and proposed actions may affect any threatened or endangered species and/or their critical habitats. This biological assessment is prepared in accordance with legal requirements set forth under section 7 of the Endangered Species Act (19 U.S.C. 1536 (c), 50 CFR 402), and meets the criteria for an informal consultation. This document also meets the requirements of the Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. 1801 et. seq) essential fishery habitat (EFH) consultation requirements (sec. 305 (b)(2) and 305 (b)(4)(B)) and ESA/EFH parallel consultation guidelines established by NOAA Fisheries (USDC 1999c, USDC 2001) for an informal consultation. The project is expected to take one to three consecutive years to complete, but due to unpredictable funding schedules this assessment will have a life span of five years or through 2017.

Please note, green sturgeon (*Acipenser medirostris*) and eulachon (*Thaleichthys pacificus*) are also listed as threatened and potentially occurring in Redwood National Park. Neither of these species has any potential to be affected by the proposed action and so will not be mentioned further in this document.

II. CONSULTATION TO DATE

RNSP currently has three species of anadromous salmonids that are listed as threatened under the Endangered Species Act:

1. California Coastal (CC) Chinook Salmon (*Oncorhynchus tshawytscha*) (USDC 1999a.)
2. Northern California (NC) Steelhead (*Oncorhynchus mykiss*) (USDC 2000)
3. Southern Oregon/Northern California Coasts (SONCC) Coho Salmon (USDC (*Oncorhynchus kisutch*) (USDC 1999b)

Critical habitat has been designated for all three species.

Other Recent Pertinent Consultations

Consultation on watershed restoration activities, primarily the removal of old logging roads, stream crossings, log decks and some skid roads within the South Fork Lost Man Creek watershed was covered under the Lost Man Creek Erosion Control and Disturbed Land Restoration Plan biological opinion (NOAA Fisheries file number 2004/02180). These activities were completed in 2010. Consultation on the routine maintenance of the Holter Ridge Road/Lost Man Creek Bike Trail, A121 Road and A131 Road that will be used by heavy equipment and log trucks in this proposed action was covered under the Annual Routine and

Non-Routine Road Maintenance Program biological opinion (NOAA Fisheries file number 151422SWR02AR6347). Additional spur roads will be utilized during this project and their use and management, as well as additional sediment management actions to take place on the routinely maintained roads just noted, will be fully described in the Proposed Action section.

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 an interagency consultation team meeting on 2 February 2011. The primary concern voiced by NOAA Fisheries was the prevention of sedimentation into project area streams and day-lighting streams due to the felling of trees along streambanks. These concerns were integrated into the development of forest thinning prescriptions.

III. CURRENT MANAGEMENT DIRECTION

RNSP are located in Humboldt and Del Norte Counties in northwestern California and encompass 105,516 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.”

The 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 1999) provides comprehensive guidance for managing the national and state parks as one complex with similar resources. The General Management Plan/ General Plan (GMP) provides overall vision and direction for the parks and identifies future planning needs. Under the GMP, the agencies will emphasize the protection of resources and will also provide a variety of opportunities for visitors to enjoy the parks. New visitor services and facilities will be provided to enhance the visitor experience if these services and facilities do not impact sensitive resources. The park agencies will cooperate with adjacent communities and landowners, local American Indian tribes, and other government agencies to accomplish long-range resource management planning to reduce threats to RNSP 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 RNSP 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 RNSP 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 RNSP as "primitive" zones where disturbance to all species from human activities would be limited to those "...necessary to restore and maintain ecosystem function" (GMP 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. RNSP are managed using an ecosystem management strategy, similar to the strategy presented in the Northwest Forest Plan ROD. Implementation of RNSP operations consistent with federal and state enabling legislation (i.e., to preserve, and restore where needed, the old-growth forest ecosystem) will augment the lands designated as Riparian and Late Successional Reserves on other nearby federal lands. RNSP policies and guidelines relative to watershed restoration are similar to those outlined by the Aquatic Conservation Strategy in the Northwest Forest Plan ROD.

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

of critical habitat. Specific management direction for each of the listed threatened, endangered, or proposed species considered in this document is reviewed in Section V, “Status and Distribution of Listed Species”.

IV. DESCRIPTION OF THE PROPOSED ACTION

Description of Project Area –

The project area is approximately 1,146 acres.

A. Existing Conditions

The Middle Fork Lost Man Creek Forest Restoration Plan (hereafter referred to as the FRP) project area is located within the redwood forest zone where natural, old-growth stands are dominated by redwood and lesser components of Douglas-fir, tanoak, western hemlock and grand fir. The project area is also within the marine influence climate zone within RNP which is dominated by wet winters and relatively damp, foggy summers as compared to more inland portions of the parks. The project area was logged with a clear cut or seed tree prescription in the 1950’s through the 1960’s. Reforestation methods included either aerial seeding with Douglas-fir or natural, unassisted regeneration. No other forest management has occurred in the project area since the initial harvest and reseeded. Stands within the project area are now densely stocked with smaller trees (Table 1) with some areas containing various densities of scattered “legacy” old growth redwood trees left as seed trees. Most of the project area is dominated by Douglas-fir with varying percentages of redwood, tanoak, western hemlock, grand fir and red alder. The northern and southern borders of the project area extends into a portion of the Lost Man Creek watershed that contains stands that are identical in harvest history size class and composition to the project area. The eastern border of the project area extends to the top of the Lost Man Creek watershed. Areas downstream of the project area extend into contiguous old growth redwood forest and lower gradient stream reaches. The project area has been previously managed as part of the Lost Man Creek Watershed Restoration project (NOAA Fisheries ref. no. 2004/02180). That project removed 4.9 miles of old logging roads throughout the proposed action project area (Appendix I - Maps).

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

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

B. Proposed Action

The goal of the FRP is to move the second growth stands towards old growth redwood forest characteristics in 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. Two major types of forest management operations, ground based yarding/skyline cable yarding and lop and scatter, will be used based primarily on slope and/or distance from access roads. Prescriptions generally vary by forest management operation type. Conservation based variations on these two major forest management operation types will be based on proximity to intermittent and permanent streams and wetlands, proximity to individual residual old growth trees and proximity to contiguous stands of old growth forest. A general description of the two management operations is given first followed by a description of minimization measures, including stream zones and road management. The work will take one to three years to accomplish, depending on funding.

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1) Ground-Based Yarding, Cable Yarding, Haul Road and Landing Operations

Section Contents:

- A. Ground Based Yarding
 - Skidder and Feller Buncher Operations/Skid Trail Management/Biomass Treatment
 - Streamside Protection
- B. Cable Based Yarding
 - Cable Yarder Management/Cable Corridor Management/Biomass Treatment
 - Streamside Protection
- C. Haul Road and Landing Management

A. Ground Based Yarding

There will be two silvicultural methods used for ground-based yarding units: Low thinning and variable density thinning. These areas have slopes less than 35%, cover approximately 392 acres of the project area and are located only on ridge tops and upper slopes, with no unit within 500 feet of a perennial flowing stream or 150 - 300 feet of an intermittent stream (Appendix 1 - Maps).

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

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

No pre-existing woody debris will be removed from any unit. No broadcast burning or pile burning of slash will occur.

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

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

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

Table 3. A summary of the percent basal area reductions (i.e. thinning intensity), the probability of selecting the thinning intensity, the approximate basal area retained (assuming 350 ft²/ac) and the corresponding # of acres to be treated (total acres = 57):

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

Skidder and Feller Buncher Operations/Skid Trail Management/Biomass Treatment

All non-merchantable trees or trees that do not qualify as biomass fuel that are felled (generally less than 5 inches dbh) will be lopped to get the wood in contact with the forest floor. This slash, along with limb wood from larger trees, will be used as ground cover after equipment operations are completed, including along all skid trails. All trees will be felled using a fellerbuncher, harvester/processor or hand-felled with a chainsaw. Felled trees will be skidded whole-tree or in log lengths to a landing using a track skidder with grapple. Tire skidders may be used if appropriate (i.e. on a main non-rocked/native surface road or main skid trail corridors). Choker

skidders may be used as long as the lead end of the logs are clear of the ground. Only existing skid trails will be used, no new skid trails will be created. All felled trees that qualify for saw timber or biomass fuel (generally trees larger than 5 inches dbh or greater) will be taken off-site to local mills or a cogeneration power plant on logging trucks (see subsection C. below for haul road and landing management). All limbs and tops processed at landings will be returned to treated units and also used to mulch any exposed ground, particularly along skid trails.

Streamside Protection

- No ground based heavy equipment will operate within 500 feet of a perennially flowing stream (Appendix 1 – Maps).
- 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. Heavy equipment will not enter these streamside protection zones. Thinning treatments will retain at least a 60% 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 at least a 70% post-treatment tree canopy.
- Trees that are felled within streamside protection zones will be lopped to get them in contact with the ground and left on site.
- All stream protection zones will be clearly marked by park staff on the ground.
- No trees will be felled into intermittent or ephemeral stream channels.
- No trees that contribute to stream bank stability (as determined and marked by park staff) will be felled.
- Equipment will not operate in or cross swale features where slope steepness is greater than 30%. Such features will be marked by park staff on the ground.
- 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. A Shalstab analysis has been conducted to aid park staff in identifying such features. Park staff overseeing contacted logging crews will identify and mark such features on the ground.
- Equipment, both hand tools and heavy equipment, will be inspected daily to check for leaks. Equipment that may leak lubricants or fuels into a stream 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.

B. Cable Based Yarding

The low thinning prescription, outlined in “ground-based operations” in subsection A. above, will also be used in the cable yarder operations. The difference is a lack of ground based skidding equipment and all tree felling will be done by only hand crews with chainsaws.

No pre-existing woody debris will be removed from any unit. No broadcast burning or pile burning of slash will occur.

Table 4. Cable based yarding with low thinning prescription units and their size. Unit locations are shown in Appendix 1 - Maps.

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

Cable Yarder Management/Cable Corridor Management/Biomass Treatment

All trees will be felled using chainsaws by hand crews. No ground based skidding equipment will be used within these units. Felled trees will be processed (cut to log length and limbed) using chainsaws prior to yarding. All non-merchantable trees, trees that do not qualify as biomass fuel that are felled, and all limb wood, tree tops and other material created from processing will be lopped to get the wood in contact with the forest floor. This slash will be moved by hand to cover any small bare ground areas (a few square feet each in size and minimally dispersed across the landscape) created by tree boles that nick the ground along cable yarding corridors (particularly at breaks in slope and near landings where deflection results in more tree dragging). Merchantable trees or trees that qualify for biomass fuels will be cable yarded to a landing, skid trail, or road using a cable yarder or yoader. Regardless of the type of skyline system used a slackpulling carriage will be used to skid felled trees to the main cable yarding corridor. Cable yarding corridors are generally not larger than 10 feet in width. Tailholds (anchors the end of a mainline) can be tree(s) or another piece of heavy equipment. If trees are used as a tailhold, they will not be old-growth trees of any species; second-growth trees (preferable Douglas-fir) will be used. Guylines, which hold down larger yarders, will be anchored to old-growth stumps, second-growth stumps, or second-growth trees; old-growth trees of any species will not be used to anchor guylines. At the landing, a processor will limb and buck the material into lengths appropriate for hauling to the mill or a cogeneration power plant. Tree tops and limbwood generated at landings will be stockpiled and used to mulch access roads and landings (see subsection C. for details).

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

Yoaders allow more flexibility for access and do not require the use of guylines. A yoader would use existing skid trails on flat areas (gentle slopes) to access steep areas (i.e. break-in-slope) for

cable yarding. The general yarding distance would not exceed 600 feet. A track or tire skidder may be used to skid trees from the yoader station to a landing or road.

Streamside Protection

- No cable yarding nor any cable yarding corridors will occur within 500 feet of a perennially flowing stream (Appendix 1 – Maps).
- 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 at least a 60% 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 at least a 70% post-treatment tree canopy.
- No trees that contribute to stream bank stability (as determined and marked by park staff) will be felled.
- All stream protection zones will be clearly marked by park staff on the ground.
- All trees cable yarded from intermittent and ephemeral streamside protection zones will be lifted clear of the ground to prevent nicking the ground before being yarded uphill.
- 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. A Shalstab analysis has been conducted to aid park staff in identifying such features. Park staff overseeing contacted logging crews will identify and mark such features on the ground.
- Cable yarding corridors that cross intermittent or ephemeral streams will be approximately 10 feet wide and all trees will be “flown” (e.g. fully suspended in the air) completely through streamside protection zones. No trees within cable corridors that cross intermittent or ephemeral streams that contribute to stream bank stability, as determined by park staff, will be removed.
- Equipment, both hand tools and cable yarding equipment, will be inspected daily to check for leaks. Equipment that may leak lubricants or fuels into a stream 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.

C. Haul Road and Landing Management

Hand and heavy equipment crews will drive into the project area using existing roads, as close to project sites as possible. Log trucks and equipment will access the project area via the Holter Ridge Road. Holter Ridge Road is a fully rocked and maintained park administrative road. Access to within the project area will be on the existing and open, native surface A121 and A131 roads and their spurs (Appendix 1 - Maps) which run primarily along ridge tops. The A131 does

have one upper stream crossing (ephemeral) while the A121 runs exclusively along a ridge top. The spur A109 Road also has one upper stream crossing (ephemeral).

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. Rocking of all or portions of the A121 Road may occur. Rock would be taken from existing park quarries (i.e. Geneva Road borrow pit).

Three road corridors, all spur roads, will be reopened. Almost all proposed corridors to be reopened occur along ridge tops. The Holter Ridge-to-A121-Connector needs to be reopened to allow log trucks access to the A121 road, and is 0.4 miles long. The A121 Spur Road needs to be reopened to allow access to the northern section of the project area, and is 0.2 miles long. The Holter Ridge-to-A111-Connector needs to be opened to allow a yarder or yoader access to those units, and is 0.3 miles long. (Appendix 1 – Maps). Reopening involves removing brush and small trees that have grown on the roadway and minimal grading.

All non-rocked road work (opening, use, winterization/closing) will be completed during the normal operating season (NOS), that is, between June 15 and October 15 of each year unless dry periods are forecast for post October 15. 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 after October 15th, additional work may be done, if they can be completed within the window of predicted dry weather. Weather predictions will be sought from specialized information available through the National Weather Service and NMFS and its sources (L. Wolff pers. comm.). Work sites will be winterized at the end of the NOS when significant rains are forecast that may cause exposed roads or landings to erode. 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.

Thirty-four potential landing sites have been identified. Of those, 13 are already open and ready for use (Appendix 1 – Maps). Landings will be located on existing sites, no new landings will be created. Reopening old landings will be similar to opening old roads, brush and small trees will be removed and minimal grading and possible stump removal may occur. No landing will be larger than 1/10th of an acre. All attempts will be made to locate landings on existing roads to minimize ground disturbance. Landing winterization will be the same as for roads, described above.

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2) Lop-and-Scatter Prescriptions

Section Contents:

- Treatment Prescription Description
- Streamside Protection
- Special Streamside Treatment Areas

Treatment Prescription Description

All areas to be treated under this prescription will be entirely cut using only hand crews and no felled trees will be yarded, but left on site. No ground based heavy equipment will enter these treatment areas nor will cable yarding be utilized. There will be no ground disturbance in any of these treatment areas. As shown in the maps in Appendix I, all perennial stream reaches will have this prescription, thus no ground based heavy equipment will be within 500 feet of a perennial stream reach. Crown thinning and/or low thinning will be the primary silvicultural methods used for lop-and-scatter operations. Alternatively, variable density thinning may be used if operational constraints can be overcome. If variable density thinning is used, it will be similar in prescription as described in item 2, Table 4. These areas were defined because they may not be accessible either by ground-based operations or cable yarding operations, and thus slope classes throughout these areas vary. These areas cover approximately 414 acres of the project area.

No pre-existing woody debris will be removed from any unit. No broadcast burning or pile burning of slash will occur.

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

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

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

Crown thinning (thinning from above) is a thinning method that removes trees in the upper crown classes (i.e. co-dominant and dominant trees) to benefit adjacent tree of the same crown classes. Up to 40% basal area reduction will be used in all areas regardless of slope and silvicultural method. The intent is to primarily stimulate growth and development (release) of dominant trees, improve stand level representation of redwood, and minimize fuel depth of woody debris. Crown thinning would target the removal of Douglas-fir in the size class range from 8 to 20 inches dbh, and would remove, on average, 120 - 220 trees per acre. To meet the basal area reduction, larger diameter Douglas fir (up to 24" dbh, but the vast majority will be restricted to 20" dbh and less) will be culled from the stand by first working down the dbh size classes until the target reduction is met. Selecting overstory trees to remove would be based on maximizing response and release of dominant redwood and/or other large conifers.

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

All tree felling will be conducted by contract hand crews using chainsaws. Trees to be cut will not be marked by park staff, except in special streamside treatment areas (below). No redwoods are planned for removal for any lop and scatter operation. All felled trees will be limbed, bucked, and lopped to get the wood in contact with the forest floor. No heavy equipment will be used and no ground disturbance will occur. Unit prescription adherence by contract hand crews will be overseen by park staff.

Streamside Protection

- 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 at least a 60% 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 at least a 70% post-treatment tree

canopy.

- No trees that contribute to stream bank stability (as determined and marked by park staff) will be felled.
- All stream protection zones will be clearly marked by park staff on the ground.
- 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. A Shalstab analysis has been conducted to aid park staff in identifying such features. Park staff overseeing contacted logging crews will identify and mark such features on the ground.
- Hand tools (e.g. chainsaws) will be inspected daily to check for leaks. Equipment that may leak lubricants or fuels into a stream 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.

Special Riparian Thinning Areas (Limited)

A similar prescription as just described will be implemented in extremely limited areas within one tree height (approximately 200 feet) of the perennial portion of the middle fork of Lost Man Creek. All work will be accomplished by handcrews, no ground based equipment will be used and no tree yarding will occur. All cut trees will be left on site. Trees will be lopped and bucked to get them in contact with the ground. The purpose of the thinning is to recruit large trees faster along perennial streams that may in the future be recruited into the stream as large woody debris. Thinning in this zone will only occur in areas with < 25% slope, which is extremely limited (see slope map in Appendix 1 for potential treatment areas), totaling no more than 10 acres and occurring along less than 0.25 miles of stream length in isolated reaches of no more than 100 yards long each. Areas to be thinned were chosen using a Shalstab slope/soil analysis. Each riparian thinning area will be clearly designated on the ground and all trees to be cut will be marked by park staff. Inaccessibility to these isolated areas may eliminate many of the reaches, further limiting this option. No trees will be felled which contribute to bank stability as determined by park resource specialists. All felling will be away from the creek. Again, heavy equipment will not be used and no ground disturbance will occur. On slopes $\leq 25\%$ steepness, thinning will retain at least a 60% post-treatment tree canopy. This treatment will only occur on the middle fork of Lost Man Creek in very limited areas (Appendix 1 - Maps).

V. EXISTING ENVIRONMENT

Lost Man Creek Setting and History

Lost Man Creek is a sixth order tributary which flows into Prairie Creek, which is itself the largest tributary of Redwood Creek and the last major tributary to join Redwood Creek before it runs into the ocean. Located approximately five road kilometers north of the town of Orick,

California in Humboldt County, Lost Man Creek composes one-third of Prairie Creek's total basin area. The watershed covers approximately 12 square miles. Table 6 gives physical characteristics of sub-basins in Lost Man Creek. Originally, the entire Lost Man Creek watershed was forested with redwood, fir, spruce and hemlock, and supported healthy runs of chinook, coho and steelhead trout. Similar to most of the former old-growth redwood areas in north coastal California, Lost Man Creek was heavily logged and roaded during the 1950s, 1960s and early 1970's, prior to implementation of the state's forest practice rules in 1975.

History of Lost Man Creek Watershed Prior to Acquisition by National Park Service

Lost Man Creek watershed lies within the ancestral lands of the Yurok people. Review of ethnographic literature, consultations with Native Americans, and archeological surveys have yielded little information about pre-historic use of the heavily forested Lost Man Creek watershed other than for fishing and gathering. Trails passed through the area, but no settlements were reported. (McConnell and Eidsness, 2000).

Likewise, Humboldt County Recorder's Office research and oral history interviews conducted by Van Kirk (1994) indicate that while these public domain lands were patented in numerous 160 acre parcels following enactment of the Timber and Stone Act of 1878, and later consolidated into two large ownerships, there was no "settlement" (farms, ranches or homes) in the Lost Man Creek watershed.

After the Redwood Highway was completed in 1935 through the Orick-Prairie Creek area, a temporary fish hatchery and egg collecting station were established on Prairie Creek near Lost Man Creek. These facilities were rebuilt as a permanent facility in 1936 on Lost Man Creek, known as the Prairie Creek Fish Hatchery. Salmon and trout were the two types of fish hatched at this facility. The hatchery was closed in 1992 and has been "mothballed". The California State Historic Preservation Officer has listed it on the National Register of Historic Places.

The first significant human impacts in the watershed began with logging and associated road building following World War II. Most of the logging activities date to the 1950s and 1960s (Van Kirk, 1994). Only the lower portion of the watershed was not logged. Fir, redwood, hemlock and spruce were the principal marketable timber types harvested. The major haul roads (Geneva, Lower B500 and Holter Ridge) plus numerous spur roads, were built in incremental segments as the loggers extended their reach into the timberlands. The nearby town of Orick prospered during this period, supporting several timber mills and services for the growing community tied to the timber industry.

Forest land use during this period consisted of largely unregulated road and landing construction, and many large areas were clear-cut. Lost Man Creek experienced widespread erosion and sedimentation during the 1955, 1964 and later floods in response to this unregulated logging. The National Park Service acquired the Middle and South Forks and the remaining old growth along the lower main stem in 1968. The area north of Geneva Road, including most of the North Fork and Larry Damm Creek, was not acquired until 1978, and experienced particularly severe ground disturbance during the final phase of logging, just prior to the park expansion.

Ultimately, 76% of the watershed was logged. Over 50 miles of major logging haul roads were constructed, along with several hundred miles of skid roads, used to drag the logs to the truck roads.

Table 6. Characteristics of Lost Man Creek watershed and sub-basins.

Sub-basin	Drainage Area (mi²)	Drainage Area (acres)	Mean Basin Slope (%)	Area in Old Growth (acres)
Larry Damm Creek (LDC)	1.9	1181	27.6	245
North Fork Lost Man Creek (NFL)	2.4	1422	35.6	135
Middle Fork Lost Man Creek (MFL)*	2.4	1444	37.0	35
South Fork Lost Man Creek (SFL)*	4.3	2522	39.3	304
Other Areas (Interfluves)	1.1	1160	---	1116
Lost Man Creek at Hatchery (LMC): Basin Mouth Totals	12.1	7729	34.9	1835

* Sub-basins highlighted in red are within the FRP project area.

History of Lost Man Creek Watershed Since Acquisition by National Park Service

Experimental thinning was conducted in several locations in the upper portions of the Lost Man Creek watershed in the late 1970s. A picnic area was developed at the junction of Lost Man and Larry Damm Creeks in 1980. Geneva and Holter Ridge roads (now Lost Man Creek Trail) were opened to hiking and bicycling use in the late 1980s. Visitor use has primarily been in the lower watershed, in the old growth, and along the hiking/biking trail. Little other management activity occurred in the watershed until 2000, when watershed restoration efforts began to address roads that had failed in the 1997 storm. Through an analysis of road conditions, erosional threats and resources at risk, Lost Man Creek watershed was identified as a high priority watershed for restoration. Within the 12 square mile watershed, 27.6 miles of abandoned, failing haul roads were removed between 2006 and 2010 by the park, restoring natural drainage patterns to the majority of the watershed. The second growth forest portions of the watershed were also identified as a high priority for restoration. Approximately 1,690 acres of second growth forest in the south fork Lost Man Creek sub basin was thinned under a variety of prescriptions from 2008-2011 in order to promote more rapid recovery of old growth forest characteristics.

Temperature

Temperature data collected near the mouth of Lost Man Creek (former Prairie Creek Fish Hatchery) for the past ten years are summarized in Figure 1.

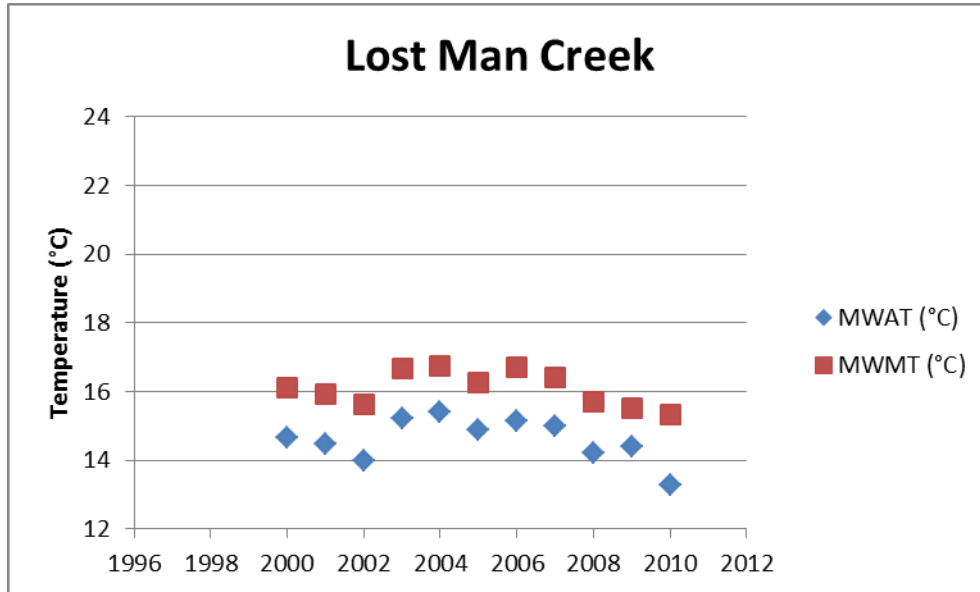


Figure 1. Seven day rolling average maximum daily temperature (MWMT) and mean temperature (MWAT) for Lost Man Creek.

VI. STATUS AND DISTRIBUTION OF LISTED SPECIES

California Coastal Chinook salmon (*Oncorhynchus tshawytscha*), Threatened

A. *Species Account*

Chinook salmon populations have declined along the Pacific coast to the degree that certain evolutionarily significant units (ESUs) were listed as threatened by the National Marine Fisheries Service (NMFS) under the Endangered Species Act (Federal Register 1999). In 2005 the California Coastal (CC) Chinook salmon was “re-listed” (i.e. reaffirmed) as threatened after a status review in response to a court order directing the Service to consider the contribution of hatchery fish to species viability (Federal Register 2005). Chinook historically ranged as far south as the Ventura River, California, and north as far as the Russian Far East (Federal Register 1999). The California Coastal ESU falls within the southern boundaries of Redwood National Park and stretches from Redwood Creek south through the Russian River.

Of the Pacific salmon, Chinook exhibit the most diverse and complex life history strategies. Two generalized freshwater life-history types were described by Healey (1991): “stream-type” Chinook that reside in freshwater for a year or more following emergence, and “ocean-type” Chinook that migrate to the ocean within their first year.

Chinook mature in the ocean at between 2 and 6+ years of age (Myers *et al.* 1998). Freshwater entry and spawning timing are generally thought to be related to local water temperature and flow regimes (Miller and Brannon 1982). Distinct runs differ in the degree of maturation at the time of river entry, thermal regime and flow characteristics of their spawning site, and actual time of spawning (Myers *et al.* 1998).

Run timing for spring-run Chinook in the CC Chinook ESU typically begins in March and continues through July, with peak migration occurring in May and June. Spawning begins in late August and can continue through October, with a peak in September. Historically, spring-run Chinook spawning areas were located in the river headwaters (generally above 1,300 feet). Run timing for fall-run Chinook varies depending on the size of the river.

Post-emergent fry seek out river/stream shallow areas with slow current and good cover, and begin feeding on small terrestrial and aquatic insects and aquatic crustaceans. As they grow to 2 to 3 in (5 to 7.6 cm) in length, the juvenile salmon move out into deeper, swifter water, but continue to use available cover to minimize the risk of predation and reduce energy expenditure. The optimum water temperature range for rearing Chinook fry is 50-55°F (10-13°C) (Rich 1997, Seymour 1956) and for fingerlings is 55-61°F (12.8-16°C) (Rich 1997). Data from the Mad River (Sparkman 2002) and Redwood Creek (Sparkman 2004) indicate that emergent Chinook fry develop rapidly following emergence. Over a 15-week period in the spring of 2001, Chinook fry increased in average length from 1.6 to 2.6 in (4.0 to 6.6 cm) with the bulk of this riverine growth occurring during a 10-week period in May and June (Sparkman 2002).

The majority of Chinook juveniles emigrate to the ocean as sub-yearlings, although yearling smolts can constitute up to approximately one-fifth of out-migrants from the Klamath River Basin. The proportion of fish which smolt as sub-yearling vs. yearling varies from year to year (Busby and Barnhart 1995). This fluctuation in age at smoltification is more characteristic of an ocean-type life history. Furthermore, the low flows, high temperatures, and barrier bars that develop in smaller coastal rivers (such as Redwood Creek) during the summer months would favor an ocean-type (sub yearling smolt) life history (Kostow 1995).

Ocean-type juveniles enter saltwater during one of three distinct phases. Immediate fry migrate to the ocean soon after yolk resorption at 1.2-1.8 in (3.0-4.6 cm) in length (Lister *et al.* 1971, Healey 1991). In most river systems, however, fry migrants, that migrate at 50-150 days post-hatching, and fingerling migrants, that migrate in the late summer or autumn of their first year, represent the majority of ocean-type emigrants. In upper Redwood Creek the months of May and June accounted for 91.5% of the total captures of migrating young-of-the-year Chinook in 2001 (Sparkman 2002). Stream-type Chinook migrate during their second or, more rarely, their third spring (Healey 1991). Under natural conditions, stream-type Chinook appear to be unable to smolt as sub-yearlings (Healey 1991).

Winter-run Chinook constitute the main Chinook run in RNSP streams. Adult fish return to spawn after three to six or more years in the ocean, although two year old male spawners (“jacks”) are commonly observed (Myers *et al.* 1998). These fish begin their upstream migration

into the park around November, if access through the Redwood Creek estuary is possible. Entry into Redwood Creek is dependent on the mouth being open to the ocean. The sand bar that blocks the mouth usually breaks open as a result of winter rain events increasing stream flow that fills the estuary and breach the sand bar. They have spawned and died by the end of January. Spring-run Chinook are not typically considered to use the Redwood Creek watershed. Adult spring-run Chinook have been observed in mainstem Redwood Creek once (6 in the summer of 1988) in the 31 years since 1981 when the park began summer steelhead (*O. mykiss*) snorkel surveys (RNSP unpub.data).

In upper Redwood Creek, almost all of the juvenile Chinook migrants are 0+ fry or fingerlings; only 0.01% (92 fish) of the juveniles captured in 10 years of downstream migration study consisted of 1+ juveniles (Sparkman 2010). The estimated population of 0+ juveniles has varied over 10 years of trapping (Sparkman 2010); production was greater than 350,000 individuals in the first 3 years, less than 1,000 in the fourth year (cohort failure) and in the fifth year there was a peak of 630,000 juvenile fish. The 9-year average (2000-2008) for the study was 244,894. A 10-year trend in population abundance over time (2000-2009) showed a significant negative decline (Sparkman 2010). This decline could have been the result of flood flows; studies cited in Sparkman (2010) indicated that scour of redds by high stream flows or floods can cause severe decreases in the production of juvenile salmonids. One study indicated a mortality estimate of 90% due to redd scour. Greene et al. (2005; cited in Sparkman 2010) showed that flood recurrence interval during Chinook intergravel development was the second most important variable in their models used to predict the return rate of adult Chinook. Three of ten years of study in upper Redwood Creek documented flows capable of scouring spawning redds, which was deemed a likely explanation for the poor production of cohorts in each of the following spring seasons. High, potentially damaging stream flows in upper Redwood Creek are not uncommon, estimated to occur on average every 3.1 years (Redwood National Park unpub. data).

Salmonid surveys in Redwood Creek and its tributaries (e.g., Prairie Creek) show juvenile Chinook do not spend time rearing in upstream areas (Anderson and Brown 1982), but instead, utilize the Redwood Creek estuary. In spring, Chinook fry migrate downstream to rear in the estuary before and after the mouth closes. After the mouth closes, Chinook entry into the ocean is in the fall when the mouth opens. Thus, the Redwood Creek estuary is important as the sole rearing habitat for these 'ocean-type' juveniles. Research shows that if given the opportunity the juveniles will spend an extended period (to late summer) in the estuary before entering the ocean. Based on scales of returning adult Chinook spawners it was determined that there may be a survival advantage favorable to the fish that remain in the estuary and grow to a larger size before entering the ocean (Reimers 1973). Redwood Creek estuary Chinook juvenile population estimates for 1997 through 2007 show a seasonal decline in numbers. The September mean estimate was 2,260 Chinook, the minimum and maximum numbers 50 and 6,660, respectively (RNSP unpub. data). The limited carrying capacity of the estuary cannot accommodate the Chinook juvenile production occurring in the watershed. However, this extended estuary rearing affords size increases to 100 mm forklengh of those fish surviving in the Redwood Creek estuary in the fall.

In Prairie Creek, the escapement of adult Chinook ranged from a high of 710 in 2002 to a low of 38 in 2008 for 1999 through 2011. Escapement of Chinook has been relatively low in this

tributary since 2005. Juvenile fish abundance in the downstream migrant trap varied considerably among years. Chinook fry were very abundant during 1999-2004 but decreased after that (Duffy 2011).

The low numbers of returning adult Chinook are probably related in part to the conditions in the Redwood Creek estuary (D. Anderson pers. comm.). Chinook spawning in the RNSP tributaries may be impeded by stream barriers, but they may be able to surmount some barriers depending on flow conditions when the fish are present.

B. Habitat Status

Chinook estuary rearing habitat was degraded when flood control levees that bisected and altered the historical configuration of the Redwood Creek estuary were constructed in 1968. The levees altered the physical and biological functions of the estuary and adjacent wetlands and confined the lower 3.4 mi (5.5 km) of Redwood Creek stream channel to a width of 300 ft (91 m). The flood control project reduced the amount of riparian vegetation and tree cover, reduced adjacent wetlands, altered valley drainage patterns, decreased the amount of instream woody debris, and caused decreased pool depths along lower Redwood Creek. The levees bypassed and isolated the last downstream meander of Redwood Creek (now called the South Slough), reduced circulation into the North and South Sloughs, and contributed to 50% of the lower estuary between 0 and 4 ft Mean Sea Level filling with sediment or becoming isolated from the embayment (Ricks 1983). Adjacent land uses, e.g., cattle grazing on the flood plain and uncontrolled breaching of the sand berm (which forms a seasonal barrier to the ocean across the mouth), also have contributed to habitat degradation of the estuary.

The Redwood Creek watershed is listed as impaired for high water temperatures and sediment under Section 303 (d) of the Clean Water Act. An example of Chinook rearing temperatures, July/August 2009 data from a temperature logger (Tidbit) located at the ends of the levees in the embayment of the Redwood Creek estuary, show the average temperature as 15.1°C and minimum and maximum temperatures as 21.3°C and 11.5°C, respectively. Maximum weekly average temperature (MWAT) was 20.2°C. Hours of temperature of 18°C and above were 227 hours. Some periods in the estuary are above the optimum rearing temperatures for Chinook.

C. Critical Habitat

Critical habitat for California Coastal Chinook salmon was designated in 2005 (Fed. Reg 2005a). Designated critical habitat for California Coastal Chinook salmon includes the stream channels within the stream reaches and includes a lateral extent as defined by the ordinary high-water line. In areas where the ordinary high-water line has not been defined, the lateral extent is defined by the bankfull elevation. Bankfull elevation is the level at which water begins to leave the channel and move into the floodplain and is reached at a discharge which generally has a recurrence level of 1 to 2 years on the annual flood series. Critical habitat in estuaries is defined by the perimeter of the water body as displayed on standard 1:24,000 scale topographic maps or the elevation of extreme high water, whichever is greater.

In designating critical habitat, NMFS focuses on the known primary constituent elements (PCEs) essential for the conservation of the species. These PCEs are those sites and habitat components that support one or more life stages, including: (1) freshwater spawning, (2) freshwater rearing,

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

Critical habitat is of variable quantity and quality depending on the condition of a watershed/sub watershed within RNSP. The condition of a watershed relative to critical habitat is primarily a function of past land use practices. That is, the level of logging and number of old or abandoned logging roads within a watershed or subwatershed influence the habitat in terms of fine sediment quantity, amount of instream LWD, amount of streamside shading, pool number and depth, and water temperature.

Northern California Steelhead (*Oncorhynchus mykiss*), Threatened

A. Species Account

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

During this century, over 23 naturally reproducing stocks of steelhead are believed to have been extirpated, and many more are thought to be in decline in numerous coastal and inland streams in Washington, Oregon, California, and Idaho. Forty-three stocks have been identified as being at moderate or high risk of extinction. For these reasons, Northern California (NC) steelhead were federally listed as endangered in one environmentally significant unit (ESUs), threatened in 10 ESUs, and as a species of special concern in one ESU. The Northern California ESU, from Redwood Creek south, falls within the boundaries of RNSP; it was listed as threatened on June 7, 2000 and relisted as a distinct population segment (DPS) in 2006 (Fed. Reg 2006).

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

Summer steelhead enter freshwater between May and October in the Pacific Northwest (Busby *et al.* 1996, Nickelson *et al.* 1992). They require cool, deep holding pools during summer and fall, prior to spawning (Nickelson *et al.* 1992). As cited by Moyle *et al.* (1995), summer steelhead on

the northcoast return to freshwater streams from April through June. They migrate up coastal streams and rivers during and soon after the final high flows of April, and migration continues through June. It may extend into July but declines presumably due to lower flows and warmer water temperatures. The gonads of the migrating fish are immature and do not mature until the fish have spent 8-10 months in freshwater (Roelofs 1983). Spawning occurs from late December through April.

Winter steelhead enter freshwater between November and April in the Pacific Northwest (Nickelson *et al.* 1992, Busby *et al.* 1996), migrate to spawning areas, spawn generally in April and May (Barnhart 1986). Some adults, however, do not enter some coastal streams until spring, just before spawning (Meehan and Bjornn 1991). On the northcoast, steelhead generally spawn earlier than those in areas to the north; both summer and winter steelhead in California generally begin spawning in December,

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

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

Steelhead require a minimum depth of 7 in (18 cm) and a maximum velocity of 8 ft/sec (2.5 m/sec) for active upstream migration (Smith 1973). Spawning and initial rearing of juvenile steelhead generally take place in small, moderate-gradient (generally 3-5 %) tributary streams (Nickelson *et al.* 1992). A minimum depth of 7 in (18 cm), water velocity of 1-3 ft/sec (0.3-0.9 m/sec), and clean substrate 0.25-4 in (0.6-10 cm) (Hunter 1973, Nickelson *et al.* 1992) are required for spawning. Steelhead spawn in 39-49° F (3.9- 9.4° C) water (Bell 1991). Depending on water temperature, steelhead eggs may incubate for 1.5-4 months before hatching, generally between February and June (Bell 1991). Nickelson *et al.* (1992) stated that eggs hatch in 35-50 days, depending upon water temperature.

After 2 to 3 weeks, in late spring, and following yolk sac absorption, alevins emerge from the gravel and begin actively feeding. After emerging from the gravel, fry usually inhabit shallow

water along banks of perennial streams (Nickelson *et al.* 1992). Older fry establish and defend territories.

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

Juvenile steelhead migrate little during their first summer and occupy a range of habitats featuring moderate to high water velocity and variable depths (Bisson *et al.* 1988). Rearing juveniles prefer water temperatures ranging from 54-59° F (12.2- 15.0° C) (Reeves *et al.* 1987). Juvenile steelhead feed on a wide variety of aquatic and terrestrial insects (Chapman and Bjornn 1969), and older juveniles sometimes prey on emerging fry. Steelhead hold territories close to the substratum where flows are lower and sometimes counter to the main stream. From these, they can make forays up into surface currents to take drifting food (Kalleberg 1958). Juveniles rear in freshwater from 1 to 4 years (usually 2 years in the California DPSs), then smolt and migrate to the ocean in March and April (Barnhart 1986). Winter steelhead generally smolt after 2 years in freshwater (Busby *et al.* 1996). The majority of juvenile steelhead in Redwood Creek spend their second year of life in the estuary and mainstem Redwood Creek (Anderson 1988). Steelhead smolts are usually 6-8 in (15-20 cm) total length and migrate to the ocean in the spring (Meehan and Bjornn 1991). Based on incidental purse seine catches, juvenile steelhead tend to migrate directly offshore during their first summer from whatever point they enter the ocean, rather than migrating along the coastal belt as salmon do. During the fall and winter, juveniles move southward and eastward (Hartt and Dell 1986).

Steelhead typically reside in marine waters for 2 or 3 years prior to returning to their natal stream to spawn as 4- or 5-year olds. Populations in Oregon and California have higher frequencies of returning age-1 ocean steelhead, (aka half-pounders) than populations to the north, but age-2 ocean steelhead generally remain dominant (Busby *et al.* 1996).

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

Redwood Creek summer steelhead snorkel surveys began in 1981 between Lacks Creek and Tom McDonald Creek, a 25.7 km (16 mi) index reach and were expanded to 38.6 km (24 mi) in 1992. Survey data indicate a steady decline since that time, although numbers were low to begin with when the surveys began. In recent years the numbers have leveled off at approximately 10-20 adult fish observed annually (D. Anderson pers. comm.). Forty-four was the highest total number of adult fish observed (in 1984 and 1985); zero fish were observed in 1989 and 2001. In other years the count ranged from 1 to 19 (1991 through 2010). Including surveys upstream of the 38.6 km reach conducted from 1993 to 1998, covering between 53 and 85 river km (33 and

53 river mi) of the 109 km (67.7 mi) long Redwood Creek, the highest numbers of adult summer steelhead observed were 36 in 1994 and 37 in 1997.

No park tributaries in the Redwood Creek basin have been snorkel surveyed for summer steelhead; the smaller streams do not have large enough pools to support fish during the warm summer months. In addition, adult summer steelhead have not been encountered in these streams during other survey and monitoring activities.

In Redwood Creek winter-run steelhead numbers are higher than summer steelhead numbers. Juvenile winter-run steelhead are the most common and widely distributed fish in the Redwood Creek basin. During sampling efforts in the summers of 1980 and 1981, steelhead trout occurred in 57 of the 111 Redwood Creek tributaries surveyed (Anderson 1988, Brown 1988). Sparkman's (2010) upper basin down migrant rotary trap catches for the nine years between 2000-2008 averaged 81,179 0+ steelhead, 9,212 1+ steelhead, and 866 2+ steelhead. There were declines in all of these age classes in 2009, and significant declines in 0+ and 2+ age classes for reasons not easily explained. Results for the lower Redwood Creek trap show a similar negative decline for 1+ and 2+ juvenile steelhead; the decline was significant for 2+ age class (Sparkman 2011). Sparkman (2010) hypothesized that over-summer conditions (e.g., lethally high water temperatures) could be limiting the production of older (2+) age classes in upper Redwood Creek. He goes on to cite numerous studies from other areas that indicate a positive linear relationship between out-migrating 2+ smolts and returning adult steelhead (percent returning in the cited studies were between 84 and 98%), and that this age class is the best class for assessing steelhead status, trends, and abundance when information on adult steelhead is not available. In addition, he states "[t]he 2+ steelhead trout are also an excellent indicator of watershed and stream conditions because they spend the longest amount of time in freshwater habitat."

Duffy (2011) estimated escapement in Prairie Creek between 1999 and 2010 to be 4-142 adults; the wide range was influenced by uncertainty in run timing in the earlier years and precipitation in all years. Beginning in 2005 a weir was installed in Prairie Creek that revealed a migration of steelhead beginning in late February through mid-April. Numbers of estimated adults in 2005 through 2008 were 70-142 fish (Duffy 2011). Downstream migrant traps in Prairie Creek caught between 505 (2001) and 8 (2004) juvenile steelhead (Duffy 2011). When unidentified 0+ and 1+ trout (which could include juvenile coastal cutthroat trout) are added, the numbers ranged between 201 in 2008 and 4,745 in 2003.

All ages of juvenile steelhead rear in the Redwood Creek estuary during the summer and fall. Population estimates show a seasonal decline in numbers, to a mean of 3,300 (range 540 to 9,350) in the fall (1997 through 2007) before the estuary opens to the ocean. The numbers indicate a lowered carrying capacity of the estuary in the fall.

B. Habitat Status

Redwood Creek watershed is listed as impaired for high water temperatures and sediment under Section 303 (d) of the Clean Water Act. As an example, data from a temperature logger (Tidbit) located on mainstem Redwood Creek upstream of Tom McDonald Creek/Tall Trees Grove for July and August 2009 had maximum and minimum water temperatures of 22.6° C (72.7 ° F) and

16.2° C (61.2° F), respectively. Maximum diurnal range was 4.9° C (40.8° F). The average water temperature was 19.4° C (66.9° F). Maximum weekly average temperature (MWAT) was 20.6° C (69.0° F). Hours of temperature of 18° C (64.4° F) and above were 1,193 hrs.

Lower Redwood Creek, closer to the ocean, has lower temperatures relative to upstream, but it is still warm. 2009 data for a logger located in lower Redwood Creek upstream of the Redwood Creek trailhead for July and August 2009 had maximum and minimum water temperatures of 22.1° C (71.8° F) and 15.1° C (59.2° F), respectively. Maximum diurnal range was 6.7° C (44.1° F). The average water temperature was 17.7° C (63.9° F). MWAT was 18.3° C (64.9° F). Hours of temperature of 18° C (64.4° F) and above were 492 hrs.

What these recent data indicate is that water temperatures in mainstem Redwood Creek are high for salmonid fish, above the preferred temperature range reported by Reiser and Bjornn (1979) for steelhead of 7.3° C (45.1° F) to 14.6° C (58.3° F).

Tributaries to Redwood Creek have lower water temperature. Water temperatures of 63 east and westside tributaries entering Redwood Creek measured during a late July/early August summer steelhead survey in 2005 ranged from 12° C (53.6° F) to 17° C (62.6° F) (Anderson 2005). Water temperatures of all tributaries were cooler than the corresponding temperature of mainstem Redwood Creek measured at the same time. Westside tributaries were generally cooler than eastside tributaries. The mean water temperature of westside tributaries was 14.3° C (57.7° F) (n = 43) and the mean water temperature of eastside tributaries was 15.3° C (59.5° F) (n = 20). The 2005 year tributary water temperatures are similar to temperatures and patterns that have been recorded in past summer steelhead surveys. Where these tributaries enter Redwood Creek there may be deeper, colder pools that may sustain steelhead, although these pools are relatively few (D. Anderson pers. comm.).

C. Critical Habitat

Designated critical habitat for NC steelhead was defined by NMFS (Federal Register 2005b) to include the stream channels within the stream reaches and a lateral extent as defined by the ordinary high-water line. In areas where the ordinary high-water line has not been defined pursuant to the lateral extent, it is defined by the bankfull elevation. Bankfull elevation is the level at which water begins to leave the channel and move into the floodplain and is reached at a discharge which generally has a recurrence level of 1 to 2 years on the annual flood series. Critical habitat in estuaries is defined by the perimeter of the water body as displayed on standard 1:24,000 scale topographic maps or the elevation of extreme high water, whichever is greater.

In designating critical habitat, NMFS focuses on the known primary constituent elements (PCEs) essential for the conservation of the species. These PCEs are those sites and habitat components that support one or more life stages, including: (1) freshwater spawning, (2) freshwater rearing, (3) freshwater migration, (4) estuarine areas, (5) nearshore marine areas, and (6) offshore marine areas. Within the PCEs, essential elements of NC steelhead critical habitat include adequate (1) substrate, (2) water quality, (3) water quantity, (4) water temperature, (5) water velocity, (6)

cover/shelter, (7) food, (8) riparian vegetation, (9) space, (10) safe passage conditions, and (11) salinity conditions.

Critical habitat is of variable quantity and quality depending on the condition of a watershed/sub watershed within RNSP. The condition of a watershed relative to critical habitat is primarily a function of past land use practices. That is, the level of logging and number of old or abandoned logging roads within a watershed or subwatershed influence the habitat in terms of fine sediment quantity, amount of instream LWD, amount of streamside shading, pool number and depth, and water temperature.

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

A. Species Account

Coho or “silver” salmon are found in streams and rivers throughout much of the Pacific Rim, from central California to Korea and northern Japan. North American coho spawn in tributaries from the San Lorenzo River in Monterey Bay, California to Point Hope, Alaska, and throughout the Aleutian Islands. They are most abundant in coastal areas from central Oregon to southeast Alaska.

Coho salmon (hereafter “coho”) have shown substantial decreases throughout their range (Konkel and McIntyre 1987). In the U.S. Pacific Northwest, they are now extinct in the eastern half of their former range, and badly depleted over most of the western half (Frissell 1993). At least 33 populations have been identified by agencies and conservation groups for being at moderate or high risk of extinction. Four of the seven west coast coho ESU’s are listed as threatened (three) or endangered (one), and an additional one listed as a species of concern.

In California, current abundance, including hatchery stocks, could be less than 6% of estimates for the period 1940 to 1949. Brown and Moyle (1991) estimated that naturally-spawned adult coho returning to California streams were < 1% of their abundance at mid-century, and indigenous, wild coho populations in California did not exceed 100 to 1,300 individuals. Further, they stated that 46% of California streams which historically supported coho populations, and for which recent data were available, no longer supported runs. Populations now are at least 70% lower than during the 1960s (CDFG 1994). The Southern Oregon/Northern California Coast ESU for coho, which occurs within RNSP, was designated as threatened in 1997 (Federal Register 1997), and re-designated as a threatened distinct population segment in 2005 (Federal Register 2005a).

Coho generally exhibit a relatively simple 3-year life cycle, with the majority of juvenile fish entering the ocean at 1 year of age and returning 2 years later to spawn. However, in Prairie Creek approximately one-quarter of smolts reside in streams for 2 years (Bell 2001). Most coho return and enter rivers between September and February. Coho river entry timing is influenced by many factors, one of which appears to be river flow. Many small California stream systems, including Redwood Creek in RNSP, have their mouths blocked by sandbars for most of the year except winter which prevents entry until sufficiently strong freshets open passages through the bars (Weitkamp *et al.* 1995). Timing of the opening of Redwood Creek depends on a combination of wave action on the sand berm which can increase the elevation of the berm, the

water elevation in the estuary, and the flow of water in the stream. Coho spawn from November to January (Hassler 1987), and occasionally into February and March (Weitkamp *et al.* 1995), with peak runs in Redwood Creek in November (RNSP unpub. data).

Although each native stock appears to have a unique time and temperature for spawning that theoretically maximizes offspring survival, coho generally spawn at water temperatures within the range of 50-55° F (10-13° C) (Bell 1991). Bjornn and Reiser (1991) found that spawning occurs in a few third-order streams, but most spawning activity was found in fourth- and fifth-order streams. Nickelson *et al.* (1992) found that spawning occurs in tributary streams with a gradient of 3% or less and in clean gravel ranging in size from that of a pea to that of an orange. Spawning is concentrated in riffles or in gravel deposits at the downstream end of pools featuring suitable water depth and velocity (Weitkamp *et al.* 1995). In Redwood Creek spawning is restricted to approximately 12 mi (20 km) of the lower mainstem and the larger low-gradient tributaries including Prairie Creek (RNSP unpub. data).

The favorable thermal range for coho salmon egg incubation is 50-55° F (10-13° C) (Bell 1991). Coho eggs incubate for approximately 35-50 days, and fry start emerging from the gravel 2 to 3 weeks after hatching (Hassler 1987, Nickelson *et al.* 1992). Following emergence, fry move into shallow areas near the streambanks. The early diets of emerging fry include chironomid larvae and pupae (Mundie 1969). As coho fry grow, they disperse upstream and downstream to establish and defend territories (Hassler 1987).

Juvenile rearing usually occurs in tributary streams with gradients of 3% or less, although they may move into streams of 4 or 5% gradient. Juveniles have been found in streams as small as 3 to 6 ft (~1 to 2 m) wide, including non-natal juveniles in Strawberry Creek, a small tributary to lower Redwood Creek (RNSP 2009). At a length of 1.5-1.75 in (3.8-4.4 cm), the fry may migrate upstream a considerable distance to reach suitable rearing areas (Nickelson *et al.* 1992). Rearing requires temperatures of 68°F (20°C) or less, preferably 53-58° F (12-14° C) (Reiser and Bjornn 1979, Reeves *et al.* 1987, Bell 1991). During spring, coho fry are most abundant in backwater pools featuring adequate cover such as LWD, undercut banks, and overhanging vegetation. During the summer, coho fry prefer deeper pools. Juvenile coho prefer to overwinter in large mainstem pools, backwater areas and secondary pools with LWD, and undercut bank areas (Hassler 1987, Heifetz *et al.* 1986). Juvenile coho are carnivorous opportunists that primarily eat aquatic and terrestrial insects. They do not appear to pick stationary items off the substratum (Mundie 1969, Sandercock 1991).

In preparation for their entry into the ocean, juvenile salmonids undergo physiological transformations known as smoltification that adapt them for their transition to saltwater (Hoar 1976). These transformations include different swimming behavior and proficiency, lower swimming stamina, and increased buoyancy that also make the fish more likely to be passively transported by currents (Folmar and Dickhoff 1980). The ideal channel for maximum coho smolt production has shallow depth (3-24 in; 8-24 cm), fairly swift mid-stream flows (2 ft/sec; 0.6 m/sec), numerous marginal back-eddies, narrow width, copious overhanging mixed vegetation (to lower water temperatures, provide leaf litter, and contribute terrestrial insects), and banks permitting hiding places. In general, smoltification is timed to be completed as fish are near the freshwater to saltwater transition. Too long a migration delay after the process begins is

believed to cause the fish to miss the window of optimal physiological condition for the transition (Walters *et al.* 1978).

Little is known about residence time or habitat use in estuaries during seaward migration, although it is usually assumed that coho spend only a short time in the estuary before entering the ocean (Nickelson *et al.* 1992). Growth is very rapid once the smolts reach the estuary (Fisher *et al.* 1984). In Redwood Creek downstream migration to the ocean from upstream rearing areas occurs in early spring (March-April). Survey data from RNSP indicate that these young salmon are present in the Redwood Creek estuary in June and gone by July (Anderson 1995). Migration through the Redwood Creek estuary is dependent upon the mouth being open to the ocean.

While living in the ocean, coho remain closer to their river of origin than do other salmon (Weitkamp *et al.* 1995). Nevertheless, coho have been captured several hundred to several thousand kilometers away from their natal stream (Hassler 1987). After about 12 months at sea, coho gradually migrate south and along the coast. Coho typically spend two growing seasons in the ocean before returning to their natal streams to spawn as 3 year-olds. Some precocious males, called "jacks," return to spawn after only 6 months at sea.

The anadromous fish populations of Redwood Creek have experienced a substantial reduction, in part due to severe flood events that moved large amounts of sediment from highly eroded hillslopes to the stream channels of the Redwood Creek basin (Madej *et al.* 2006). News accounts and recollections of longtime residents of the Redwood Creek watershed suggest that both the size and numbers of salmonids have declined in recent decades (Van Kirk 1994). Within the last decade no juvenile coho have been observed in the main channel above river km 20 and juvenile coho were restricted to 9 side pocket cold pools locations in the lower 20 km of the channel (Ozaki and Anderson 2005). Madej *et al.* (2006) stated that < 20% of the main Redwood Creek channel currently supports young coho during summer. In 2009, no 0+ or 1+ juvenile salmon were captured in upper Redwood Creek down migration trap and both of these age classes' capture rates have showed steady declines between 2003 and 2009 with the 0+ age class exhibiting a particularly severe decline (Sparkman 2010). In 2010 at the lower Redwood Creek trap, only six 0+ and 13 1+ coho juvenile were captured (Sparkman 2011). The vast majority of coho juvenile are coming from the Prairie Creek subwatershed. In Prairie Creek Duffy (2011) estimated escapement of adult coho ranged from a high of 680 in 2002 to 28 in 2010.

B. Habitat Status

Currently occupied suitable coho habitat occurs in the lower 12 mi (20 km) of the mainstem of Redwood Creek and its low gradient tributaries, including the first 13 mi (21 km) of Prairie Creek. Suitable habitat in Redwood Creek also exists in the approximately 15 mi (25 km) upper most reach of Redwood Creek, however, coho no longer occur from here down to the lower reach below the Tall Trees Grove. Surface water and daily minimum temperatures in summer from Tall Trees to the O'Kane Bridge on Hwy 299 tend to be above the desired range for juvenile coho (i.e., < 18° C [64° F]) (Madej *et al.* 2006). These conditions are likely the result of intensive logging in the basin that began after 1950. Floods in the 1950s, 60s, and 70s, and in 1997 caused wide-spread road and stream-crossing failure that increased streambed aggradation and bank erosion. Also, the riparian vegetation changed from conifer-dominated to red alder-dominated, allowing for increased sunlight and an increase in stream temperatures (Madej *et al.*

2006). Non-natal coho habitat below Prairie Creek is restricted to the only two tributaries entering the estuary. Both, Sand Cache Creek and Strawberry Creek are low gradient but degraded due to land use activities and effects of the levee configuration, Sand Cache is generally isolated from the estuary embayment, but coho have been found in Strawberry Creek.

C. Critical Habitat

Critical habitat is defined in Section 3(5)A of the Endangered Species Act as "...the specific areas within the geographical area occupied by the species... on which are found those physical or biological features (a) essential to the conservation of the species and (b) which may require special management considerations or protection". Essential features may include, but are not limited to, spawning sites, food resources, water quality and quantity, and riparian vegetation. Structurally complex streams containing boulders, logs, brush, and aquatic macrophytes support larger numbers of rearing coho juveniles (Scrivener and Andersen 1982) than do streams that lack these structural features.

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

Critical habitat is of variable quantity and quality depending on the condition of a watershed/sub watershed within RNSP. The condition of a watershed relative to critical habitat is primarily a function of past land use practices. That is, the level of logging and number of old or abandoned logging roads within a watershed or subwatershed influence the habitat in terms of fine sediment quantity, amount of instream LWD, amount of streamside shading, pool number and depth, and water temperature.

VII. IMPACTS TO THREATENED AND ENDANGERED SPECIES

A. Direct Effects

1. Visual Disturbance

Visual disturbance of any age class of listed salmonids will not occur because no proposed activities will occur immediately adjacent to anadromous fish bearing stream reaches. The only area where any activity will be occurring along a perennial stream is the limited riparian thinning along the middle fork of Lost Man Creek that have slopes of less than 30% (Appendix 1 - Maps).

These areas are 0.25 miles above numerous large log jams and bedrock waterfalls that are fish barriers (pers. obs). There is some evidence that steelhead trout may make it past the lowest jam (B. Holden pers. comm.), but numerous very large jams and bedrock falls exist upstream of that jam within the project area that prevent any fish from entering the project area. Therefore, there is no potential for visual disturbance.

2. Injury or Harm

One possibility for injury or harm that could result from the proposed action would be from inadvertent fuel spillage entering a stream course and poisoning fish. Best management practices built into the proposed action will prevent such a possibility from occurring and thus is discountable.

3. Loss and Modification of Suitable Habitat

The first potential for loss or modification of suitable habitat from the proposed action would be increased stream temperatures from a loss of riparian cover due to the felling of trees along intermittent and perennial streams that may/would be flowing during the summertime. Increased stream temperatures will be insignificant because of the restrictive streamside forest thinning prescriptions described in the proposed action and the local microclimate air temperature regime. For intermittent 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 at least a 60% post-treatment tree canopy. For intermittent 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 at least a 70% post-treatment tree canopy. For perennial and 3rd-order and above streams, streamside protection zones will be 500 feet wide from the outer edge of the channel or floodplain, or to the break-in-slope, whichever distance is greater, in all areas except for very limited special riparian treatment areas along the middle fork of Lost Man Creek. On slopes $\leq 25\%$ steepness, thinning will retain at least a 60% post-treatment tree canopy. This will only occur along the middle fork of Lost Man Creek in limited places and nowhere along the south fork of Lost Man Creek due to slope steepness concerns (Appendix 1 - Maps). It is expected that a maximum of a quarter mile total stream length spread over numerous less than 100 yard long reaches will be treated with this prescription and will total <10 acres. On slopes $>25\%$, thinning will retain at least an 80% post-treatment tree canopy. The average existing canopy cover for the project area is approximately 80% (RNSP unpub. data), meaning essentially no treatment in these areas. Another reason that the decrease in streamside forest canopy will cause insignificant stream temperature increase is because even the lowest canopy on intermittent streams is sufficient to maintain sufficient shading, particularly in the steep valleys of the south fork of Lost Man Creek where direct sunlight on stream bottoms is limited to mid day only. The greater canopy retention restrictions on perennial stream sections will result in almost total retention with few to no trees be removed within the stream protection zone except for the limited areas along the middle fork. Thus, no shading capacity will be lost due the proposed action on the south fork and negligible shading will be lost on the middle fork. In addition, the Lost Man Creek drainage has a low ambient

temperature all year long, including maximum high water temperatures that are within suitable limits for all three salmonid species (Figure 1). Additionally, Lost Man Creek along the middle fork is a deeply incised creek with steep topography along its entire length (Appendix 1 - Maps). Therefore, direct solar radiation is limited to only the midday due to topographic shading, regardless of riparian tree cover. Also, the middle fork of Lost Man Creek within the project area is a relatively high gradient stream, which results in generally cooler water temperatures and more resiliency to increased temperatures due to solar radiation (Lewis et al. 2000). Finally, the entire Lost Man Creek watershed is within 10 kilometers of the coast and is considered entirely within the coastal fog zone or zone of coastal influence, where ambient air temperatures and direct solar radiation stay significantly lower than inland areas. Stream temperature reviews of northern California streams within the fog zone, or zone of coastal influence, have demonstrated lower increases in temperature when partially day lit after riparian forest thinning (or even total removal) (Lewis et al. 2000, CBOF-TAC 2007). Therefore, the minimal riparian forest thinning along the middle fork of Lost Man Creek will not cause adverse increases in stream temperature over the short and medium term. Conversely, the riparian forest thinning should promote quicker mean basal area tree growth than if left untreated.

The second possibility for loss or modification of suitable habitat from the proposed action would be sedimentation and subsequent increase in turbidity of streams caused by erosion of soil exposed by heavy ground based yarding tree boles to log landings. Only 365 acres, or roughly one-fifth of the 1,687 acres of the project area will have ground based log yarding equipment used to remove tree boles. In areas that tree boles will be yarded, ground based equipment will be limited to slopes of less than 30%, a relatively low slope gradient for equipment that can safely operate on slopes of up to 45%. Perennial streamside areas will be off limits to ground based equipment due to the 500 foot or greater operation distance exclusion zone (Appendix I – Maps). Intermittent and ephemeral streams will have streamside protection zones that exclude ground based heavy equipment in zones of increased width (50 to 300 feet) based on slope steepness (Appendix 1 - Maps). Negligible amounts of mobilized sediment will reach streams from ground based yarding due to the low slope gradient restrictions and skid trail mulching. Almost all sediment will be trapped by the intervening forest floor woody debris, vegetation and mulch. The ground based equipment restrictions described in the proposed action are much more restrictive than those currently recommended under California Forest Practice Rules to protect anadromous fish bearing streams (G. Bundros pers. comm.). In addition, all tree limbs and tops will be scattered on site throughout the ground based yarding units, not just on skid trails, and will provide an additional protective layer to trap mobilized sediment and prevent it from reaching stream channels. Finally, any sediment that could reach a stream would be greatly diluted by the time it was transported downstream to anadromous occupied reaches. The closest ground based yarding units (X and W1, Appendix 1 – Maps) are almost a full stream mile from anadromous reaches and many tributaries flowing from untreated areas join the ephemeral streams that drain from those units.

The third possibility for loss or modification of suitable habitat from the proposed action would be sedimentation and subsequent increase in stream turbidity caused by haul road and landing opening and use. The A131 Road and A109 spur road are hydrologically connected due to a single ephemeral stream crossings and are native surfaced. No other roads to be used by the project have stream crossings and thus are not hydrologically connected (Appendix 1 – Maps).

Opening and use of all the other roads, excepting the fully rocked Geneva Road, will only occur during the normal operating period. All roads will be fully winterized before measureable rains fall. Because all but the A131 Road and A109 spur road occupy ridges, any sediment that does get transported from roads due to sheet flow will be captured by the slash and vegetation remaining within the treated units. In addition, all the haul roads, and landings, are located at least a full mile from anadromous reaches. However, very small amounts of sediment may still enter the ephemeral stream crossing the A131 Road and A109 spur road due to minor sheet flow. These crossings are two miles upstream from anadromous reaches and many tributaries flowing from untreated areas join the ephemeral streams. Any sediment would be greatly diluted by the time it was transported downstream to anadromous occupied reaches. The effects from this very minor sediment source will be negligible.

The rest of the project area will have no ground based yarding. Trees will be felled by hand crews working on foot. In the lop and scatter units, trees will be felled, lopped and left on site. These treatment areas have no possibility for causing stream sedimentation. In the cable based yarding units, cable yarded trees will not be in contact with the ground within streamside protection zones. Ground disturbance from cable based yarding will be minimal and restricted to small areas of a few square feet or yards near breaks in slope or near landings where deflection will cause tree tops to drag on the ground. Tree limbs and tops will be placed on these exposed areas as mulch and will minimize sediment transport, as will the slash and remaining vegetation within the rest of the unit. Sediment from cable yarded units that could be transported to streams will be very minimal and thus will be negligible or discountable.

B. Indirect Effects

No indirect effects are expected.

C. Cumulative Effects

Cumulative effects are those state and private actions that may occur in the future that have the potential to impact listed species in the park. Much private timber company land and other private and tribal land occurs immediately adjacent to park boundaries. State and county roads and highways also exist immediately adjacent to the park and within the park. Timber will presumably continue to be harvested on private timber company lands immediately to the east of the project area, but that land is in an entirely different watershed (Klamath River basin). RNSP engages in consultations with adjacent private land owners 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 does not have legal jurisdiction to influence actions outside of the STA.

VIII. DETERMINATION

Based on the design and timing of the proposed actions, it is determined that the Middle Fork Lost Man Creek Forest Restoration Plan in Redwood National Park may affect, but will not adversely affect SONCC coho salmon, CC chinook salmon, NC steelhead trout and their respective critical habitats and Essential Fisheries Habitats.

VIII. MANAGEMENT RECOMMENDATIONS

None.

VIX. PREPARATION AND CONTRIBUTORS

Bensen, Keith. Fish and Wildlife Biologist – Redwood National Park. Analysis and write-up.
Teraoka, Jason. Forester - Redwood National Park. Stand data tables and prescriptions.
Powell, Scott. Biological Technician – Redwood National Park. Map.

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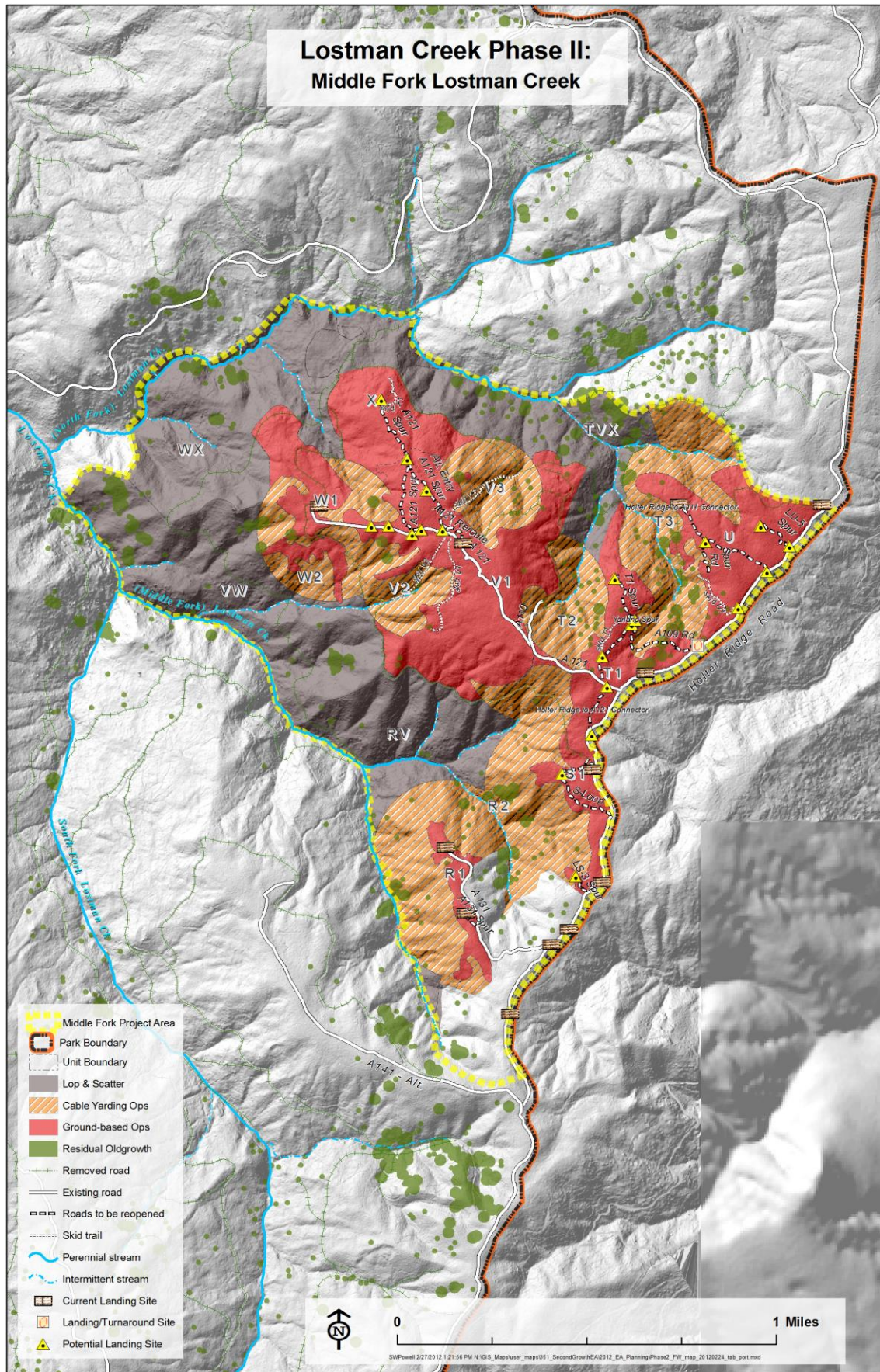
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Appendix 1 – Maps

Lostman Creek Phase II: Middle Fork Lostman Creek





UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration

NATIONAL MARINE FISHERIES SERVICE
Southwest Region
501 West Ocean Boulevard, Suite 4200
Long Beach, California 90802-4213

JUL - 2 2012

In response refer to:
2012/00806

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

Dear Mr. Chaney:

On March 8, 2012, NOAA's National Marine Fisheries Service (NMFS) received your March 5, 2012, letter requesting informal consultation pursuant to section 7(a)(2) of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. § 1531 *et seq.*) and its implementing regulations (50 C.F.R. Part 402). Your request concerns the effects of forest restoration in the Middle Fork of Lost Man Creek (project) on threatened salmonid species, and their habitats in Redwood National Park (RNP). You also requested consultation on the effects of the project on essential fish habitat (EFH) for species managed under the Pacific Coast Salmon Fishery Management Plan, pursuant to the Magnuson-Stevens Fishery Conservation and Management Act (MSA), 16 U.S.C. § 1855(b).

The purpose of the project is to move previously logged, second growth forests towards old growth redwood forest characteristics more quickly than would occur through unmanaged forest development. The project is proposed to occur in the Middle Fork of Lost Man Creek, near Orick, in Humboldt County, California, during years 2012 through 2014.

This letter concludes informal consultation for the following threatened species and their critical habitats: (1) Southern Oregon/Northern California Coast (SONCC) coho salmon (*Oncorhynchus kisutch*; 70 FR 37160, June 28, 2005), (2) California Coastal (CC) Chinook salmon (*O. tshawytscha*; 70 FR 37160, June 28, 2005), (3) Northern California (NC) steelhead (*O. mykiss*; 71 FR 834, January 5, 2006), (4) SONCC coho salmon critical habitat (64 FR 24049, May 5, 1999), (5) CC Chinook salmon critical habitat (70 FR 52488, September 2, 2005), and (6) NC steelhead critical habitat (70 FR 52488, September 2, 2005). In addition, this letter completes EFH consultation, in accordance with the MSA, and serves as consultation under the authority of and in accordance with provisions of the Fish and Wildlife Coordination Act (FWCA)



of 1934, as amended.

ACTION AREA

Treatment of second growth forest stands would occur within the Middle Fork and North Fork of Lost Man Creek watersheds, within RNP [Figure 1 in the Biological Assessment (BA) for this project (RNP 2012)] and includes 1,146 treated acres. The action area for this project is the Middle Fork and North Fork of Lost Man creeks, to their confluences with the mainstem of Lost Man Creek.

DESCRIPTION OF THE PROPOSED ACTION

Consistent with management direction provided by the *General Management Plan/General Plan and Environmental Impact Statement/Report for Redwood National and State Parks* (USDI and CDPR 1999), RNP proposes to enhance old growth redwood forest characteristics within previously logged areas by thinning forest stands consisting of mostly young and densely spaced trees. The project will also change 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. Cut trees will be moved or “yarded” to landings and roads with ground based heavy equipment, or by suspending one or both ends of a tree with skyline cable yarding systems. In some areas, trees will be cut and left on the ground, known as “lop and scatter.” The process and prescriptions used for thinning forest stands will vary based on: 1) the type of yarding method proposed, 2) whether or not lop and scatter is used, 3) slope gradient, and 4) the distance to perennial or intermittent streams.

Ground Based Yarding Areas

Areas proposed for ground based yarding cover approximately 392 acres of the project area, have slopes less than 35 percent, and are located on ridge tops and upper slope areas (RNP 2012, appendix 1 for project map). The primary silvicultural method used within ground-based yarding areas will be low thinning (thinning from below) which removes trees in the lower crown classes (*i.e.*, suppressed, intermediate, and co-dominant crown classes) to benefit trees in the upper crown classes (*i.e.*, co-dominant and dominant). The intent of the thinning is to reduce overall stand densities to levels that would stimulate stand growth and development, release dominant trees, improve conditions for development of understory vegetation, improve stand level representation of redwood, and minimize woody debris accumulation on the forest floor. One 57 acre unit will be treated using a variable density thinning prescription. Variable density thinning attempts to enhance spatial variability by varying the thinning intensity throughout the stand and inducing fine-scale variation in the forest canopy. A 40 percent reduction in basal area is planned for thinned stands under both prescriptions.

Trees will be felled using a feller buncher, harvester/processor or hand-felled with a chainsaw. Felled trees will be skidded whole-tree, or in log lengths, to a landing using a track or tire skidder with a grapple attachment. Choker skidders may be used as long as the lead end of the log is

clear of the ground. Only existing skid trails will be used, no new skid trails will be created. All felled trees that are merchantable as either saw timber or biomass fuel (generally trees larger than 5 inches dbh) will be taken off-site to local mills or a cogeneration power plant on logging trucks (see subsection below for haul road and landing management). All limbs and tops processed at landings will be returned to treated units and also used to mulch any exposed ground, particularly along skid trails.

All non-merchantable trees, or trees that do not qualify as biomass fuel, that are felled [generally less than 5 inches diameter as measured at breast height (dbh)] will be lopped and scattered to get the wood in contact with the forest floor. This downed wood, along with limb wood from larger trees, will be used as ground cover after equipment operations are completed, including along all skid trails.

Cable Based Yarding Areas

Areas proposed for cable based yarding cover approximately 242 acres of the project area, generally have slopes greater than 35 percent, and are located on upper and middle slope areas (RNP 2012, appendix 1 for project map). The low thinning prescription, described in the *Ground Based Yarding* sub-subsection above, will also be used in the cable yarding areas, but ground based skidding equipment will not be used, and all tree felling will be done by hand crews with chainsaws. Felled trees will be processed (*i.e.*, cut to log length and limbed) using chainsaws prior to yarding. All non-merchantable felled trees, (including trees that do not qualify as biomass fuel), and all limbs, tree tops and other material created from processing (collectively known as “slash”) will be lopped and scattered to get the wood in contact with the forest floor. This slash will be moved by hand to cover any small bare ground areas (a few square feet each in size and minimally dispersed across the landscape) created when the ends of trees nick the ground along cable yarding corridors (particularly at breaks in slope and near landings where deflection results in more tree dragging). Cable yarding creates corridors within vegetation that are generally not larger than 10 feet in width. Merchantable trees, or trees that qualify for biomass fuel, will be cable yarded to a landing, skid trail, or road using a cable yarder or yoader. At the landing, a processor will limb and buck the material into lengths appropriate for hauling to the mill or a cogeneration power plant.

Lop and Scatter Areas

Areas proposed for lop and scatter cover approximately 414 acres of the project area, have varying slope steepness, and are located areas that are inaccessible by equipment, on both middle and lower slopes (RNP 2012, appendix 1 for project map). Trees in lop and scatter areas will be cut using hand crews and felled trees will not be yarded, but will be left on site. No ground based heavy equipment will enter these treatment areas, nor will cable yarding be utilized. Crown thinning and/or low thinning will be the primary silvicultural methods used for lop and scatter areas. Low thinning was described in the *Ground Based Yarding* sub-section. Crown thinning (thinning from above) is a thinning method that removes trees in the upper crown classes (*i.e.*, co-dominant and dominant trees) to benefit adjacent trees of the same crown classes. The intent is to stimulate growth and development (release) of dominant trees, improve stand level

representation of redwood, and minimize fuel depth of woody debris. Selecting overstory trees to remove would be based on maximizing response and release of dominant redwood and/or other large conifers. Up to a 40 percent basal area reduction will be used in all lop and scatter areas regardless of slope and silvicultural method. All felled trees will be limbed, bucked, and lopped to get the wood in contact with the forest floor.

Riparian Thinning Areas (Limited)

A similar crown thinning prescription will be implemented in limited areas within 200 feet of the perennial portion of the Middle Fork of Lost Man Creek. All work will be accomplished by handcrews, no ground based equipment will be used and no tree yarding will occur. All cut trees will be left on site and lopped and scattered to get them in contact with the ground. The purpose of the thinning is to promote development of large trees more quickly along a perennial stream that may in the future be recruited into the stream as large wood. Thinning in this zone will only occur on slopes with less than 25 percent gradient, which occur in very limited areas (see map in appendix 1 of BA), totaling no more than 10 acres and occurring along less than 0.25 miles of stream length in total, along isolated stream reaches of no more than 300 feet long each. Thinning will retain at least a 60 percent post-treatment tree canopy. Each riparian thinning area will be clearly designated on the ground and all trees to be cut will be marked by park staff.

Streamside Protection Measures Applied to All Thinned Areas

- Except for very limited areas along the perennial section of the Middle Fork of Lost Man Creek, thinning will not occur within 500 feet (each side) of perennial streams. In addition, ground based heavy equipment will not operate within 500 feet of a perennial stream, and cable yarding and associated cable yarding corridors will not occur within 500 feet of a perennial stream.
- For intermittent and ephemeral streams on slopes less than or equal to 30 percent, streamside protection zones will be a minimum 50 feet wide or to the break-in-slope, whichever distance is greater. Heavy equipment will not enter streamside protection zones. Thinning treatments will retain at least 60 percent post-treatment tree canopy. For intermittent and ephemeral streams on steeper (31 to 45 percent) 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 at least 70 percent post-treatment tree canopy.
- All trees cable yarded from intermittent and ephemeral streamside protection zones will be lifted clear of the ground to prevent nicking the ground before being yarded uphill.
- Cable yarding corridors that cross intermittent or ephemeral streams will be approximately 10 feet wide and all trees will be “flown” (i.e., fully suspended in the air) through streamside protection zones of intermittent and ephemeral streams.
- Trees that are felled within streamside protection zones will be lopped to get them in contact with the ground and left on site.
- All streamside protection zones will be clearly marked by park staff on the ground.
- No trees will be felled into intermittent or ephemeral stream channels.

- No trees that contribute to stream bank stability (as determined and marked by park staff) will be felled.
- Equipment will not operate in, or cross swale features, where slope steepness is greater than 30 percent. Such features will be marked by park staff on the ground.
- 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. A “Shalstab” slope stability analysis has been conducted to aid park staff in identifying unstable and potentially unstable areas. Park staff overseeing contracted logging crews will identify and mark such unstable and potentially unstable areas on the ground.
- All equipment, including hand tools, heavy equipment, and cable yarding equipment, will be inspected daily to check for leaks. Equipment that may leak lubricants or fuels into a stream 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 will be trained in spill containment. In the event of a spill, work will be stopped immediately, clean-up will begin and the appropriate authorities will be notified.

Roads and Landings

Hand and heavy equipment crews will drive into the project area using existing roads. Log trucks and equipment will access the project area via the Holter Ridge Road. Holter Ridge Road is a fully rocked and maintained park administrative road. Access within the project area will be on the existing, native surfaced A121 and A131 roads and their spurs (RNP 2012 appendix 1 for project map) which run primarily along ridge tops. 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. Rocking of all or portions of the A121 road may occur. Rock would be taken from existing park quarries (e.g. Geneva Road borrow pit).

All non-rocked road work (i.e., reopening, use, winterization/closing) will be completed between June 15 and October 15, defined as the normal operating season (NOS) of each year, unless dry periods are forecast after October 15. 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 after October 15, the project may continue past the typical end of the NOS if the work can be completed within the window of predicted dry weather. Weather predictions and information available through the National Weather Service will be used to determine if work will occur outside of the NOS. Work sites, including roads and landings, will be winterized at the end of the NOS, or during the NOS if significant rains are forecast that may cause exposed roads or landings to erode. Winterization includes: 1) grading exposed road and landing surfaces to allow water to freely drain across them without concentrating, ponding or rilling, 2) installing rolling dips/drains to drain steeper sections of road, 3) clearing clogged drainage ditches or culverts, and 4) installing silt fences and other erosion control devices where necessary to convey concentrated water across exposed road and landing surfaces.

Thirty-four potential landing sites have been identified. Of those, 13 landing sites are already open and ready for use. New landings will not be constructed; however old, existing landings will be reopened. Reopening old landings will be similar to reopening old roads, brush and small trees will be removed and minimal grading and possible stump removal may occur. Landings will not be larger than one-tenth of an acre each. Landing winterization will be the same as for roads, described above.

ESA CONSULTATION

Coho salmon, Chinook salmon, and steelhead are ESA-listed as threatened within the Redwood Creek watershed. Within the Lost Man Creek sub-watershed, coho salmon, Chinook salmon, and steelhead are distributed throughout most of the mainstem of Lost Man Creek, but a series of large log jams and bedrock falls located on Lost Man Creek, just downstream of the confluence with the North Fork of Lost Man Creek, prevents anadromous salmonid access to the Middle Fork and North Fork of Lost Man creeks. Thus, the action area is 0.25 miles upstream of anadromous salmonid distribution. However, designated critical habitat extends for approximately 1.25 miles upstream of the log jams within the Middle Fork of Lost Man Creek, and for approximately 1.50 miles upstream of the log jams within the North Fork of Lost Man Creek.

Effects of the Action on Listed Species

The project has the potential to result in: 1) sediment delivery to the stream channel network through ground disturbing activities and road and landing use, 2) the delivery of petroleum products to the stream network through the use of power tools within riparian zones, and heavy equipment outside of, but adjacent to, riparian zones, and 3) increased stream temperatures due to thinning trees within riparian zones. However, the project incorporates numerous best management practices (BMPs) and has been designed to prevent or minimize increases in stream temperature, sediment delivery, or petroleum product delivery to the stream network.

Sediment

The majority of the areas identified for project activities are in upland locations away from streams. However, there is the possibility of sediment being introduced to the stream network through ground disturbing activities, such as yarding with heavy equipment, corridors of bare ground exposed by cable yarding, and haul road and landing opening and use. Heavy equipment is proposed for use on gentle slopes, less than 30 percent gradient, and is not proposed for use within 500 feet (each side) of perennial streams. In addition, intermittent and ephemeral streams will have streamside protection areas that exclude heavy equipment in zones of increasing width based on slope steepness, and the distance to the streamside break in slope from the surrounding hillside. Thus, heavy equipment will not disturb ground below the break in slope that drains to intermittent or ephemeral streams. Similarly, cable yarding is not proposed within 500 feet of perennial streams, or on the slope (below the break in slope) that drains to intermittent or ephemeral streams. In addition, all tree limbs and tops from cut trees will be scattered on site throughout the ground based yarding units, not just on skid trails, and on cable yarding corridors

and will provide a protective layer on disturbed ground to prevent or minimize erosion. Thus, negligible amounts of sediment will reach streams from ground disturbed by heavy equipment or cable yarding due to the proposed streamside protection zones, slope gradient restrictions and extensive mulching.

Regarding haul road and landing opening and use, one road and one spur road (A131 road and A109 spur road) are hydrologically connected to the stream network due to a single ephemeral stream crossing on each, and both of these roads are native surfaced. Other roads or landings to be opened and used by the project do not have stream crossings or ditches and are not hydrologically connected to the stream network. Opening and use of all the other roads and landings, excepting the fully rocked Holter Ridge Road, will only occur during the normal operating period. All roads and landings will be fully winterized before October 15 or before measureable rain fall, and seasonal road closures will prevent native surface road use during the wet weather season. Because all but the A131 road and A109 spur road occupy ridges, any sediment that does get transported from roads or landings due to erosion by sheet flow will be retained on adjacent hillslopes by mulch, natural woody debris, and vegetation.

However, small amounts of sediment may enter the ephemeral streams crossing the A131 road and A109 spur road. These stream crossings are two miles upstream from the end of anadromous salmonid distribution in Lost Man Creek and many tributaries flowing from untreated areas join the ephemeral streams. The small amount of sediment that could enter the stream network at these two stream crossings would be greatly diluted by the time it was transported downstream to areas occupied by anadromous salmonids. Thus, the amount of sediment that could be generated and delivered to the stream network would be small; the likelihood of sediment delivery to areas occupied by anadromous salmonids is low; and, even if sediment is delivered, any elevation in turbidity in an area occupied by anadromous salmonids would be negligible. Therefore, the potential for exposing salmonids of any species and life stages to elevated turbidity caused by sediment generated from program activities is negligible, and the expected response of salmonids to any negligible increase in turbidity is insignificant.

Petroleum Products

With any heavy equipment and power tool use there is the possibility that petroleum products may enter the stream network, either through spills or leaks. Spill plans and best management practices for managing petroleum products should prevent or minimize the probability of runoff of hazardous materials in the unlikely event of a spill or leak associated with power tool or heavy equipment use. In addition, heavy equipment is proposed for use only outside of riparian areas, in mid slope and upland locations. Therefore, the potential for exposing salmonids (all species and life stages), to petroleum pollutants is negligible, and the expected response of salmonids to a negligible potential for exposure to petroleum products is insignificant.

Stream Temperature

The majority of the project area is located in mid slope and upland locations away from perennial streams that would be flowing during summer months. In addition, thinning adjacent to

perennial streams is proposed for very limited areas and the action area is within the zone of coastal air temperature influence. Thinning will not occur within 500 feet from the outer edge of the channel or floodplain of a perennial stream in all areas except for very limited riparian treatment areas along the Middle Fork of Lost Man Creek. Thinning in these riparian treatment areas will only occur on slopes with less than 25 percent gradient, which occur in very limited areas (see map in appendix 1 of BA), totaling no more than 10 acres and occurring along less than 0.25 miles of stream length in total, along isolated stream reaches of no more than 300 feet long each, and a post treatment tree canopy of at least 60 percent will be retained.

The Middle Fork of Lost Man Creek is a deeply incised creek with steep channel gradient. Therefore, direct solar radiation is limited to only the midday due to topographic shading, regardless of riparian tree cover. High stream gradients result in generally cooler water temperatures and greater resiliency to increased temperatures due to solar radiation (Lewis *et al.* 2000). In addition, the entire Lost Man Creek sub-watershed is within approximately 6 miles of the coast and, as such, is considered within the coastal fog zone, or zone of coastal influence, where ambient air temperatures and direct solar radiation stay significantly lower than inland areas. Stream temperature reviews of northern California streams within the zone of coastal influence have demonstrated small increases in stream temperature when partially exposed after riparian forest thinning (Lewis *et al.* 2000). Therefore, due to: 1) the small size and extent of areas proposed for riparian thinning along perennial streams, 2) the retention of 60 percent canopy cover to provide shade, 3) the presence of topographic shading and the steep stream gradient, and 4) the location within the zone of coastal influence, the riparian thinning along the Middle Fork of Lost Man Creek will cause a negligible increase in stream temperature, upstream of anadromous salmonid distribution. Thus, the potential for exposing salmonids (all species and life stages) to increased stream temperatures is negligible, and the expected response of salmonids to a negligible potential for exposure to increased stream temperatures is insignificant.

Effects of the Action on Critical Habitat

The project will have limited effects to critical habitat from: 1) ground disturbing activities causing a negligible increase in turbidity, 2) riparian thinning causing a negligible potential for increase in stream temperatures, and 3) the small possibility of petroleum products entering the stream network and decreasing water quality. However, the likelihood of sediment entering the stream network is low and the amount of sediment would be small, and the likelihood of small amounts of petroleum products entering the stream network is also low. In addition, areas proposed for riparian thinning along streams with water present during the summer are very limited in size and extent, and sufficient riparian canopy will be retained so that any increase in stream temperatures will be minor and localized. Therefore, the effects to critical habitat from the project are expected to be insignificant.

ESA Conclusion

Based on our review of the documents provided by RNP, and based on review of site conditions within the action area, NMFS concurs with RNP's determination that the project is not likely to adversely affect threatened SONCC coho salmon, CC Chinook salmon, NC steelhead or their

designated critical habitat.

This concludes informal consultation for the project. Reinitiation of consultation may be necessary where discretionary Federal agency involvement or control over the action has been retained or is authorized by law and if: 1) new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered, 2) the action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered, or 3) a new species is listed or critical habitat designated that may be affected by the action.

EFH CONSULTATION

The project area is located within an area identified as EFH for Pacific salmon (coho salmon and Chinook salmon) managed under their respective Fishery Management Plans (FMP) under the MSA.

NMFS has evaluated the proposed project for potential adverse effects to EFH pursuant to Section 305(b)(2) of the MSA. Under the EFH implementing regulations [50 C.F.R. 600.810(a)], the term “adverse effect” is defined as any impact that reduces quality and/or quantity of EFH and may include direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce quantity and/or quality of EFH.

The potential adverse effects to EFH from the project would be from ground disturbing activities causing a small and temporary increase in turbidity, from the risk of petroleum products entering the stream network, and from minor and localized increases in stream temperature. Therefore, NMFS has determined that the proposed project would adversely affect EFH for Pacific salmon. However, the proposed project contains adequate measures to avoid, minimize, mitigate, or otherwise offset the adverse effects to EFH. Therefore, NMFS has no EFH conservation recommendations to provide at this time. This concludes EFH consultation for the proposed project. Pursuant to 50 CFR 600.920(l), RNP must reinitiate EFH consultation with NMFS if the proposed action is substantially revised in a way that may adversely affect EFH.

FWCA CONSULTATION

The purpose of the FWCA is to ensure that wildlife conservation receives equal consideration, and is coordinated with other aspects of water resources development (16 U.S.C. 661). The FWCA establishes a consultation requirement for Federal departments and agencies that undertake any action that proposes to modify any stream or other body of water for any purpose, including navigation and drainage [16 U.S.C. 662(a)]. Consistent with this consultation requirement, NMFS may provide recommendations and comments to Federal action agencies for the purposes of conserving fish and wildlife resources. The FWCA allows the opportunity to offer recommendations for the conservation of species and habitats beyond those currently managed under the ESA and the Magnuson-Stevens Fishery Conservation and Management Act. NMFS has no additional recommendations under the FWCA.

Please contact Ms. Leslie Wolff at (707) 825-5172, or via email at Leslie.Wolff@noaa.gov, if you have any questions regarding these consultations.

Sincerely,

For 
Rodney R. McInnis
Regional Administrator

cc: Copy to file ARN 151422SWR2012AR00233

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