

**A Biological Assessment of Impacts to
Threatened Anadromous Salmonids from
the Trail and Backcountry Management Plan in
Redwood National and State Parks (RNSP)**

Prepared by:
Keith Bensen, Fish and Wildlife Biologist

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I. INTRODUCTION

The purpose of this biological assessment (BA) is to review the proposed Redwood National and State Parks' (RNSP) Trail and Backcountry Management 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 formal consultation with NOAA Fisheries. 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). It is expected that this assessment will have a life span of ten years or through 2016.

II. CONSULTATION TO DATE

RNSP currently has three species of anadromous salmonids belonging to three different evolutionary significant units (ESU) 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 is currently designated for CC Chinook and SONCC coho salmon.

Previous Pertinent Consultations

Consultation on the maintenance of existing and proposed trails that are located along existing roads was completed in an assessment of annual and periodic road maintenance within RNSP. A Biological Opinion was issued by NOAA Fisheries on 4 March 2003 (NOAA Fisheries Administrative File # 151422SWR02AR6347).

Current Consultation

On 9 October 2002, Keith Bensen and Baker Holden met with Leslie Wolff at the NOAA Fisheries office in Arcata, California to present a preliminary overview of the Trail and Backcountry Management Plan proposed action. A detailed description of the proposed action was discussed with the main potential impact issues revolving around proposed watershed restoration/road to trail conversion activities on the West Ridge Road/Trail in Prairie Creek Redwoods State Park, the existing fords along the Mill Creek Horse Loop Trail and potential harassment of fish by visitors swimming in Redwood Creek in the summer. On 17 October 2002 Keith Bensen and Leslie Wolff conducted a field visit to a number of existing foot and horse trail bridges and to the proposed West Ridge Road/Trail project site. A draft Environmental Assessment (EA) of the Trail and Backcountry Management Plan was sent to NOAA Fisheries on 24 March 2003. Comments on the draft EA from NOAA Fisheries were received at RNSP in a letter dated 28 May 2003 (NOAA Fisheries Administrative File # 151422SWR03AR8825). The proposed action was significantly modified after that draft EA was written in order to address terrestrial

threatened and endangered species concerns. Keith Bensen called Brad Wiley (NOAA Fisheries) - Brad had taken over the consultation from Leslie Wolff - on 10 July 2003 to update him on the changes to the proposed action, to go over the comments NOAA Fisheries had made on the previous draft EA and to identify any informational needs. Brad and Keith determined that this consultation was not the appropriate venue for addressing the potential impacts of recreational fishing along Redwood Creek and that RNSP would seek other venues to address this issue. See Appendix 2 for an example of ongoing RNSP efforts to manage recreational fishing along Redwood Creek through the California State Fish and Game Commission. Comments on a first draft Biological Assessment were received from Brad Wiley on 3 September 2003 with a number of clarifying telephone calls made during the following weeks. Further changes due to additional terrestrial listed and candidate species prompted further analysis and changes to the proposed action. Comments on a second draft Biological Assessment were received from Brad Wiley on 30 November 2004. RNSP requested that NOAA Fisheries put the consultation on hold through 2005 and most of 2006 while terrestrial threatened and endangered species impact concerns were addressed.

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".

Specific Legislation and Previous Plans for Trail Development

The 1978 Federal park expansion legislation (PL 95-250) mentioned above also called for the development of foot trail access to the Tall Trees Grove on the east side of Redwood Creek. The legislation specified that "one route shall, unless shown by the Secretary [of the Interior] to be inadvisable, principally traverse the east side of Redwood Creek through the essentially virgin forest, connecting with the roadhead on the west side of the park east of Orick."

Numerous past planning documents have addressed trail development within RNSP; some actions having been taken and some not. The General Management Plan (USDI/CDPR 1999) specifically states that a

new trail plan be developed but does not specify where developments should be placed (p. 57). Some of the trails and related developments described here have been discussed previously in one, some, or all of the following plans: General Management Plan for Redwood National Park - 1980, Backcountry Trail Plan for Redwood and Skunk Cabbage Creeks - 1984, General Plan for the Redwood State Parks – 1985 and Davison Ranch Development Concept Plan - 1996.

IV. DESCRIPTION OF THE PROPOSED ACTION

A. Existing Conditions

1. Existing Trails and Trailheads –

The current RNSP trail system includes about 135 miles of hiking trails, 47 miles of equestrian trails, and more than 31 miles of bicycle trails (Table 1)(Appendix 1 – Maps 1 and 2). Some of the trail miles are counted more than once because equestrian and bike trails are also open to hiking, and the Little Bald Hills trail is open to both horses and bikes. The Orick and Mill Creek horse trails are counted only under equestrian trails, and the Lost Man Creek bike trail is counted only under bike trails. Hiking only trails consist of a three foot wide foot tread, up to eight foot wide area cleared of understory vegetation, footbridges, puncheons (short, un-hand railed boardwalks), and raised “causeways.” Bicycle trails are placed on old abandoned roadbeds with bridges and culverts. Horse trails can either be on abandoned roadbeds or be similar to hiking trails except with a four foot wide tread.

Trails have developed trail heads (Appendix 1 – Maps 1 and 2) unless they are connecting one trail to another. The size of trailheads varies from hard surfaced parking lots with multiple slots, toilets, interpretive signs, picnic facilities and trash cans to only simple gravel surfaced pullouts.

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Table 1. Miles of trails and number of backcountry camps in RNSP.

Park Unit	Trail Type (in miles)			Backcountry Camps (# of campsites)
	Hiking Trails	Equestrian Trails	Bicycle Trails	
Jed Smith Redwoods State Park	18.5 ¹	2.0 ¹	1.5 ¹	0
Del Norte Coast Redwoods State Park	17.5	2.3	4	0
Prairie Creek Redwoods State Park	55.4	0	4.5 ²	3 (9)
Redwood National Park	43.8 ¹	42.8 ¹	21.5 ¹	6 (36) ³
Total	135.2	47.1	31.5	9 (45)

¹ Includes Little Bald Hills multi-use trail.

² Excludes Gold Bluffs Beach and Davison Roads.

³ Excludes dispersed camping along Redwood Creek gravel bars.

The existing Mill Creek Horse Loop Trail located just to the south of Jedidiah Smith Redwoods State Park along Mill Creek (Appendix 1, Map 1) has a seasonal closure restriction (15 October to 31 May for the south ford and 15 October to 31 March for the north ford) for anadromous fish. The two stream fords which allow access to the east side loop section of the trail are closed to the public in order to prevent or minimize inadvertent trampling of SONCC coho redds.

2. Existing Backcountry Camps and Dispersed Camping –

Nine backcountry camps exist within RNSP (Table 1) (Appendix 1, Maps 1 and 2). Camps are located along the Coastal Trail at Nickel Creek (five sites), DeMartin Prairie (ten sites), Flint Ridge (nine sites), Miner's Ridge (three sites), Ossagon (three sites), Gold Bluffs Beach environmental camp (four sites), Little Bald Hills (four sites), Elam Creek (three sites) and Forty-four Creek (four sites). No more than two tents are allowed per site (Appendix 1, Maps 2 and 3).

Dispersed camping is currently allowed all along the Redwood Creek gravel bars upstream of McArthur Creek except within a quarter mile of the Tall Trees Grove. Camper use along Redwood Creek extends from the mouth of McArthur Creek upstream to approximately one mile upstream of the mouth of Bridge Creek; upstream of this area the creek channel becomes a steep, rocky gorge with little to no flat area suitable for camping. The gravel bars, and thus areas where dispersed camping is possible, end at a location on Redwood Creek called "Rocky Gap." The stream distance from McArthur Creek to "Rocky Gap" is approximately 9.25 miles. No camping is allowed within 50 feet of a surface water source or on a trail, trailhead, or road. Some areas of "concentrated" dispersed camping exist in select areas along Redwood Creek where visitors regularly camp due to extensive sandy areas (Appendix 1, Map 2).

Park regulations require all campers to store food and other scented materials in bear proof containers or by hanging food away from campsites, to maintain a clean camp to avoid attracting bears and other wildlife, and to pack out all trash. Campfires are permitted in designated backcountry camps only in park provided grills and fire rings. No ground fires are allowed outside of park provided grills or fire rings except by permit on the Redwood Creek gravel bars.

3. Current Visitor Use –

Combined national and state park visitation in RNSP in 2002 was approximately 850,000, divided roughly equally between the NPS and CDPR units (RNSP 2003). The NPS maintains visitor use statistics on backcountry camping and some trails and trailheads within the national park – the state parks only maintain overall visitor use numbers based on a sampling regime. Tables 2 and 3 show numbers of visitors, vehicles or overnight stays recorded between 1998 and 2003 at selected trailheads, four NPS backcountry camps and camps on the Redwood Creek gravel bars.

Table 2. Visitor use at selected trails within Redwood National Park.

Year	Number of Visitors				Number of Vehicles
	Tall Trees Trailhead	Lady Bird Johnson Trailhead	Redwood Creek Trailhead	Skunk Cabbage Trailhead	Orick Rodeo Ground Horse Trailhead
1998	12,094	80,454	16,975	1,454	285
1999	11,160	53,649	15,779	10,284	217
2000	9,250	71,142	10,480	7,961	401
2001	No data	106,137	13,167	35,487	389
2002	No data	97,036	13,032	4,962	899
2003	No data	70,655	11,903	6,197	653

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Table 3. Visitor use by individual overnight stays at selected backcountry and dispersed camps within Redwood National Park.

Year	Nickel Creek	Flint Ridge	DeMartin Prairie	Little Bald Hills	Elam and 44 Creeks Horse Camps	Redwood Creek Gravel Bars
1998	981	873	122	76	69	1,919
1999	1,209	1,120	113	142	46	1,548
2000	1,033	1,028	129	103	256	1,148
2001	776	821	66	68	49	1,488
2002	800	812	71	76	63	1,653
2003	818	1,487	75	25	115	980

4. *Current Maintenance –*

Existing trail, trailhead and backcountry camp annual and periodic maintenance within RNSP has been determined to have no effect on listed anadromous fish and thus no consultation with NOAA Fisheries has occurred. Maintenance includes clearing overgrown or fallen vegetation along trail paths, clearing overgrown or fallen vegetation from drainage structures (i.e. waterbars), repairing bridge railings and decks, removing trash along trails and in backcountry camps, repairing trail signs as well as cleaning toilets. Trail treads require cyclic reshaping (once every five years to remove sluff and berm material and regain an outsloped surface). All maintenance activities are completed using non motorized or motorized hand tools; no herbicides are employed to clear vegetation. The maintenance of existing bicycle or horse trails which occur along roads maintained by RNSP (i.e. Lost Man Creek Trail, portions of the Redwood Creek Horse Trail system and the Mill Creek Horse Loop Trail) has been analyzed under a recent consultation on RNSP's annual and periodic road maintenance program. A Biological Opinion was issued on 4 March 2003 (NOAA Fisheries Administrative File # 151422SWR02AR6347).

B. Proposed Action

The trails, facilities and rules changes proposed under this plan include: approximately 35.3 miles of new hiking trails, 2 miles of rerouted hiking trail, almost 16 miles of new equestrian trails (including those not entirely within RNSP), approximately 10 miles of new bike trails, four new trailheads, two redesigned trailheads, two new backcountry camps, the retrofit of an existing backcountry camp for increased accessibility, the retrofit and relocation of one backcountry horse camp for increased accessibility, the opening of a portion of the West Side Access (WSA) Road to the public, the cessation of fees charged to visitors using backcountry camps, continued but modified issuing of backcountry permits to all visitors staying overnight in the backcountry, the seasonal closure of two trail fords across Mill Creek, a new visitor education emphasis on the impacts of intentional and unintentional harassing of spawning fish, the abandonment of approximately 3.5 miles of existing trail, the complete removal of approximately 5 miles of existing trail/road. Some of the trails will be constructed while some, primarily bike trails and some horse trails, will involve the conversion of an existing road to a designated trail. Thus, not all the trail miles described above will require the construction of new trail treads. Construction of all proposed

trails, trailheads and backcountry camps as well as the rehabilitation of existing trails and roads is expected to be completed within 10 years. Construction and restoration will occur as funding comes available. Maintenance will initiate once each respective development is constructed or converted and will continue in perpetuity. New interpretive programs are currently being initiated and will expand as each new development is completed. Detailed descriptions of each development, construction technique, maintenance type and schedule, restoration technique, rules change and interpretive program are described below.

1. New Trails –

Proposed new trails (Table 4) and their locations are shown in Appendix 1, Maps 1 and 2. Letter designators for each proposed trail used in the Trail Plan are used here, throughout this document, and on maps for consistency.

Table 4. Proposed trail names, approximate lengths, type, and whether a new construction or road conversion.

Trail Letter Designator and Trail Name	Miles	Trail Type	Construction or Road Conversion
A. Hiouchi Flat Trail	1.1	Hiking	construction
B. Aubell-Boy Scout Tree Trail-Hatton Trail Connector	8.0	Hiking	construction
C. Camp Lincoln-Walker Hole Connector	1.8	Hiking	construction
D. Lieffer-Ellsworth-Peterson Trail Connector	0.3	Hiking	construction
E2. Mill Creek Horse Trail-Little Bald Hills Trail Connector*	10.8	hiking/equestrian	9.5 mile conversion/ 1.25 mile construction (primarily outside of RNSP)
G. Rellim Ridge-Coastal Trail Connector	1.7	hiking	construction
H. Crescent Beach Loop	0.7	Hiking	construction

L. B-Line Bike Trail	4.5	Bicycle	conversion
M. Q. East Side Trail (two segments)	7.1	Hiking	construction
N. Stone Lagoon Horse Trail*	3.0	Equestrian	construction (primarily outside of RNSP)
R. Gyon Bluff segment of California Coastal Trail	0.5	Hiking	construction
U. Coyote Creek Bike Loop	5.8	Bicycle	conversion
W. Elk Meadow-Lady Bird Johnson Trail Connector	2.1	Hiking	construction
X. Skunk Cabbage North Trail	1.2	Hiking	construction
Total	49		

*Trails E2 and N will be “tracked” separately throughout this document because they are connected actions within the Federal “nexus” but will be taking place almost entirely outside of RNSP’s authorized boundaries. Any section of this assessment which mentions trails E or N will be designated by the following lead sentence, “PLEASE NOTE – ACTIONS PARTIALLY OR WHOLLY OCCURRING OUTSIDE OF RNSP.”

Lengths of trail segments, acres of disturbance and number of stream crossings were estimated using GIS analyses via planning corridors. All final trail alignments will be designed for site specific conditions when the trails are laid out. The final alignment will be determined in the field to account for steepness and grade, drainage patterns, soil type, ground stability, avoidance of sensitive resources, and the presence of obstacles or interesting features such as cliffs, large trees, large rocks and views. Final route adjustments will not be significant however (i.e. routes will not deviate more than a few hundred feet), and will not affect the analyses described in this document.

Trails will be constructed to state or national park standards depending on the location of the trail or to specific standards required under a specific funding source. State park trail standards are described in the *California State Parks Trails Handbook* (1996) while national park trail standards are described in the *NPS Trails Management Handbook* (1983). In general, all newly constructed hiking trails will be built

with a three foot wide tread necessitating up to a four foot wide soil disturbance, depending on the steepness of the slope. Newly constructed equestrian trails will require a four foot wide and “rocked” tread.

Trails will be constructed using only hand tools such as shovels, modified hoes, modified rakes, wheelbarrows (non motorized and motorized), hand saws, chainsaws, sledges, hand winches and levers or very small (4 foot wide blade and tracks) bull dozers or mechanized hand tractors, where appropriate. No large heavy equipment will be used – only equipment that can be carried, pushed by one person or fit on a four foot wide trail tread will be utilized.

Listed plant surveys will be conducted along the route of every trail passing through potential suitable habitat. No large trees of any species will be removed during trail construction. Most vegetation removed for trail construction will be shrubs and saplings. On foot trails a vegetation clearance zone of 6 feet wide by 8 feet tall will be cleared while on horse trails a clearance zone of 8 feet wide by 10 feet tall will be utilized. The maximum size of trees to be removed for trail construction will be 18 inches diameter at breast height (dbh) in dense second growth areas where no alternative route exists. The vast majority of trees removed are expected to be less than 12 inches dbh. More small trees (< 12 inches DBH) will be removed to construct trails in second growth coniferous and alder forests because these forests have much denser stands of smaller trees that cannot be avoided as compared to old growth coniferous forests. Topsoil and duff that is scraped off and placed on the side of a trail under construction contains a native seedbank that allows for rapid, natural revegetation. Some vegetation removed from a trail corridor, such as sword fern, will be stockpiled along the edge of the trail and replanted to improve aesthetic qualities.

There will be no major changes in natural topography due to trail construction; the majority of trails will be laid out along a contour or routed to avoid extremely steep slopes to achieve a reasonable grade and to avoid slope failure. Switchbacks or climbing turns will be used to make changes in trail elevation through areas confined by steep drainages, unstable soils, dense second growth forest, or other physical features that must be avoided. Small (less than six feet tall), native rock or log retaining walls or other soil retaining structures will be built where a trail must traverse steep side slopes, where parent soils are unstable, where trail structures require footings and abutments or where the trail passes under trees and the trail tread is built up to protect roots and maintain grade. These small structures will be located on side slopes away from stream courses. Newly disturbed soils will be compacted along the trail tread while other disturbed soil areas will be covered with local duff or small pieces of vegetation removed during construction to reduce erosion. Trails will not be constructed when soils are saturated. Either full bench cuts will be utilized near stream courses to create trail treads and all material removed will be “exported” by hand out of the inner gorge area and placed and compacted in stable locations or crib walls will be constructed to stabilize any fill within the inner gorge area.

If it is not possible to construct a trail or install a trail bridge with sufficient time for natural revegetation to occur before the onset of the rainy season, standard erosion control methods will be used such as scattering certified weed free straw, duff, and tree branches, installing silt fences and replanting. Trail bridges will be constructed across small perennial streams where the stream banks are too steep or the stream is too wide for safe access or crossing. Trail bridges will be constructed to span the entire active stream channel with the deck well above the 100 year flood zone. No RNSP trail bridges have ever been lost to a flood and no newly constructed trail bridges are expected to be susceptible to flooding. All of the perennial streams to be crossed by bridges are smaller order streams usually located in steep channels which means that all proposed bridges will be well out of the flood zone of each stream. No abutments will be placed within any active stream channels. Bridges or boardwalks (“puncheons”) will also be built

across any perennially wet areas that cannot be avoided by the trail route. Abutments for most RNSP trail bridges are ten to twelve feet wide. Generally abutments will be made of concrete but some more remote locations will be made of wood or rock. No chemically treated wood will be used in any abutments. Specific conservation measures associated with trail bridge construction are described below.

Trail Bridge Abutment Design Criteria to Minimize Impacts of Ground Disturbance and Pollution:

- a. Ground disturbance work will be completed when soils are not saturated. If more than 0.5 inches of rain is forecast within two days, the abutment construction will temporarily cease and the site will be winterized.
- b. Effective erosion control measures shall be in place at all times during construction activities. Construction within the 5-year floodplain will not begin until all temporary erosion controls (e.g., straw bales, silt fences that are effectively keyed in) are in place and down slope of project activities within the riparian area. Erosion control structures shall be maintained throughout, and possibly after, construction activities. Sediment shall be removed from sediment controls once it has reached on-third of the exposed height of the control. Whenever straw bales are used, they shall be staked and dug into the ground 12 cm. Catch basins shall be maintained so that no more than 15 cm of sediment depth accumulates within traps or sumps.
- c. All mechanized equipment will be inspected daily 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.
- d. 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 shall be stopped immediately, clean up shall begin and the appropriate authorities will be notified.
- e. Petroleum products, chemicals, fresh cement, deleterious materials, or water contaminated by the aforementioned shall not be allowed to enter flowing waters.
- f. Any materials stocked on floodplains shall be removed prior to high water.
- g. Adequate erosion control supplies (gravel, straw bales, shovels, etc.) shall be kept at all construction sites and during all maintenance activities to ensure materials are kept out of water bodies.
- h. Bridges shall be constructed to accommodate at least the 100-year flood, including associated bedload and debris.
- i. Bridges shall be designed to avoid encroachment into the active flood plain or, if possible, the 50 or 100 year flood plain. Measures shall be taken to prevent construction debris from falling into the aquatic resource. Any material that falls into a stream during construction operations will be removed in a manner that has a minimum impact on the streambed and water quality.
- j. Bridge replacements will be conducted during times of low stream flow but prior to upstream migration of adult anadromous salmonids. Construction activities will avoid, to the maximum extent feasible, removal of any riparian vegetation.

- k. Measures shall be taken to remove any fill materials in the floodplains to a stable location prior to high water.
- l. All materials which inadvertently fall into streams will be immediately removed.

Almost the entire length of the Mill Creek Horse Trail-Little Bald Hills Trail Connector (E2) will be routed along existing roads and across existing bridges and culverts. No construction will be necessary along those portions of the trail which are on existing roads. Only a portion (approximately 1.25 miles) which will connect the existing Little Bald Hills trail to an existing road near the top of a ridge will require new construction (Appendix 1, Map 1).

2. Rerouted Trail

Approximately two miles of the existing James Irvine hiking trail in Prairie Creek Redwoods State Park (Appendix 1, Map 2) will be abandoned (see section 10 of the Proposed Action below for details) and approximately two miles of a new route (Trail ZA, Appendix 1, Map 2) will be constructed using all the methods for new trail construction described above in section 1 of the Proposed Action.

3. New and Redesigned Trailheads –

Four new trailheads will be constructed and two existing trailheads will be redesigned (Table 5). All trailheads will be located in areas that are already partially developed or have been previously disturbed/developed during past logging operations or road building projects. All trailheads will have vault toilets, bear-proof trash containers and information kiosks installed. All trailheads located on CDPR parks lands will have picnic tables while all trailheads located on NPS lands will not. A rough estimate of the area covered by each trailhead is based on the number and type of parking spaces. Passenger vehicle spaces are estimated to cover 200 square feet per vehicle while recreational vehicle spaces are estimated to cover 400 square feet. The total area is then doubled to account for turnarounds and trailhead amenities.

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Table 5. Estimated vehicle capacity, estimated area, and trails served by each of the new and redesigned trailheads (see Appendix 1, Maps 1 and 2 for locations).

Trailhead Name	Trail(s) Served by Trailhead	Estimated Parking Spaces (# RV or passenger vehicle)	New or Redesigned Trailhead	Estimated Acres of Each Trailhead
Highway 199/Elk Valley Road Junction	Aubell-Boy Scout Tree Trail-Hatton Trail Connector (B)	40 (20 RV, 20 passenger vehicle)	New	1.0
Camp Lincoln	Aubell-Boy Scout Tree-Hatton Trail Connector (B)	5 (passenger vehicle)	New	0.2
Aubell Ranch	Aubell-Boy Scout Tree Trail-Hatton Trail Connector (B)	30 (15 RV, 15 passenger vehicle)	New	0.8
East Side of 101 North of Wilson Creek	Coastal Trail (existing trail)	10 (3 RV, 7 passenger vehicle)	New	0.2
West Side Access Road: A-9 Deck	Redwood Creek Horse Trails (existing trails)	30 (15 RV, 15 passenger vehicle)	New	0.8
Mill Creek Horse Trailhead off Bertsch Avenue	Mill Creek Horse Trails (existing trails)	30 (15 RV, 15 passenger vehicle)	Redesign	0.8
Lyons Ranch Trailhead	Lyons Ranch Trail (existing trail), Coyote Creek Bike Trail (U) and East Side Trail (M, Q)	10 (passenger vehicle)	Redesign	0.2

Newly disturbed soils will be compacted within the parking areas while other disturbed soil areas will be covered with local duff or small pieces of vegetation removed during construction to reduce erosion. Trailheads will not be constructed when soils are saturated. If it is not possible to construct a trailhead with sufficient time for natural revegetation to occur before the onset of the rainy season, standard erosion control methods would be used such as scattering certified weed free straw, installing silt fences and replanting. The West Side Access: A9 Deck trailhead will be placed on a pre-existing log deck and thus will require no new soil disturbance during construction except during the digging of the new toilet pits. None of the new or redesigned trailheads are within a riparian zone.

4. New, Relocated and Retrofitted Backcountry Camps –

Two new backcountry camps will be constructed, one existing backcountry horse camp will be relocated, and one existing backcountry camp will be retrofitted to improve accessibility (Table 6).

Table 6. Number of campsites and names of each new, relocated or retrofitted backcountry campgrounds (see Appendix 1, Maps 1 and 2 for locations).

Backcountry Campground	Number of campsites	New, Relocated or Retrofitted
Skunk Cabbage Creek	4	New
Copper Creek	5	New
Forty-four Horse Camp	5	Relocated
Gold Bluffs Beach Environmental Camp	3	Retrofit

Each of the two new backcountry camps will have pit toilets, bear proof food lockers, fire rings and picnic tables installed at each campsite. Site selection for each of the new backcountry camps was partially based on sufficient flat ground upon which to place campsites. Minimal amounts of ground will be disturbed during toilet and campsite construction. The total amount of ground disturbed by construction for the two new backcountry camps is estimated to be less than an eighth of an acre. The Forty-four Horse Camp will be relocated onto an existing roadbed (which will no longer be utilized as a road) so there will be no new ground disturbance from its construction except for the digging of a new toilet pit. The two backcountry camps to be retrofitted will have new universally accessible pit toilets installed as well as universally accessible picnic tables. The only ground disturbance will result from digging new toilet pits. No proposed backcountry camps are within a riparian zone.

The new Copper Creek backcountry camp will have interpretive signs which will describe the potential negative impacts to “summer” NC steelhead from humans swimming in deep pools and how to avoid disturbing over summering adult steelhead. See section 8 “New Interpretive Programs” of the Proposed Action for more details.

Newly disturbed soils will be compacted and revegetated within the campsites while other disturbed soil areas (such as around toilets) will be covered with local duff or small pieces of vegetation removed during construction to reduce potential erosion. Campgrounds will not be constructed when soils are saturated. If it is not possible to construct or retrofit campgrounds with sufficient time for natural revegetation to occur before the onset of the rainy season, standard erosion control methods would be used such as scattering certified weed free straw, duff, and tree branches, installing silt fences and replanting.

5. Increased Public Access –

The existing West Side Access Road will be opened to controlled public use. Public vehicles will only be allowed up to the proposed A-9 Deck Trailhead and no further for a total distance of approximately 6.5 miles (Appendix 1, Map 2).

6. New Backcountry Permits –

Fees for backcountry permits will be discontinued, but all backcountry visitors will still be required to obtain a backcountry permit. Along with the backcountry permit each backcountry visitor will receive an interpretive message which describes the potential negative impacts to “summer” NC steelhead from swimming in deep pools and how to avoid disturbing adult NC steelhead. The message will be printed and attached to the permit (example Appendix 3) as well as given either through personal contact with an issuing interpretive or law enforcement ranger or through some other media such as a video or interpretive display. See section 8, New Interpretive Programs of the Proposed Action for more details.

7. Seasonal Closure of Existing Mill Creek Horse Trail Fords -

The existing Mill Creek Horse Trail has two fords which cross Mill Creek (Appendix 1, Map 1). Both fords are spawning areas used by anadromous salmonids. A seasonal closure has been placed on the southern ford from 15 October to 31 May and from 15 October until 31 March on the northern ford. The seasonal closures are meant to protect spawning SONCC coho and other anadromous salmonids and their redds from disturbance and trampling caused by hikers and horses crossing the fords. No RNSP staff or visitors are allowed to cross the fords during the seasonal closure period. The seasonal closures have been incorporated into the RNSP Superintendent’s compendium and are an enforceable parks rule subject to penalty for violation. Seasonal closure signs have been placed at the Mill Creek Horse Trail trailheads and at the turn offs to the fords themselves. A visitor education program (described in section 8 “New Interpretive Programs” of the Proposed Action) has been initiated to inform the public of the seasonal closure and the reasons for the closure.

8. New Interpretive Programs –

A new RNSP interpretive program concentrating on the potential negative effects of human swimmers disturbing salmonids holding in cold pools during the summer will be initiated. Programs will primarily target areas along Redwood Creek and backcountry permit users. The objective of the program is to reduce the number of visitors swimming in the deeper pools of Redwood Creek in summer when salmonids are stressed by elevated stream temperatures. Interpretive and law enforcement staff will receive extra resource training and will make the issue a central interpretive theme for the park. All future RNSP visitor orientation publications will include a message concerning this issue. Interpretive staff at each of the park’s visitor centers will also discuss the issue in interpretive programs as well as during casual visitor contacts. Backcountry roaming interpretive staff and patrolling law enforcement staff will also discuss the issue during casual visitor contacts, particularly near the proposed Copper Creek backcountry camp. Other media (e.g. signs, videos and permanent displays) will be utilized as funding becomes available.

Another program initiated during the spawning season will teach visitors about salmonid breeding behaviors and how to avoid disturbing spawning fish (i.e. stay a short distance from spawning fish while observing them). Programs similar to those described above will be used but will primarily target areas along upper Prairie Creek, Lost Man Creek picnic area and Mill Creek.

A visitor education program will be initiated using similar methods to those described above that explains the necessity for seasonal closure at the existing Mill Creek Horse Trail fords. The educational program will particularly target regular user groups (i.e. local and regional equestrian groups) and solicit the target groups for volunteers to support the seasonal closure by informing other recreational horseback riders.

9. New Annual Maintenance –

As each new trail, trailhead and backcountry campground is completed an annual maintenance program will commence and continue in perpetuity. Annual maintenance could occur everyday, once per week, once per month, a few times per year, once per year or only every few years depending on the trail or facility's condition and the type of maintenance necessary.

Annual trail maintenance will involve clearing vegetation which has overgrown or fallen on the trail route or drainage structures. Vegetation clearance zones will be the same as for trail construction. Overgrown or fallen vegetation will be cleared to 6 feet wide by 8 feet tall on foot trails and 8 feet by 10 feet on horse trails. Trail tread will require cyclic reshaping (once every five years to remove sluff and berm material and regain an outsloped surface). All trail tread reshaping will be done using non motorized hand tools such as shovels, hoes and rakes. Bridges along foot and horse trails could occasionally require minor repairs including replacing broken handrails and deck boards. Most trails will receive maintenance only once or twice per year.

Bicycle trails on existing roads will be maintained to road standards so that park personnel can utilize the trails/roads for management purposes. This includes brushing the sides of roads, clearing inboard ditches and culverts of fallen vegetation and grading road surfaces with graders. These activities were described in detail and analyzed in a previous consultation on road maintenance (NOAA Fisheries reference number 151422SWR02AR6347).

Annual trailhead maintenance will include daily or weekly toilet and picnic facility cleaning as well as emptying trash cans. Trailhead boundaries may also be cleared of overgrown vegetation, and any existing structures (e.g. toilet buildings, picnic tables, signs, bulletin boards) may be repaired as the need arises.

Annual campground maintenance will include daily, weekly, or monthly cleaning of toilets. Vegetation will be cleared around campsites, usually on an annual or biannual schedule. Occasional repairs to foodlockers, fire rings, hitching posts, signs and picnic tables will occur on an as needed basis.

Any maintenance of any foot bridge (e.g. replacement of handrails or deck boards) which crosses a stream which could have migrating or spawning anadromous fish species will occur either outside of the anadromous fish breeding season (October 15th to May 31st) or work will occur during the anadromous fish breeding season with the following limitations: daily site specific surveys by an RNSP Fishery Biologist assessing the potential for the presence of migrating or spawning fish, constant monitoring of fish presence by RNSP staff on site, cessation of work if up migrating or spawning fish are present. Any gas powered hand tools will be refueled on a spill proof tarp and at least 150 feet from any watercourse.

10. Trail Closure and Subsequent Restoration –

Two existing trails and the segment of one existing trail which are either better served by other existing trails and/or that pose potential resource risks will be closed and restored (Table 7)(Appendix 1, Maps 1 and 2). Trail closure and restoration will be accomplished by de-compacting the trail tread to loosen soils, pulling up the fill material to obtain full recontouring of the hill slope, planting native understory vegetation (from within the same watershed) to obliterate the trail, scattering branches and duff over the rehabilitated trail and placing large debris at junctions or trailheads. Natural revegetation of abandoned and restored trail treads is extremely rapid within RNSP, usually within less than two growing seasons. Work will be done using only non-motorized handtools due to the very small scale of the restoration needed (i.e. only a two foot wide trail tread needs to be recontoured). No large woody vegetation will be cut. Neither of the two trails proposed to be restored crosses a stream. The segment of the existing trail to be abandoned does have some puncheons across wet areas and one bridge which will be removed as part of the restoration process. All restoration work will be done when soils have fully dried.

Table 7. Proposed abandoned trails or trail segment and their lengths.

Trail Name	Length Of Trail In Miles
R1. Mill Creek Campground Trail	0.4
R2. Boat Creek Trail	1.0
James Irvine Trail segment	2.0

11. Road to Trail Conversion and Watershed Restoration -

The West Ridge Road/Butler Creek Trail (R3) and Ossagon Road (R4) are old logging roads built before acquisition by the California Department of Parks and Recreation. A one mile portion of the five mile long West Ridge Road bed is currently utilized as part of the West Ridge Trail. The 0.2 mile long Ossagon Road is redundant because the nearby Ossagon Trail serves the same area. Sections of the roads are either currently beginning to fail or may fail and have the potential to cause increased sedimentation into streams if left to further deteriorate. The West Ridge and Ossagon Roads are also some of the few physical remnants of historic logging roads remaining within Prairie Creek Redwoods State Park. Thus an additional reason for removal of the road is to enhance aesthetic qualities and restore the “naturalness” of the surrounding unroaded old growth forest areas. Four of the five miles of the West Ridge Road will be completely removed while one mile of road will be partially removed and converted to a foot trail. The Ossagon Road will be completely removed (Appendix 1, Map 2).

Portions of the West Ridge Road that lie within anadromous habitat (Prairie Creek watershed) are approximately 0.6 miles long (Appendix 1, Map 2). These sections contain only one relatively small stream crossing (across Prairie Creek) with the rest of the road section consisting of typical cut and fill or ridge top graded construction which will require rehabilitation. The other approximately 4.5 miles of road and crossings to be removed lie within small non-anadromous watersheds that drain directly west to

Gold Bluffs Beach. All of the 0.2 miles of Ossagon Road lie within the Prairie Creek watershed and it also has one small crossing across Prairie Creek (Appendix 1, Map 2).

All of the recently consulted upon techniques, restrictions, and “sideboards” described in the biological assessment “A Biological Assessment of Impacts to Aquatic Threatened Species from the Watershed Restoration Program in the Northern Portion of Lost Man Creek Watershed, Redwood National and State Parks” (Holden III et. al. 2003) and the subsequent Biological Opinion (NOAA Fisheries #151422SWR01AR54) will be utilized in all proposed restoration work described here.

Road removal work and road to trail conversion work involves completely excavating stream crossings, restoring natural contours and landforms along road corridors by retrieving sidecast fill, uncovering buried topsoil, spreading woody debris on finished surfaces and replanting with native species (if needed). The natural contours of the streambed and forest floor developed and existed in balance with the pre-disturbance natural hydrologic conditions, and represent the most stable configuration for the landscape. The re-exposed topsoil provides a nutrient-rich base for re-establishment of native species. The woody debris scattered adjacent to the finished stream channels provides immediate surface erosion control, habitat for small terrestrial species, and, as it decays, adds additional organic matter to the soil.

Road to trail conversion involves all of the above steps except that a small portion of the road prism (approximately 5 feet wide) is left upon which a trail tread is placed. The trail tread is located on the cutbench of the former road in order to create a stable tread. In addition, armored stream crossing or small foot bridges are installed across streams at the uphill, upstream portion of the former road stream crossing.

Watershed restoration work requires the use of heavy equipment (various combinations of bulldozers, excavators, loaders, dump trucks and scrapers) in order to be effective. The period of operations will be scheduled for the month of 16 September to 14 October due to disturbance concerns for terrestrial threatened and endangered species and to avoid wet periods. If the watershed restoration geologist determines that windows of dry weather are predicted beyond 15 October and there are small additional work items that can be completed within the predicted window, then NOAA Fisheries will be consulted. If an agreement is reached, work may continue.

Experienced heavy equipment contractors will be employed through an established contracting framework. A watershed restoration geologist will be present on-site during excavation work to make adjustments to excavation design and to ensure resource protection and quality control.

a. Detailed Description of Stream Crossing Removal Techniques - A bulldozer will begin the Prairie Creek crossing excavation by dishing down the road fill, scooping out as much fill as possible, and pushing it along the road to recontour the cut just uphill of the crossing. The excavation work will not disturb the bottom of the stream channel nor will it be near flowing water during this time. Once the bulldozer has removed as much fill as possible, an excavator will move onto the downstream portion of the remaining fill. The excavator will excavate the remaining fill from the channel, beginning at the downstream extent of the fill and moving in the upstream direction. The goal of the stream channel excavation is to uncover, yet not disturb, the buried natural channel armor, usually a combination of rock and woody debris. The large woody debris, encountered during the excavation, will be placed in the channel to augment the natural channel armor.

Prairie Creek will be diverted around the excavation area. Water will be kept flowing through the culvert as long as possible. The culvert will be removed section by section, as the excavator works its way up the

channel; thus water will only be allowed to flow on the finished stream channel excavation, and not on partially excavated areas. When the excavation nears the upstream end, water will flow across a partially excavated area for a brief period while the excavation of the top of the crossing is completed.

Stream channel excavations may experience minor adjustments, mostly during the first winter following excavation. The remaining road fill, wedged in the interstices of the original stream bed may be mobilized and very small portions of channel sidebanks may settle or slide. Much of the material mobilized during these adjustments is trapped by the large woody debris that is encountered during the excavation and placed back into the channel, augmenting the natural channel armor. Woody debris placed on areas adjacent to streams reduces surface erosion and provides habitat for seedlings, fungi, microorganisms, insects, birds, salamanders and small mammals. This habitat enhances the recovery of the forest ecosystem across the former road corridor.

b. Detailed Description of Road Removal Techniques - Excavation of sidecast fill reduces the amount of road fill that may fail as a mass movement, restores surface runoff patterns, and often uncovers buried topsoil. Many sections of road in RNSP are built on a layer of pioneer road logging debris and forest understory vegetation. This layer of organic material continues to decay and contributes to slope failures. The configuration of the road (insloped, outsloped, ditched, rutted, etc.) controls local hillslope runoff patterns.

A bulldozer removes vegetation from the inboard ditch then de-compacts the inboard ditch with its rippers or blade. It then de-compacts the roadbed with its rippers and then dishes down the outside edge of the road, and pushes the fill toward the cutbank. Depending on how steep the slopes are, the bulldozer may be able to complete the excavation and shape the fill to conform with local pre-disturbance landforms. On steeper ground an excavator assists, lifting more fill up toward the cutbank. On the steepest slopes, all of the work may be done with the excavator.

The original buried topsoil is often encountered as the sidecast excavation nears completion. Uncovering this layer of organic and nutrient rich material is one of the goals of sidecast fill excavations. It is a marker horizon that indicates original ground configuration, and thus the most stable configuration for road removal work.

Undergrowth vegetation and trees that are growing in the road prism and fill are removed and stockpiled for surface erosion control in areas adjacent to streams. The average width of fill with trees growing in it is estimated to be 36 feet wide or 4.6 acres per mile of road. This helps to reduce potential surface erosion, and also provides immediate cover for small terrestrial species. As the debris decays, it adds organic matter to the soil, and encourages fungi, speeding recovery of native forest vegetation as well as reducing the establishment of exotic plants.

Road to trail conversion includes all of the actions described above except that a small portion of the road prism (approximately 5 feet wide) is left upon which a trail tread is placed. The trail tread is located on the cutbench of the former road, not on old fill, in order to create a stable tread. Excavated fill is placed on the cut above the new trail tread recontouring the terrain to mimic the original shape of the slope. The tread is outsloped where necessary and no inboard ditches are created in order to provide for proper drainage. The trail tread may be constructed with gentle meanders to soften the appearance of straight road sections. Final trail tread shaping may be done by heavy machinery or by handcrews. Final mulch placement along exposed slopes beside the trail tread is also completed by handcrews because excavator placement has proven to be inefficient for this task in road to trail conversion projects. Handcrews cut

and place vegetation left by the excavator along the trail tread and also may replant stockpiled vegetation with viable root balls to further speed revegetation and soften the restored area's appearance.

c. Post Restoration Monitoring, Adjustments, Reporting – All completed projects are visited several times during the first winter, and photo-points established prior to excavation are re-photographed. The distribution of woody debris and rock in the excavated channel may be rearranged using hand tools, to minimize post-excavation erosion.

Records of how many fish were moved and any mortalities will be recorded and reported. With respect to the watershed restoration/road to trail conversion work, copies of the restoration reports, final fill volumes moved, pre-/post- photo monitoring of the crossing excavation, and estimates of the size and delivery of any voids or surface erosion found after the first two rainy seasons will be supplied in annual reports to NOAA Fisheries.

V. STATUS AND DISTRIBUTION OF LISTED SPECIES AND ENVIRONMENTAL BASELINE

1. California Coastal (CC) Chinook salmon (Oncorhynchus tshawytscha), Threatened

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

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

In spring, CC chinook salmon fry migrate downstream to rear in the Redwood Creek estuary before entering the ocean in the fall. Reimers (1973) documented the role estuaries play in fall chinook salmon production. From scale analysis of spawning fall chinook, he determined that the majority of returning adults spend June, July, and August as juveniles within estuaries before completing their seaward migration. His investigations determined that juvenile chinook spending less than three months in the estuary seldom returned to spawn in the natal stream. Reimers (1973) concluded that these fish did not survive as well in the ocean as the fish that had spent three months in the estuary. Apparently a survival advantage was conferred upon the fish that remained in the estuary and grew to a larger size before entering the ocean. Chinook salmon usually return to freshwater after three to four years in the ocean, although two year old male spawners are commonly observed.

Juvenile CC chinook salmon in Redwood Creek do not spend time rearing in upstream areas (Anderson and Brown 1982), but instead, utilize the Redwood Creek estuary. Thus, the Redwood Creek estuary is important as the sole rearing habitat for CC chinook salmon in RNSP. RNSP research shows that if given the opportunity the juveniles will spend an extended period (to late summer) rearing in the estuary before entering the ocean. Prior to 1978 most young CC chinook salmon were released from Prairie Creek Fish Hatchery in the early spring. These were fish hatched from eggs taken only four or five months earlier. Capturing sufficient numbers of chinook to obtain their eggs was difficult because of the low numbers of returning adult fish. The low numbers of returning adult CC chinook salmon, a species that relies totally on the estuary during its brief juvenile freshwater rearing period, are probably related in part to the summer/fall conditions in the Redwood Creek estuary. Construction of the flood control project in the estuary has resulted in degraded rearing habitat. Winter spawning/carcass counts in RNSP continue to indicate low numbers (D. Anderson pers. comm.).

CC Chinook Critical Habitat

Critical habitat is defined in Section 3(5)A of the Endangered Species Act as "...the specific areas within the geographical area occupied by the species... on which are found those physical or biological features (a) essential to the conservation of the species and (b) which may require special management considerations or protection". In designating critical habitat NOAA Fisheries considers habitat elements and conditions required for all life stages of the species. In addition, NOAA Fisheries also focuses on the known physical and biological features (primary constituent elements) within the designated area that are essential to the conservation of the species. These essential features may include, but are not limited to, spawning sites, food resources, water quality and quantity, and riparian vegetation.

In California Coastal, NOAA Fisheries has designated critical habitat for this ESU to include all naturally spawned populations of chinook salmon from rivers and streams south of the Klamath River to the Russian River, California, as well as seven artificial propagation programs: the Humboldt Fish Action Council (Freshwater Creek), Yager Creek, Redwood Creek, Hollow Tree, Van Arsdale Fish Station, Mattole Salmon Group, and Mad River Hatchery fall-run chinook hatchery programs.

2. Southern Oregon/Northern California Coasts (SONCC) Coho Salmon (Onchorynchis kisutch), Threatened

Coho salmon were historically distributed throughout the North Pacific Ocean from central California to Point Hope, Alaska, through the Aleutian Islands, and from the Anadyr River, Russia, south to Hokkaido, Japan (USDI 1997). The species probably inhabited most coastal streams in Washington, Oregon and northern California.

Coho salmon have shown substantial decreases throughout their range (Konkel and McIntyre 1987). In the U.S. Pacific Northwest, they are now extinct in the eastern half of their former range, and badly depleted over most of the western half (Frissell 1993). At least 33 populations have been identified by agencies and conservation groups for being at moderate or high risk of extinction. Overall a geographic trend for the West Coast Coho salmon stocks has developed with the southernmost and easternmost stocks in the worst condition. In California, including hatchery stocks, current abundance could be less than 6% of estimates for the period 1940 to 1949. Populations now are at least 70% lower than during the 1960s (CDFG 1994). Two contiguous ESUs including the southern Oregon/northern California coasts (SONCC) ESU (where RNSP is located) of coho salmon were designated as threatened (USDI 1997). Both the Smith River watershed in the north of RNSP and the Redwood Creek watershed in the south of RNSP fall within this ESU.

The anadromous fish populations of Redwood Creek have experienced a substantial reduction during the last 30 years, in part due to severe flood events that moved large amounts of sediment from highly eroded hill slopes to the stream channels of the Redwood Creek basin. Current fish runs are far below those that occurred 70-80 years ago. News accounts and recollections of longtime residents of the Redwood Creek watershed suggest that both the size and numbers of salmonids have declined in recent decades (Van Kirk 1994). The total population in the Redwood Creek system may still number more than 2,000 adult SONCC coho, but most occur in the Prairie Creek drainage and probably originate from the Prairie Creek Hatchery (D. Anderson field notes). With the closure of the hatchery in 1992, those numbers are probably now much lower.

After hatching, juvenile SONCC coho salmon generally spend one full year rearing in freshwater before entering the ocean. Downstream migration of SONCC coho to the ocean from upstream Redwood Creek and Smith River rearing areas occurs in early spring (March-April). Survey data from RNSP indicate that these young salmon presently move directly into the ocean, spending a minimal amount of time in the Redwood Creek Estuary (Anderson 1995). The same is most likely true of the Smith River. Adult migration through the Redwood Creek estuary is dependent upon the mouth being open to the ocean. The Smith River usually stays open all year and so migration to the ocean is most likely direct. Whether or not the Redwood Creek mouth is open depends on a combination of wave action on the sand berm, the volume of water in the estuary, and the flow of water in the stream. Adult SONCC coho typically run upstream to spawn from late October to early March depending on access through the estuary (Anderson 1995). Recent data suggest that the peak of the spawning run begins in late November (Anderson 1998).

SONCC coho salmon distribution in the Redwood Creek basin is limited to the mainstem and the larger low gradient tributaries. RNSP conducted general stream surveys of the basin in 1980 and 81 to describe and characterize the salmonid rearing habitat and distribution of juvenile salmonids (Anderson 1988, Brown 1988). Migrational barriers were identified during these surveys. No SONCC coho were found during these early electrofishing surveys above the barriers. However, subsequent surveys in the 1990's have detected SONCC coho in streams that did not have SONCC coho in 1980-81. Whether these barriers still exist, have changed to allow fish passage, or new barriers have been created is unknown. Based on these data, RNSP has estimated that SONCC coho can be found occupying 26 miles of stream within the Lower Redwood Creek Basin (RNSP unpub. data) (Appendix 1, Map 2).

SONCC coho salmon distribution within the Smith River basin is also limited to the mainstem and larger gradient tributaries. Except for RNSP areas bordering the Smith River within RNSP, most of the coho habitat within RNSP is in the Mill Creek watershed along the mainstem and west branch (RNSP unpub. data) (Voight and Waldvogel 2002). SONCC coho exist throughout all portions of these streams found within the current RNSP boundary (Appendix 1, Map 1). Life cycle timing for Smith River SONCC coho is described in Voight and Waldvogel (2002).

Specific to this proposed action area, SONCC coho are suspected to spawn at the two Mill Creek Horse Loop Trail fords (Appendix 1, Map 1) (pers. obs.). The southern ford provides relatively extensive spawning habitat in an approximately 50m x 10m riffle consisting of mixed sized substrate. Unlisted chinook salmon and steelhead trout were seen spawning throughout this riffle and at least 10 separate redds were counted in the actual ford area in 2003 (pers. obs.). The northern ford provides relatively limited spawning habitat in an approximately 5m x 5m long pool tail. Two redds of unidentified species origin (most likely chinook based on timing and size) were seen in the actual ford area in 2003 (pers. obs.). No further specific data exists for these two spawning areas.

SONCC Coho Critical Habitat

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

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

3. Northern California (NC) Steelhead Trout (Oncorhynchus mykiss), Threatened

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

During this century, over 23 indigenous, 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. Steelhead have recently been listed as endangered in two ESUs and threatened in four ESUs. The Northern California ESU falls within the boundaries of RNSP within the Redwood Creek watershed.

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

NC Steelhead are the last of the anadromous salmonid species to return to freshwater in the annual cycle, generally between January and April. Juveniles rear in the streams for one to four years before their downstream migration to the ocean. The majority of juvenile NC steelhead in Redwood Creek spend

their second year of life in the estuary and lower part of Redwood Creek (Anderson 1988). They reside in marine waters typically for two or three years prior to returning to the natal stream to spawn. Unlike other Pacific salmon, steelhead are capable of spawning more than once before they die.

RNSP began summer NC steelhead surveys in 1981 and survey data indicate a continuous decline. Forty-four adult fish is the highest total number observed during summer surveys of portions of the mainstem of Redwood Creek. No adult fish were seen in 1989. No other RNSP streams in the Redwood Creek basin have been surveyed for summer steelhead; these streams do not have pools large enough to support fish during the warm summer months.

Winter NC steelhead numbers are much higher. Juvenile NC steelhead are the most common and widely distributed fish in the Redwood Creek basin. During sampling efforts in the summers of 1980 and 1981, NC steelhead occurred in 57 of the 111 tributaries surveyed.

NC Steelhead Critical Habitat

Critical habitat is defined in Section 3(5)A of the Endangered Species Act as "...the specific areas within the geographical area occupied by the species... on which are found those physical or biological features (a) essential to the conservation of the species and (b) which may require special management considerations or protection". In designating critical habitat NOAA Fisheries considers habitat elements and conditions required for all life stages of the species. In addition, NOAA Fisheries also focuses on the known physical and biological features (primary constituent elements) within the designated area that are essential to the conservation of the species. These essential features may include, but are not limited to, spawning sites, food resources, water quality and quantity, and riparian vegetation. NOAA Fisheries designated critical habitat for this DPS between Redwood Creek, California and Russian River, California.

4. Environmental Baseline

a. Redwood Creek Watershed Baseline

Detailed watershed baseline condition descriptions for Redwood Creek can be found in the recently completed Annual Routine and non-routine road maintenance program in Redwood National and State Parks biological assessment (RNSP 2002a), the Redwood Creek Watershed Analysis (RNSP 2002b), and the Total Maximum Daily Load for Sediment: Redwood Creek, California (EPA 1998). All of these documents are on file at RNSP and the NOAA Fisheries office in Arcata, California.

b. Smith River Watershed Baseline

Detailed watershed baseline condition descriptions for the entire Smith River can be found in Smith River Watershed Analysis (Smith River National Recreation Area 1995) and the Smith River Anadromous Fish Action Plan (Smith River Advisory Council 2002). Detailed watershed baseline condition descriptions for just Mill Creek can be found in the Mill Creek Property, Interim Management Recommendations (Stillwater Sciences 2002). Both of these documents are on file at RNSP and the NOAA Fisheries office in Arcata, California.

VI. IMPACTS TO THREATENED AND ENDANGERED SPECIES

A. Direct Effects

1. Disturbance

Individual juvenile and adult salmonids have the potential to be temporarily disturbed by the construction of foot bridges. Different species are present in some streams and absent in others. In addition, the Smith River watershed and Redwood Creek watershed are split into various ESU's, depending on the species. Table 8 describes which species are in which streams crossed by proposed trails or proposed roads to be removed.

Table 8. List of proposed trails to be built or removed which cross streams containing anadromous salmonids. Proposed trails may or may not cross streams at fish bearing reaches depending on stream flows. Locations are presented in Appendix 1, Maps 1 and 2.

Trail Name and Letter Designator(s)	Number of CC chinook stream crossings	Number of SONCC coho stream crossings	Number of NC steelhead stream crossings
Aubell-Boy Scout Tree Trail-Hatton Trail Connector – “B”*	None	2 intermittent reaches	None
Lieffer-Ellsworth-Peterson Trail Connector – “D”*	None	1	None
Mill Creek Horse Trail-Little Bald Hills Trail Connector – “E2”*	None	5***	None
East Side Trail – “M, Q”**	None	None	3
Coyote Creek Bike Loop – “U”**	None	2*** intermittent reaches	2*** intermittent reaches
West Ridge Road – “R3”**	1	1	1
Ossagon Road – “R4”**	1	1	1

*Trail route partially or wholly within the Smith River watershed.

**Trail route partially or wholly within the Redwood Creek watershed.

***Proposed trail on existing road, thus crossings already exist. No new crossings to be constructed.

a. *Trail R3/West Ridge Road and Ossagon Road* – which are to be removed, each cross a stream section (Prairie Creek) which could potentially contain CC chinook, SONCC coho, and/or NC steelhead. Work will occur within the anadromous watershed portion of the road removal projects between 16 September and the first rains. All CC chinook juveniles will have already migrated to the estuary (Anderson pers. comm.) by the time work will commence and adults will not enter the stream until after the first rains

when Redwood Creek opens to the ocean. There is no potential, therefore, for CC chinook to be disturbed by road removal activities.

No SONCC coho adults will be present in Prairie Creek for the same reasons as for chinook. No NC steelhead adults will be present within Prairie Creek for the same reasons as coho and chinook and because no pools are large enough to provide habitat for “summer” steelhead.

Any SONCC coho or NC juvenile steelhead present that are in the stream crossing area will be removed prior to and during stream flow diversion and dewatering. Listed salmonids will be relocated to a suitable instream location immediately up or down stream of the work area. This will be done by qualified fishery biologists using nets to capture and relocate listed salmonids when practical. When it is necessary to use electroshockers, RNSP will follow and be consistent with NOAA Fisheries guidelines. RNSP’s section 10 permit does not cover the capture and relocation of listed salmonids during culvert replacement and installations activities, therefore take coverage is necessary. All efforts shall be taken to neither exhaust nor kill listed salmonids during the capture and relocation process.

b. Trail M,Q – to be built along a portion of the east side of Redwood Creek valley, crosses two small order, high gradient tributary streams which could potentially contain NC steelhead (Appendix 1, Map 1). Small footbridges will be built across both of these streams. Work may occur during the spawning season. Most of the streams will be crossed well upslope of their junctions with Redwood Creek where presence/absence surveys were conducted (Anderson pers. comm.). Accessible spawning reaches on these streams are most likely highly variable from year to year due to fluctuating flow levels and most likely steelhead do not reach the proposed stream crossing locations. The chances of any one individual fish being present at a bridge site during construction activities is low. On site construction project personnel and RNSP Fisheries Biologists will regularly monitor downstream sections of the creek for any “pooled” fish which appear to be inhibited by bridge construction activities. If fish are appearing to be disturbed (e.g. fish swimming back and forth rapidly or repeatedly seek cover) then activities will cease until effected fish are clear of the work area.

c. Trail D – to be built across lower Clark’s Creek, could potentially contain SONCC coho. A small footbridge will be built across this stream and work may occur during the spawning season. Individual spawning fish could be temporarily disturbed during construction activities. Spawning fish do not occur in Clark’s Creek every year because the creek only occasionally connects with the Smith River (Anderson pers. comm.). The chances of any one individual fish being present during construction activities or when future visitors are crossing is very low. On site construction project personnel and RNSP Fisheries Biologists will regularly monitor up and downstream sections of the creek for any “pooled” fish which appear to be inhibited by bridge construction activities. If fish are appearing to be disturbed then activities will cease until effected fish are clear of the work area. The occasional visitor crossing this bridge is expected to have a negligible disturbance effect on any individual SONCC coho.

d. Trail E2 – will be placed on existing roads and bridges along almost its entire length (Appendix 1, Map 1). Only a portion (1.5 miles) located in the upper headwaters area of a small tributary will require new construction. No new crossings will be constructed on this portion thus there is no potential for any disturbance from construction of this trail. The occasional visitor crossing existing bridges and culverts along this trail is expected to have a negligible disturbance effect on any individual SONCC coho. None of the proposed trails within the Smith River watershed will provide increased access to any potential swimming holes with SONCC coho because none of the creek sections crossed by proposed trails are large enough for human swimmers during summer months when swimming would occur.

e. Trail U – is located so far upslope in the Coyote Creek watershed that it only crosses intermittent reaches of Coyote Creek (Appendix 1, Map 2). There is no possibility for anadromous salmonids to exist at any of the crossings and thus there is no potential for disturbance.

f. Trail B – crosses a stream which has historically contained SONCC coho (Clarks Creek), but does so on the far upper intermittent reaches of the stream, well above suitable habitat – therefore, there is no potential for disturbance.

2. Loss and Modification of Suitable Habitat

a. Trails -

Three proposed trails (G, H, R) (Table 9) are located entirely outside of anadromous watersheds (Appendix 1, Maps 1 and 2) and thus their construction has no potential to effect anadromous habitat.

Table 9. List of proposed trails in relation to anadromous watersheds, crossing construction and ground disturbance due to construction. Locations are shown in Appendix 1, Maps 1 and 2.

Trail Letter Designator and Trail Name	Partially or Wholly Within Anadromous Watershed?	Construction of Crossing(s) on Anadromous Stream(s)?	Construction (ground disturbance) or Road Conversion (no additional ground disturbance)
A. Hiouchi Flat Trail	Yes	No	construction
B. Aubell-Boy Scout Tree Trail-Hatton Trail Connector	Yes	Yes	construction
C. Camp Lincoln-Walker Hole Connector	Yes	No	construction
D. Lieffer-Ellsworth-Peterson Trail Connector	Yes	Yes	construction
E2. Mill Creek Horse Trail-Little Bald Hills Trail Connector	Yes	No	conversion and construction (primarily outside of RNSP)
G. Rellim Ridge-Coastal Trail Connector	No	No	construction
H. Crescent Beach Loop	No	No	construction
L. B-Line Bike Trail	Yes	No	conversion
M. Q. East Side Trail (two segments)	Yes	Yes	construction

N. Stone Lagoon Horse Trail	Yes	No	conversion and construction (primarily outside of RNSP)
P. Whiskey 40 Interpretive Trail	Yes	No	construction
R. Gyon Bluff segment of California Coastal Trail	No	No	construction
U. Coyote Creek Bike Loop	Yes	No	conversion
X. Skunk Cabbage North Trail	Yes	No	construction
W. Elk Meadow-Lady Bird Johnson Trail Connector	Yes	No	construction
Z. Berry Glen-Lost Man Creek Bike Trail	Yes	No	conversion
ZA. James Irvine Trail Reroute	Yes	No	construction

Twelve proposed trails (A, B, C, D, E2, M, N, P, Q, W, X, Z, ZA) (Table 9), which will require some ground disturbance during construction, are located either partially or wholly within anadromous watersheds. Construction of trails away from streams is not expected to cause any increase in sedimentation. Trail treads are the only portions which will be exposed mineral soil. Treads are only going to be three (for foot trails) to four (for horse trails) feet wide. Any excavated fill (which at most will only be a few feet wide) will either be planted with vegetation removed from the trail route or will rapidly revegetate after construction. All excavated material within inner gorges will be “exported” out of the inner gorge to more stable locations. Only small trees directly along the tread route will be removed, thus, no new trail will be directly exposed to rainfall because either the entire or a significant portion of the canopy will be retained. In second growth areas, where the most exposure to rainfall would be expected because a higher proportion of small trees will be removed, rapid canopy growth will completely cover the trail tread within a few years. In addition, any negligible amount of sediment produced will be “captured” by surrounding vegetation and downed woody debris naturally occurring on the forest floor. Drainage structures (i.e. outsloped treads, waterbars, etc.), slope stabilizing features (e.g. retaining walls) and regular maintenance will ensure that no new trail will fail and cause sediment to enter a stream.

Three proposed trails (B, D, M) (Table 9) (Appendix 1, Maps 1 and 2) will require that new footbridges be built across anadromous fish bearing streams. Trails B and D are within the Smith River watershed and thus only SONCC coho could potentially be affected (Table 8) (Appendix 1, Map 1). Trail M crosses three streams containing NC steelhead (Table 8) (Appendix 1, Map 2). For the same reasons stated above, it is not expected that any shading riparian vegetation will be significantly modified by construction near streams. Only small trees will be removed while all larger trees will be preserved, thus maintaining canopy cover. Trail and footbridge construction near streams could potentially cause sediment to enter streams and the refueling of motorized hand tools could potentially pollute streams. Only negligible amounts of sediment is expected to enter streams during near-stream trail and footbridge

construction because of precautions taken to prevent sedimentation (i.e. use of silt screens, construction occurring only when soils aren't saturated, depositing fill excavated near streams away from streams, use of weed free straw, construction "diapers"). In addition, no structures will be built within any streambeds during bridge construction and bridge abutments will be placed outside of the 50 to 100 year flood zone. Finally, all tool refueling will take place at least 150 feet from any stream course, thus preventing the potential for accidental pollution.

CC Chinook, SONCC Coho and NC Steelhead Critical Habitat

Critical habitat elements will only be negligibly affected by trail construction, primarily from extremely minor sedimentation, for the reasons stated above.

b. Trailheads -

Two (Mill Creek Horse trailhead off Bertsch Avenue and Aubell Ranch trailhead) of the seven proposed trailheads (Table 5) are not within anadromous watersheds and thus have no potential to affect habitat. The Lyon's Ranch trailhead is located in flat, ridge top area which is at least 0.5 miles from the nearest perennial stream. Any ground disturbance and subsequent potential sediment generation associated with the construction or expansion of this site will be buffered by the large areas of intervening vegetation. The A-9 Deck trailhead will be placed on an existing flat, ridge top cleared area which used to be a large log deck. No new ground disturbance will be necessary to build this trailhead. The Camp Lincoln trailhead is located at an existing facility which will require only minor amounts of ground disturbance to create new parking areas. The trailhead is located at the base of a hill near flat pasture land with no ready drainage to area streams. These pastures would buffer the small amount of sediment created during construction. The Wilson Creek trailhead is located within a few hundred yards of the mouth of Wilson Creek. The area is already heavily disturbed due to nearby Highway 101 and Wilson Creek Road. Any negligible amount of sediment which is not buffered by soil erosion control measures (i.e. use of silt screens, construction occurring only when soils aren't saturated, depositing fill excavated near streams away from streams, use of weed free straw) would enter the creek within the final few hundred yards of the stream where little to no suitable spawning or rearing habitat exists. Once completed, this trailhead will not pose any sedimentation threats because the area will be revegetated and is located at least 300 feet from the creek. Trailhead locations are shown in Appendix 1, Maps 1 and 2.

CC Chinook, SONCC Coho and NC Steelhead Critical Habitat

Critical habitat elements will only be negligibly affected by trailhead construction, primarily from extremely minor sedimentation, for the reasons stated above.

c. Campgrounds -

Three of the proposed backcountry campgrounds to be constructed or modified (Skunk Cabbage Creek, Gold Bluffs Beach Environmental, Miner's Ridge) (Table 6) are not within anadromous watersheds and thus have no potential to affect habitat. Moving Forty-four Horse Camp from its present location to the new location 0.5 miles upslope will actually improve habitat. The new camp location will be at an already existing road on a ridge. The horse camp will be farther from the creek than it is now. No new soil disturbance will be required to build the new camp except for digging the toilet pit. The Copper Creek backcountry campground will be located within a few hundred yards of its namesake creek but will not be located immediately next to it. NC steelhead have been noted near the mouth of Copper Creek. Only minor ground disturbance will be required at the camp in order to create flat sleeping areas and dig

toilet pits. Pollution from human waste will be prevented by the installation of the pit toilets. Standard erosion control measures mentioned above for trails and trailheads will be implemented at each site. Sedimentation is expected to be absolutely minimal from the construction of this backcountry campground. Locations of backcountry campgrounds are shown in Appendix 1, Map 2.

CC Chinook, SONCC and NC Steelhead Coho Critical Habitat

Critical habitat elements will only be negligibly affected by the construction of Copper Creek campground, primarily from extremely minor sedimentation, for the reasons stated above.

d. Maintenance -

The regular annual maintenance of proposed foot and horse trails not located on existing roads is expected to have no effect on habitat because no new ground disturbance is involved. Only the clearing of encroaching vegetation and drainage structures is necessary during regular maintenance of these types of trails. Cyclic maintenance (done every five years) includes the reshaping of any foot or horse trail treads to get rid of berms and reestablish proper drainage. This small scale work is done entirely with hand tools. Cyclic trail maintenance only involves the existing exposed trail tread in dispersed locations along the trail. No new soil areas are disturbed and all tread areas that are reshaped are also re-compacted resulting in no new soil movement. The maintenance techniques of proposed bicycle trails and horse trails which occur along existing roads maintained by RNSP or CDPR (i.e. B-Line Bike Loop – trail “L”, Coyote Creek Bike Loop – trail “U”, Rellim Ridge – Little Bald Hills Connector – trail “E”) have been analyzed under a previous consultation on RNSP’s annual road maintenance program (Biological Opinion issued on 4 March 2003 - NOAA Fisheries Administrative File # 151422SWR02AR6347).

e. Trail Abandonment and Restoration –

The abandonment and restoration of the 3.5 miles of trails and trail section is expected to have no to a negligible beneficial effect on habitat. Eliminating the trail treads of these trails will eliminate whatever negligible amount of sediment they may produce.

f. West Ridge Road/Trail Conversion and Removal and Ossagon Road Removal -

Approximately 3,600 feet of the West Ridge Road and 1,120 feet of Ossagon Road lie within CC chinook, SONCC coho and NC steelhead habitat (Prairie Creek watershed). These sections contain only one stream crossing for each road (across Prairie Creek) with the rest of the roads consisting of typical cut and fill along an intermittent drainage or ridge top graded construction which will require removal. The other approximately 4.5 miles of road of West Ridge Road, including sections and crossings to be completely removed and the section to be converted to a trail, lie within small non-anadromous watersheds that drain directly to Gold Bluffs Beach to the west. The total length of Ossagon road is only 0.2 miles long (Appendix 1, Map 2).

Removal of the West Ridge and Ossagon Roads will eliminate the potential for catastrophic failures from the landscape. The restoration work itself, however, has the potential to cause short-term negative effects on salmonids and their habitat through sedimentation and the removal of some understory riparian vegetation. Post-excavation erosional adjustments are expected to occur. However, the total volume of post-excavation erosion is small in comparison to the volumes being prevented from eroding by removing the road fill. It is estimated that the annual sediment savings incurred by removing the West Ridge Road

sections of road within the Prairie Creek watershed will be approximately 48 cubic yards (based on 64,800 square feet of road removed times an average sediment yield of .02 cf per year per sq. ft. of road surface). The estimated annual sediment savings for Ossagon Road will be 15 cubic yards. The current average sediment yield may be lower than this because the roads are rarely utilized and partially cover by vegetation (D. Beers, pers. comm.). Turbidity and suspended sediment effects on young salmonids should be minimal because of the relatively small amounts of material which could enter Prairie Creek after the first winter rains when the most adjustment occurs. The long term benefits of excavating the sidecast fill and crossing fill should greatly exceed the short term negative impacts of restoration disturbance.

In order to minimize disturbance to the buried natural stream channel armor, heavy equipment will excavate down to the top of the armor layer. A minor amount of road fill remains in the crevices of this armor, and some of this is flushed downstream during first winter's heavy flows. Experience has shown it is better to leave this small amount of fill in the crevices of the natural armor than to disturb the interlocked nature of the original bed's rock and wood. Any large woody debris encountered during excavation will be added to the finished channels to supplement the natural sediment trapping action of the existing woody debris.

A minor amount of riparian vegetation, primarily understory shrubs and some alders, will be removed during excavation of the two Prairie Creek crossings. The conditions of the crossings (relatively flat reaches, relatively smaller amounts of fill, large old growth conifers nearby forming a complete canopy, and fill covered by only understory shrubs) creates situations where the post excavation "foot prints" will be relatively small. The amount of fill in the crossings has not been calculated but is relatively small because of the reasons just described. The maximum depth of the fill is no more than eight to ten feet, primarily due to the flatness of the reaches, and are approximately 75 feet long by twenty feet wide at their widest. The post excavation overstory vegetation should provide complete shading. Reestablishment of vegetation on excavated areas is expected to be rapid because of the many surrounding seed sources. Water temperatures will not increase as a result of removing the crossing.

Woody debris in the stream channel will increase as a result of the stream crossing excavation. Woody debris uncovered during excavation will be stockpiled and placed in the finished channel excavation to mimic natural woody debris. This woody debris reduces surface erosion, captures sediment moving through the excavation area, and provides cover for aquatic and terrestrial species.

CC Chinook, SONCC Coho and NC Steelhead Critical Habitat

Critical habitat elements will be affected by the road removal projects, primarily from sedimentation occurring as the site readjusts immediately after excavation. These effects are expected to be minor and short lived, however, for the reasons stated above.

3. Essential Fisheries Habitat (EFH) -

Essential Fish Habitat for CC chinook, SONCC coho and NC steelhead will not be affected by most of the proposed actions. Negligible amounts of sedimentation may occur during foot bridge construction. In addition, some sedimentation may occur immediately after road and stream crossing removal during watershed restoration work on West Ridge Road and Ossagon Road. These effects are expected to be negligible to minor as well as short lived for the reasons stated above.

B. Indirect Effects

Potential increased visitor use resulting from improved trail linkages and increased access to new and existing areas of RNSP resulting from the activities described in the proposed action may cause some indirect effects to listed salmonids.

1. Disturbance

NC steelhead juveniles, adult “summer” NC steelhead and juvenile SONCC coho salmon could potentially be temporarily disturbed by visitors swimming in deeper pools which provide cool water and anti-predator refugia for these species. Salmonids forced out of these deeper pools and into warmer, shallow water could subsequently suffer from increased thermal stress and predation if there were no easily accessible cool water pools or cover nearby. It is unknown if being flushed from cool water pools would affect salmonid survivorship or reproduction. Juvenile CC chinook salmon migrate downstream to estuaries by summer and so are not present in the upper reaches of streams when visitors would be swimming in pools (Anderson pers. comm.).

Ward’s (1988) study of summer steelhead pool utilization in the Eel River showed that adult summer steelhead do move out of pools when human surveyors/divers are present and there is sufficient flow for the fish to migrate upstream. However, Eel River steelhead did not move out of pools when water levels dropped and impeded migration. It is unknown if this forced movement decreased survivorship in the fish. Unfortunately, there is no published information on the behavioral response of juvenile salmonids to human swimmers in pools. Anecdotal and personal observations, however, appear to indicate that juvenile salmonids seek cover within the same pool and do not flush long distances, if at all, when divers are present. This may be due to the juveniles’ ability to find cover in small structures (Anderson pers. comm., Holden pers. comm., pers. obs.).

The proposed East Side Trail (M, Q) will increase visitor access to Redwood Creek pools near the proposed Copper Creek back country camp (Appendix 1, Map 2). The potential for disturbance will most likely be relatively low because of the remote location of the camp, expected low visitation to the new camp and the proposed visitor education program described in the proposed action. No other pools along Redwood Creek should experience increased swimming by visitors because none of the other sections of the East Side Trail (M, Q) are within easy access of Redwood Creek (i.e. the proposed trail is at least 0.25 to 0.5 miles from the creek with dense old growth forest and steep slopes in between).

Existing trails and dispersed camping opportunities do provide visitors access to pools along Redwood Creek from an area approximately 1 mile upstream of Bridge Creek all the way downstream to the RNSP boundary. An unknown number of visitors do swim in Redwood Creek in the summer. Anecdotal observations indicate that most visitors swim in areas upstream from Bond Creek, particularly around the Tall Trees Grove. This is probably due to the persistent fog and lower air temperatures on the lowest stretches of Redwood Creek and ease of access to the creek via the Tall Trees Trail. Some summer steelhead along these stream reaches are presumably being disturbed by swimmers. Again, it is unknown if this disturbance constitutes a severe enough effect to decrease survivorship or reproduction in adult summer NC steelhead.

The proposed actions are not expected to increase catch and release fishing caused disturbance beyond current levels because no new trails will access fishing areas not already accessible by existing trails. Please note that the California Department of Fish and Game currently allows recreational fishing along Redwood Creek downstream of Bond Creek. RNSP is currently addressing the issue of recreational fishing effects to summer steelhead through comments to the California Department of Fish and Game Commission (see Appendix 2 for example).

Some existing parks trails do provide visitors the opportunity to be in close proximity (within 10 to 20 feet) to some suitable spawning areas along Lost Man Creek, Prairie Creek and Mill Creek. No scientific literature exists on the potential disturbance casual observation by humans near stream banks or on footbridges could have on spawning fish. Regional salmonid experts have all stated that visitors observing spawning fish on trails and trail bridges, like those found in RNSP, may cause minor, temporary disturbance of spawning fish but that the disturbance is short lived, if at all, and fish invariably return to their spawning after a short time (C. Zimmerman pers. com., D. Gale pers. comm., J. Polos pers. com., L. Preston pers. com., M. McCain pers. com., M. Sparkman pers. com., W. Duffy pers. com.). On the contrary, all the regional experts agree that the public should be encouraged to witness spawning fish so that they may gain an appreciation for the species and support their conservation – as long as the observing does not unnecessarily overburden any one spawning location or cause constant disturbance. None of the opinions’ of regional experts which work within RNSP or RNSP fisheries staff personal observations indicate that visitors are causing more than a very minor disturbance to spawning salmonids.

2. Loss and Modification of Suitable Habitat and Injury or Harm

Visitor use could potentially affect SONCC coho due to the potentially increased use of the Mill Creek Horse Loop Trail created by the improved trail linkages caused by the proposed Little Bald Hills – Mill Creek Trail Connector (Trail “E”) (Appendix 1, Map 1). The Mill Creek Horse Loop Trail currently has two fords along its route on the main stem of Mill Creek. The improved trail linkages caused by the opening of Trail E may increase visitor use along the Mill Creek Horse Loop Trail and thus increase the amount of potential impact to the Mill Creek stream course at the two fords. Both fords provide suitable SONCC coho spawning habitat but it is unknown if coho utilize these specific areas to spawn (unlisted chinook salmon and steelhead trout are currently known to use both ford areas for spawning) (pers. obs.). Main stem Mill Creek spawning survey reaches which include the ford areas have been surveyed annually from 1993 to present (C. Howard pers. comm.). No SONCC coho have ever been recorded to have spawned along any portion of the main stem of Mill Creek during those surveys. However, C. Howard (pers. comm.) believes that during low water years that there is the potential that coho could spawn in those locations, but that the potential is low.

SONCC coho redds (if present at the fords) could be trampled by horses or visitors on foot as they cross the fords when eggs and alevin are present (Roberts and White 1992). As described in the proposed action and in order to reduce the impacts to SONCC coho, RNSP closes the Mill Creek Horse Loop Trail at the two fords between 15 October and 31 May on the south ford and 15 October and 31 March on the north ford. Smith River SONCC coho salmon emerge from redds from the beginning of February to the end of April (Voight and Waldvogel 2002). No injury or harm should occur to SONCC coho eggs or alevin present at the south ford because all individual fry should be out of any redds and rearing in pools away from the ford by the time it is opened to visitors and park staff. The seasonal closure should allow some eggs and alevin to fully incubate and emerge from the north ford area without the threat of being trampled. However, some late incubating eggs and pre-emergent fry could be trampled as visitors cross the north ford. The seasonal closure period only partially covers the incubation period for Smith River SONCC coho. The number of fish and alevin that could be potentially trampled is currently very difficult to estimate given the lack of coho detections in this particular spawning area. Identification of redds specific to SONCC coho is impossible without direct observation of spawning fish. Coho redds are of intermediate size and thus can be easily confused with relatively small chinook salmon redds or relatively large steelhead trout redds. However, based on the size of the spawning area at the north ford, it is very roughly estimated that an absolute maximum of 10 occupied SONCC coho redds could be present at the ford when the closure period ends and visitors are allowed to cross the stream (D. Anderson pers. comm., B. Holden pers. comm.). All of these redds could potentially be destroyed by visitors crossing the stream.

It must be noted that the estimated number of SONCC redds that could be present at the north ford is an absolute maximum and that most likely a much smaller number of occupied coho redds, if any, would be at the ford (D. Anderson pers. comm., B. Holden pers. comm.). In addition, as evidenced by the statements by C. Howard (pers. comm.), coho salmon have never been recorded to have spawned in the main stem of Mill Creek during the past 12 years. Therefore, the chance that coho redds would be present at the north ford on any given year is low and thus the direct impact to the overall coho productivity of the Mill Creek system would be low as well. A quantifiable impact is impossible to calculate or predict given the lack of recorded coho spawning in the main stem of Mill Creek.

No stream bank gullies or significant alterations of the stream substrate have been identified during personal observations of the ford areas. The rocky geologic nature of Mill Creek at each of the crossings inherently reduces bank erosion and provides some bank armoring. The indirect effects to suitable habitat from potential increases in visitor use of the Mill Creek Horse Loop Trail are therefore expected to be minor.

Another potential indirect effect that could occur is from an inadvertent stove fuel spill or use of camp stove fuel to ignite a wood fire by a backpacker along the lower Redwood Creek gravel bars – dispersed camping along the gravel bars will continue to be allowed under this plan but visitors will have to obtain a backcountry camping permit and associated conservation education materials at park visitor centers. The two types of backpacking petroleum fuel stoves that are used in the USA, however, make petroleum pollution extremely unlikely. The first type of stove uses a liquid petroleum fuel tank which is attached to the burner until empty. A spill from this type of stove is virtually impossible because the tank changing mechanism makes spilling fuel very difficult. In addition, liquid petroleum has a very low evaporation temperature and immediately vaporizes when decompressed in normal atmosphere, thereby eliminating any petroleum residue remaining on the ground. The other type of stove commonly used is fueled by white gas. Like liquid petroleum, white gas has a very low evaporation temperature and also vaporizes when exposed to normal atmospheric conditions. Any spilled fuel and petroleum residue, likely to be negligible, should completely evaporate by the time stream waters rise in November. Additionally, if a camper used white gas to ignite a wood fire, then the fuel would be completely consumed. Again, no petroleum residues would remain to pollute the stream.

C. Cumulative Effects

No other similar future, State, local and private actions are reasonably certain to occur within the areas under consideration. No significant new trail systems, other than those described above, are planned for the foreseeable future. No additional watershed restoration work will occur in the upper Prairie Creek watershed because no remaining roads are planned for removal. Using the guidelines outlined in this document, cumulative adverse effects to anadromous fish or their habitat are not expected.

VII. DETERMINATION

Based on the nature and timing of the proposed actions, it is my determination that the Trail and Backcountry Management Plan in Redwood National and State Parks in RNSP will have the following effects on the threatened and endangered species and Essential Fisheries Habitat listed in this document:

No effect to CC chinook or their critical habitat, SONCC coho or their critical habitat and NC steelhead due to the construction of trails, trailheads and backcountry campgrounds; may affect but is not likely to adversely affect CC chinook and their critical habitat, SONCC coho or their critical habitat and NC steelhead due to negligible amounts of sedimentation caused by footbridge construction; may affect but not likely to adversely affect SONCC coho and NC steelhead because of potential minor disturbance caused by human swimmers in cold pool refugia in Redwood Creek, may affect but not likely to adversely affect CC chinook, SONCC coho and NC steelhead due to some minor disturbance caused by visitors observing spawning fish. SONCC coho critical habitat may be indirectly affected but is not likely to be adversely affected by minor changes caused by potential increased visitor use of the Mill Creek Horse Loop Trail due to negligible amounts of increased sedimentation.

Watershed restoration work on the small crossing across Prairie Creek on West Ridge Road (Trail “R3”) and watershed restoration work within the Prairie Creek watershed on Ossagon Road (Trail “R4”) may affect and is likely to adversely affect CC chinook, CC chinook critical habitat, SONCC coho, SONCC critical habitat, NC steelhead and their respective Essential Fisheries Habitat. Incidental take is requested for all three species. These effects, however, are expected to be minor and short lived and the long term benefits will far outweigh the short term costs.

A currently unquantifiable, but very small number of SONCC coho salmon redds are likely to be indirectly adversely affected by visitors crossing the Mill Creek Horse Loop Trail north ford and subsequently trampling eggs and pre-emergent fry. This adverse effect is expected to be minor and likely will not occur every year, if at all. Additional unquantifiable incidental take, therefore, is requested for SONCC coho.

VIII. MANAGEMENT RECOMMENDATIONS

Visitor use patterns along the accessible portions of Redwood Creek should be monitored in order to determine where and how many visitors are swimming along the creek and whether the proposed visitor education program is effective.

The amount and timing of SONCC coho spawning (if they spawn at this location at all) at the north ford of the Mill Creek Horse Loop Trail ford should be monitored on an annual basis to determine the level of adverse impact occurring to redds trampled by visitors crossing the ford.

VIX. CONTRIBUTORS

Judy Wartella – RNSP GIS Specialist, GIS analysis and map production.

LITERATURE CITED

- Anderson, D.G. 1988. Juvenile salmon habitat of the Redwood Creek basin in Humboldt County, California. Master's Thesis. Humboldt State University, Arcata, CA. 99 pp.
- Anderson, D.G. 1995. Biological supplement to Redwood National and State Parks US Army Corps of Engineers application: coho salmon utilization of Redwood Creek estuary. Unpub. Rep. on file at Redwood National and State Parks, Orick, CA. 13 pp.
- Anderson, D.G. 1998. Redwood Creek estuary breaching and channel manipulation. Request for formal consultation with National Marine Fisheries Service. Upub. Rep. on file at Redwood National and State Parks. Orick, CA. 188 pp.
- Anderson, D.G. and R.A. Brown. 1982. Anadromous salmonid nursery habitat in Redwood Creek watershed. *In*: Proceedings of the first biennial conference of research in California National Parks. University of California, Davis.
- Brown, R.A. 1988. Physical rearing habitat for anadromous salmonids in the Redwood Creek basin, Humboldt County, California. Master's Thesis. Humboldt State University, Arcata, CA. 132 pp.
- CDFG California Department of Fish and Game. 1994. Petition to the Board of Forestry to list coho salmon as a sensitive species. Calif. Dept. Fish and Game Rep. 35 pp plus appendices.
- CDPR. 1996. California Department of Parks and Recreation – Trails Handbook. Unpub. handbook on file at Redwood National and State Parks, Orick, CA. 312pp.
- Childers, E.L. 1999. Monitoring the northern spotted owl in Redwood National and State Parks 1993 to 1999. Unpubl. report on file at Redwood National and State Parks, Orick, CA. 86pp.
- Environmental Protection Agency (EPA). 1998. Total Maximum Daily Load for Sediment. Redwood Creek, California. Region 9. 71.
- Frissell, C.A. 1993. Topology of extinction and decline of native fishes in the Pacific Northwest and California. *Conserv. Biol.* 7:342-354.
- Holden III, B., T. Spreiter, M. Sanders, N. Youngblood, R. Klein, G. Craven. 2003. A Biological Assessment of Impacts to Aquatic Threatened Species from the Watershed Restoration Program in the Northern Portion of Lost Man Creek Watershed, Redwood National and State Parks. Unpublished report on file at Redwood National and State Parks, Orick, CA. 35 pp.
- Konkel, G.W. and J.D. McIntyre. 1987. Trends in spawning populations of Pacific anadromous salmonids. USDI Fish and Wildlife Service Wildl. Tech. Rep. 9, Washington DC. 25 pp.
- Reimers, P.E. 1973. The length of residency of juvenile fall chinook salmon in Sixes River, Oregon. *Res. Rep. of Fish Comm. of Oregon* 4(2).
- Roberts, B.C. and R.G. White. 1992. Effects of angler wading on survival of trout eggs and pre-emergent fry. *North American Journal of Fisheries Management.* 12:450-459.
- RNSP. 2002a. A Biological Assessment of Impacts to Aquatic Threatened Species for the Annual Routine and Non-Routine Road Maintenance Program in Redwood National and State Parks (RNSP). June.
- RNSP. 2002b. Redwood Creek Watershed Analysis. January.

- Sakai, H. 2003. A conservation strategy for managing threatened and endangered species in Redwood National and State Parks. Unpublished report on file at South Operations Center – Redwood National and State Parks, Orick, CA. 116 pp.
- Scrivener, J. C. and B. C. Andersen. 1982. Logging impacts and some mechanisms which determine the size of spring and summer populations of coho salmon fry in Carnation Creek. *In*: Proceedings of the Carnation Creek Workshop: a ten year review. G.F. Hartman, ed. Pacific Biological Station, Nanaimo, BC, Canada.
- Smith River Advisory Council. 2002. Smith River Anadromous Fish Action Plan. Unpublished report on file at South Operations Center – Redwood National and State Parks, Orick, CA. 78 pp.
- Smith River National Recreational Area. 1995. Smith River Watershed Analysis. October.
- Spence, B.C., G.A Lomnický, R.M. Hughes, and R.P. Novitzki. 1996. An ecosystem approach to salmonid conservation. TR-4501-96-6057. ManTech Environmental Research Services Corp., Corvallis, OR.
- USDC U.S. Department of Commerce. 1999a. Endangered and threatened species; threatened status for two chinook salmon evolutionarily significant units (ESUs) in California. Fed. Reg. 64(179):50394-50415.
- USDC U.S. Department of Commerce. 1999b. Designated critical habitat; central California coast and southern Oregon/northern California coasts coho salmon; final rule and correction. Fed. Reg. 64(86):24049-24062.
- USDC U.S. Department of Commerce. 2000. Designated critical habitat: critical habitat for 19 evolutionarily significant units of salmon and steelhead in Washington, Oregon, Idaho, and California; final rule. Fed. Reg. 65(32):7764-7787.
- USDI U.S. Department of the Interior. 1997. Endangered and threatened species; threatened status for the southern Oregon/northern California coast evolutionarily significant unit (ESU) coho salmon; final rule. Fed. Reg. 62(117):33038-33039.
- USDI U.S. Department of the Interior and [CDPR] California Department of Parks and Recreation. 1999. Redwood National and State Parks, Humboldt and Del Norte Counties; final general management plan/ general plan; environmental impact statement/ environmental impact report. Vol. 1. Crescent City, CA: USDI National Park Service and California Department of Parks and Recreation.
- Van Kirk, S. 1994. Historical information on Redwood Creek. Unpub. Rep. on file at Redwood National and State Parks, Arcata, CA.
- Voight, H. and J. Waldvogel. 2002. Smith River Anadromous Action Plan. Unpublished report on file at Redwood National and State Parks, Orick, CA. 78 pp.
- Ward, M.B. 1988. Adult summer steelhead trout utilization of summer holding pools, Middle Fork Eel River, California. In Western Proceedings: 68th Annual Conference of the Western Association of Fish and Wildlife Agencies. Albuquerque, New Mexico.

PERSONAL COMMUNICATIONS

- Anderson, David. Fishery Biologist. Redwood National and State Parks, Orick, CA
- Chamberlain, Charles. Senior Fishery Biologist. Yurok Tribe, Hoopa, CA
- Duffy, Walt. Leader. USGS California Cooperative Research Unit, Humboldt State University, Arcata, CA.
- Gale, Dan. Senior Fishery Biologist. Yurok Tribe. Klamath, CA.

Holden III, Baker. Fishery Biologist. Redwood National and State Parks, Orick, CA.

Howard, Chris. Fishery Biologist, Mill Creek Fisheries Program, California Department of Fish and Game, Orick, CA.

McCain, Michael. Fishery Biologist, Six Rivers National Forest, Gasquet, CA.

Polos, Joseph. Fisheries Biologist. USFWS, Arcata, CA.

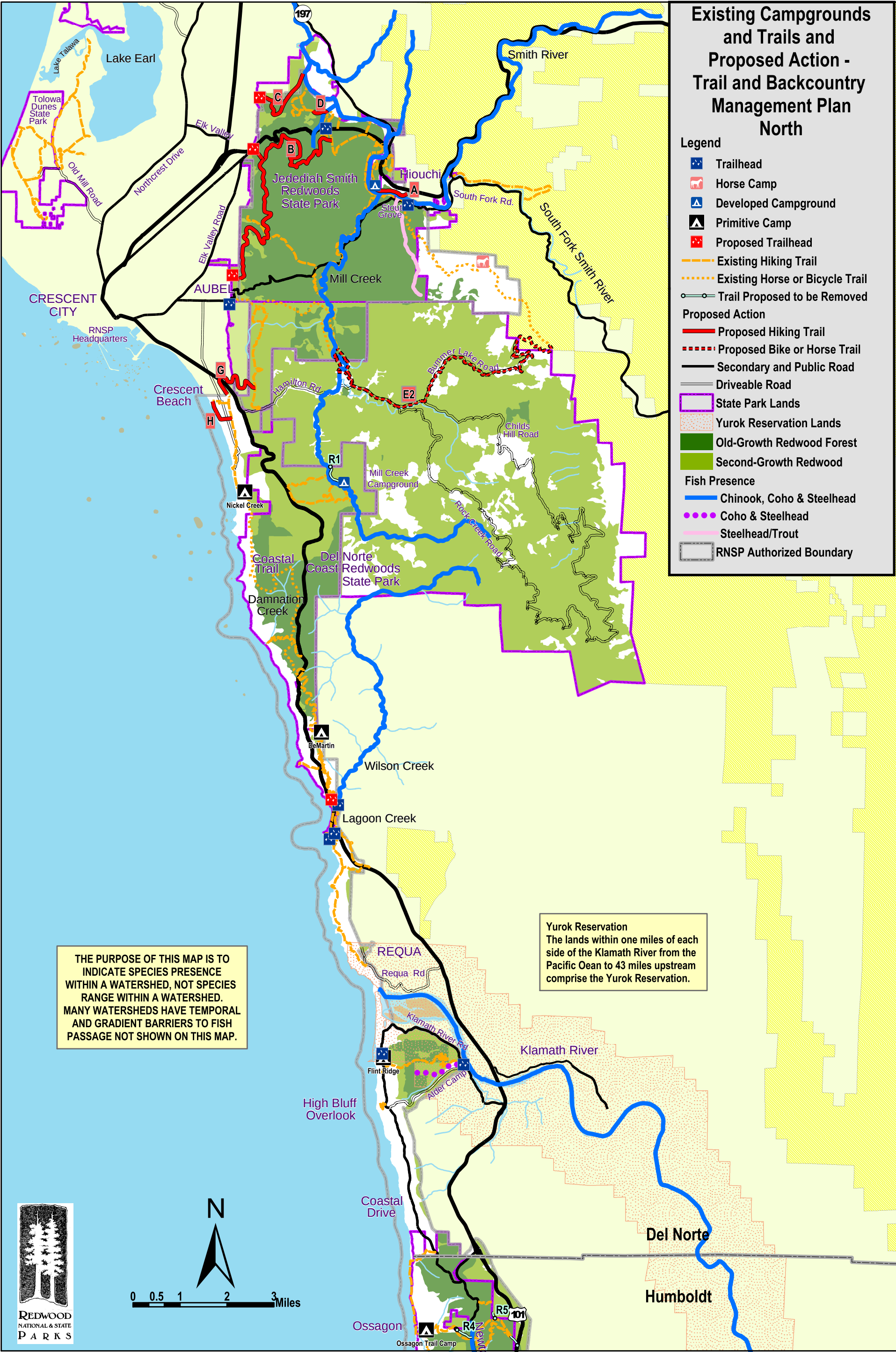
Preston, Lawrence. Associate Biologist, California Department of Fish and Game, Eureka, CA.

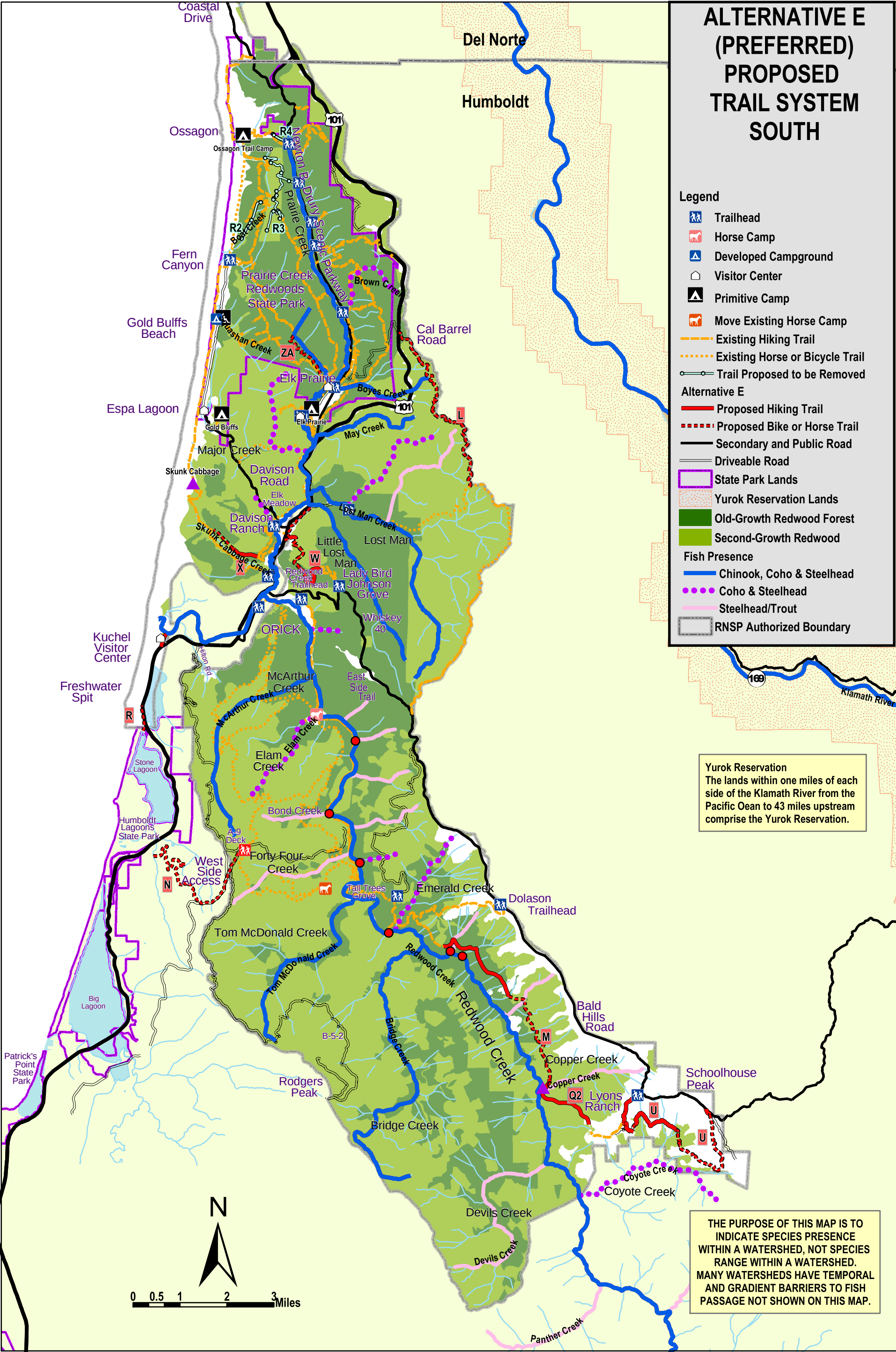
Sparkman, Michael. Bioloigist (Marine/Fisheries), California Department of Fish and Game, Arcata, CA.

Zimmerman, Christian. Research Fishery Biologist, USGS Alaska Science Center, Anchorage, AK.

Appendix 1 – Maps

**Appendix 2 – Letter to California Department of Fish and
Game Commission on request for seasonal closure of
recreational fishing along Redwood 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

SEP 17 2007

In response refer to:
2006/07504

Mr. Steve Chaney
National Park Superintendent
Redwood National Park, National Park Service
1111 Second Street
Crescent City, California 95555

Dear Mr. Chaney:

This letter transmits NOAA's National Marine Fisheries Service's (NMFS) biological opinion (Opinion) regarding the Redwood National and State Parks' Trails and Backcountry Management Plan (Plan) in accordance with section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 *et seq.*). The Opinion (enclosure 1) addresses the effects of the Plan on Southern Oregon/Northern California Coast coho salmon (*Oncorhynchus kisutch*), California Coastal (CC) Chinook salmon (*O. tshawytscha*), Northern California (NC) steelhead (*O. mykiss*), and their designated critical habitats.

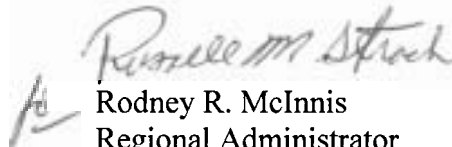
After reviewing the best available scientific and commercial information, the current status of SONCC coho salmon, CC Chinook salmon and NC steelhead, the environmental baseline for the action area, the anticipated effects of the Plan, and the cumulative effects, it is NMFS' biological opinion that the Plan, as proposed, is not likely to jeopardize the continued existence of these three species or result in the destruction or adverse modification of their designated critical habitats.

In addition, amendments to the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) require Federal agencies to consult with NMFS regarding any action or proposed action that may adversely affect Essential Fish Habitat (EFH) for Federally-managed fish species. NMFS evaluated the Plan for potential adverse effects to EFH pursuant to section 305(b)(2) of the MSFCMA (enclosure 2). The action area of the Plan includes areas identified as EFH for various life stages of Chinook salmon and coho salmon, Federally-managed under the Pacific Coast Salmon Fishery Management Plan. Based on the best available information, NMFS has determined that the Project would adversely affect EFH for various Federally-managed fish species within the Pacific Coast Salmon Fishery Management Plan. However, no EFH Conservation Recommendations are necessary.



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

Sincerely,



Rodney R. McInnis
Regional Administrator

Enclosures (2)

cc: Bruce Lynn - State Parks Superintendent, Crescent City
Keith Bensen – Fish and Wildlife Biologist, RNSP
Copy to File – ARN 151422SWR2003AR8825

Endangered Species Act - Section 7 Consultation

BIOLOGICAL OPINION

ACTION AGENCY: National Park Service

ACTIVITY: Trail and Backcountry Management Plan

**CONSULTATION
CONDUCTED BY:** Southwest Region, National Marine Fisheries Service

DATE ISSUED: September 17, 2007

I. BACKGROUND AND CONSULTATION HISTORY

From October 2002 to November 2004, technical assistance was provided by NOAA's National Marine Fisheries Service (NMFS) staff to Redwood National and State Parks (RNSP) staff regarding the proposed Trail and Backcountry Management Plan (Plan), including providing comments on draft Environmental Analyses and draft Biological Assessments (BAs), site visits, and discussions. On March 10, 2005, RNSP requested consultation on the Plan, and provided NMFS with a BA. RNSP subsequently requested that NMFS suspend the consultation while concerns about threatened and endangered terrestrial species impacts were addressed (Bensen 2006). On December 7, 2005, NMFS submitted a letter to Federal action agencies, including the RNSP, recommending that they reinstate consultations due to newly designated critical habitat for California Coastal (CC) Chinook salmon and Northern California (NC) steelhead. RNSP sent a final BA to NMFS on August 30, 2006, and NMFS received it on August 31, 2006. On September 22, 2006, NMFS sent RNSP a letter requesting additional information about critical habitat designation information in the BA. On September 29, 2006, NMFS received clarification from RNSP. On October 13, 2006, NMFS replied that all the information necessary to initiate consultation was received, and that formal consultation was initiated on October 6, 2006.

This biological opinion (Opinion) analyzes the effects of the Plan on Southern Oregon/Northern California Coast (SONCC) coho salmon, CC Chinook salmon, and NC steelhead, and their critical habitats. A complete administrative record for this consultation is on file at the Arcata Area Office of NMFS.

II. DESCRIPTION OF THE PROPOSED ACTION

The Plan includes the conversion of West Ridge Road to a trail, and restoration of Prairie Creek at the West Ridge road crossing. The Plan also includes: approximately 35.3 miles of new hiking trails, approximately 10 miles of new bike trails, 2 miles of rerouted hiking trail, almost

16 miles of new equestrian trails, the closure and restoration of approximately 3.5 miles of existing trail, the complete removal of approximately 5 miles of existing trail/road, 5 new trailheads, 2 redesigned trailheads, 2 new backcountry camps, the retrofit of an existing backcountry camp for increased accessibility, the retrofit and relocation of one backcountry horse camp for increased accessibility, the opening of a portion of the West Side Access Road to the public, the seasonal closure of two trail fords across Mill Creek, a new visitor education emphasis on the impacts of harassing spawning fish, and continued but modified issuing of backcountry permits to all visitors staying overnight in the backcountry. A complete description of the Plan can be found in the BA, as well as detailed descriptions of measures proposed to minimize impacts to listed salmonids during trail construction, closure, and conversion, trailhead construction and redesign, and backcountry camp construction, relocation, and retrofitting. The Plan will be implemented through December 31, 2017 (Bensen 2007).

The following measures will be taken to avoid impacts to listed salmonids during implementation of the Plan, where applicable.

- a. Equipment, both hand tools and heavy equipment, will be inspected daily to check for leaks. Equipment that may leak lubricants or fuels into drainage will not be used. All equipment will be stored, serviced, and fueled outside of riparian areas and away from stream crossings. Heavy equipment will be cleaned (*e.g.*, power washed, steam cleaned) prior to use below the ordinary high water mark.
- b. Petroleum products, chemicals, fresh cement, deleterious materials, or water contaminated by the aforementioned will not be allowed to enter flowing waters.
- c. Spill plans and materials for containment systems will be onsite and inside construction equipment, available to onsite personnel, and personnel will be trained in their use. In the event of a spill, work will be stopped immediately, clean up will begin and the appropriate authorities will be notified.
- d. Activities within the 5-year floodplain will not begin until all temporary erosion controls are in place downslope of the activities. Measures include, but are not limited to, using silt fences and hay bales that are effectively keyed in, and winterizing stockpiles. Erosion control structures will be maintained throughout construction, and possibly for some time after construction if deemed necessary by a RNSP earth scientist. If it is not possible to construct a trail, trailhead, or campsite, or install a trail bridge with sufficient time for natural revegetation to occur before the onset of the rainy season, standard erosion control methods will be used for all exposed soils caused by the construction, such as scattering certified weed free straw, duff, and tree branches, installing silt fences, and replanting. Newly disturbed soils at trailheads and campsites will be compacted within the parking areas (trailheads) or campsites, or revegetated within the campsites.
- e. Newly disturbed soils will be compacted along the trail tread while other disturbed soil areas will be covered with local duff or small pieces of vegetation removed during construction to reduce erosion. Either full bench cuts will be utilized near streamcourses to create trail treads and all material removed will be exported by hand out of the inner gorge area and placed and

compacted in stable locations, or crib walls will be constructed to stabilize any fill within the inner gorge area. Drainage structures (*i.e.*, outsloped treads, waterbars, *etc.*), slope stabilizing features (*e.g.*, retaining walls) and regular maintenance will ensure that no new trail will fail and cause sediment to enter a stream. Trail drainages will be routed away from potentially unstable channels, fills, and hillslopes.

- f. There will be no major changes in natural topography due to trail construction. The majority of trails will be laid out along a contour or routed to avoid extremely steep slopes to achieve a reasonable grade and to avoid slope failure. Switchbacks or climbing turns will be used to make changes in trail elevation through areas confined by steep drainages, unstable soils, dense second growth forests, or other physical features that must be avoided. Small (less than 6 feet tall), native rock or log retaining walls or other soil retaining structures will be built where a trail must traverse steep side slopes, where parent soils are unstable, where trail structures require footings and abutments, or where the trail passes under trees and the trail tread is built up to protect roots and maintain grade. These small structures will be located on side slopes away from stream courses.
- g. Trail bridges will be constructed across small perennial streams where banks are too steep or the stream is too wide for safe access or crossing. Trail bridges will be constructed to span the entire active stream channel with the deck well above the 100-year flood zone. No newly-constructed trail bridges are expected to be susceptible to flooding. All of the perennial streams to be crossed by bridges are smaller order streams usually located in steep channels, which means that all proposed bridges will be well out of the flood zone of each stream. No abutments will be placed within any active stream channels. Abutments for most RNSP trail bridges are 10 to 12 feet wide. Generally, abutments will be made of concrete, but in more remote locations, they will be made of wood or rock. No chemically-treated wood will be used in any abutments. Bridges or boardwalks will also be built across any perennially wet areas that cannot be avoided by the trail route. Fords may be constructed on streams and armored so that bank erosion is minimized. The footbridge for the Lieffer-Ellsworth-Peterson Trail Connector (Trail D) will be built across lower Clark's Creek outside of the spawning season (Benson 2006a).
- h. All restoration work will be done when soils have fully dried, and no construction or ground-disturbing work will occur when soils are saturated.
- i. RNSP geologists will identify and map all streams, springs, seeps, steep slopes and other unstable areas, and avoid them when placing fill. The geologist on-site during project implementation will ensure that the contractor is fully aware of potential unstable areas and any wet soil conditions, and also ensure that the final fill, if placed by the excavator, will be limited to stable locations. RNSP will leave a free-draining (gently sloped) bench downslope of areas that might fail in order to catch mobilized material and ensure that any fillsite failures would not contribute sediment into live streams.
- j. The stream crossing excavation will be limited to September 16 to October 14. The site will be dewatered, and a RNSP fisheries biologist will be involved in the timing of the excavation to ensure that the stream is not dewatered when any salmonid eggs or alevin are present.

- k. If more than 0.5 inches of rain is forecast within 2 days, construction will temporarily cease and the site will be winterized. Winterization procedures will be supervised at all times by RNSP geologists, and include: smoothing unfinished surfaces to allow water to freely drain across them without concentrating or ponding; compacting unfinished surfaces with an excavator bucket or similar tool where concentrated runoff may flow (*e.g.*, the bottoms of small stream channels) to minimize surface erosion and the formation of rills; and installation of culverts, silt fences and other erosion control devices where necessary to convey concentrated water across unfinished surfaces, and trap eroded sediment before it leaves the work site.
- l. If the RNSP watershed restoration geologist determines that windows of dry weather are predicted beyond October 14 and there are small additional work items, or repairs needed to reduce risks from active erosion, that can be completed within the predicted window, then work may continue. RNSP will have all erosion control materials necessary to winterize each work site within 24 hours for all work occurring after October 14. RNSP will monitor weather forecasts daily after October 14 to determine when wet weather conditions are likely and when to cease operations for the year.
- m. Proposed treatments in riparian areas on fish-bearing and non fish-bearing streams that lead immediately into fish-bearing streams will be reviewed to determine effects on fish by an interdisciplinary team prior to implementation. The team will include a RNSP geologist and fishery biologist.
- n. All streams with surface flow capable of transporting sediment will be diverted around stream crossing removal sites before excavation commences. The diverted flows will be returned to their natural streamcourses as soon as restoration is complete and prior to October 15. Any turbid wastewater from project activities and dewatering will be disposed of off-site in a location that will not drain directly into a stream channel or carry sediment-laden water into a stream channel. Disruption of natural hydrologic flow paths, including diversion of streamflow and interception of surface and subsurface flows, will be minimized during all excavation.
- o. Listed salmonids in a project site will be removed prior to and during streamflow diversion and dewatering associated with stream crossing excavation, and relocated to a suitable location immediately up or downstream of the work area. Fish relocation will be performed by a qualified fisheries biologist who is familiar with identification and handling of all life stages of listed salmonids. All efforts will be taken to neither exhaust nor kill listed salmonids during collection and relocation. Capture will be made with nets. If netting is unsuccessful, electroshocking will be employed following NMFS' Guidelines for Electrofishing Waters Containing Salmonids Listed Under the Endangered Species Act (NMFS 2000). Records of how many fish were moved and any mortalities will be recorded and reported to NMFS. Copies of the restoration reports concerning the road-to-trail conversion work and subsequent watershed restoration, final fill volumes moved, pre- and post-photo monitoring of the crossing excavation, and estimates of the size and delivery of

any voids or surface erosion found after the first two rainy seasons will be provided in annual reports to NMFS.

- p. For all stream dewatering that requires pumping, pumps will be placed in flat areas as far from the stream channel as feasible, and will be secured by tying off to a tree or stake. Refueling of pumps will occur well outside of the active channel in a flat area and fuel absorbent mats will be placed under the pumps. All pumping will be accomplished in accordance with NMFS' Water Drafting Specifications (NMFS 2001).

A. Watershed Restoration

The West Ridge Road/Butler Creek Trail is an old logging road built before acquisition by the California Department of Parks and Recreation. A 0.6-mile long portion of the West Ridge Road to be converted to a trail and restored is partly within anadromous salmonid habitat in the Prairie Creek watershed (a third order tributary of Redwood Creek). This portion contains one culvert with a relatively small amount of fill across an anadromous salmonid section of upper mainstem Prairie Creek, which will be removed with the rest of the road section, and will require rehabilitation.

Road-to-trail rehabilitation involves completely excavating one culvert, restoring natural contours and landforms along road corridors by retrieving sidecast fill, uncovering buried topsoil and wood, spreading woody debris on finished surfaces and replanting with native species. A small portion of the road prism (approximately 5-feet wide) is left upon which a trail tread will be placed. The trail tread is located on the cutbench of the former road in order to create a stable tread. In addition, armored approaches or small foot bridges will be installed across the stream at the uphill, upstream portion of the existing crossing structure. Experienced heavy equipment contractors will be employed, and a watershed restoration geologist will be present on-site during excavation work to make adjustments to excavation design, as necessary, and to ensure resource protection and quality control.

Prairie Creek will be diverted around the excavation area. Water will be kept flowing through the culvert as long as possible. The culvert will be removed section by section, as the excavator works its way up the channel; thus, water will only be allowed to flow on the finished stream channel excavation, and not on partially excavated areas. When the excavation nears the upstream end, water will flow across a partially excavated area for a brief period while the excavation of the top of the crossing is completed. A wide area (50-100 yards) at the site can be used for equipment to move in. The crossing consists of an approximately 4-foot pipe under a flat section of unpaved road. The maximum depth of the fill is no more than 10 feet.

In order to minimize disturbance to the buried natural stream channel armor, heavy equipment will excavate down to the top of the armor layer. Unearthed large woody debris (LWD) will be placed in the channel and in areas adjacent to streams to minimize surface erosion, contribute to organic debris in the soil, to supplement the natural sediment-trapping function of the existing woody debris, and provide habitat for riparian vegetation and invertebrates that live in it, which provide allochthonous nutrients to fish. Measures a-e and h-p, above, will be implemented during this activity.

B. Action Area

The action area includes “all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action” (50 CFR 402.02). The action area for the Plan includes approximately 105,516 acres, which consists of all of RNSP, located along the northern California coast. These lands encompass numerous tributaries within the Redwood Creek and Smith River Basins, and several non-anadromous salmonid coastal streams on the west side of the Coast Range.

III. STATUS OF THE SPECIES AND CRITICAL HABITAT

SONCC coho salmon, CC Chinook salmon, NC steelhead, and designated critical habitats for these three species occur in the action area and may be affected by the Plan.

Table 1 presents a summary of the *Federal Register* (FR) Notice dates and citations, and geographic distributions for these species and critical habitat. This section summarizes the status of critical habitat, and species’ life history and population trends at the Evolutionarily Significant Unit (ESU) scale, and in the case of NC steelhead, at the Distinct Population Segment (DPS) scale. Abundance and distribution information, along with a description of designated critical habitat in the action area, is provided in the *Environmental Baseline* section.

A. Critical Habitat

This Opinion analyzes the effects of the proposed action on designated critical habitats for SONCC coho salmon, CC Chinook salmon, and NC steelhead.

Critical habitat is defined as the specific areas within the designated geographical areas occupied by the species, at the time it is listed, on which are found those physical and biological features essential to the conservation of the species and which may require special management considerations or protection, or specific areas outside the geographical area occupied by the species at the time it is listed when the Secretary determines that such areas are essential for the conservation of listed species.

The ESA defines conservation as “to use all methods and procedures which are necessary to bring any endangered species or threatened species to the point at which the measures provided pursuant to the ESA are no longer necessary.” As a result, NMFS approaches its “destruction and adverse modification” determinations by examining the effects of actions on the conservation value of the designated critical habitat, that is, the value of the critical habitat for the conservation of threatened or endangered species.

1. SONCC Coho Salmon Designated Critical Habitat

Designated critical habitat for SONCC coho salmon encompasses all accessible reaches of rivers (including estuarine areas and tributaries) between the Elk River in Oregon and the Mattole River in California, inclusive. This designation includes all waterways, substrate, and adjacent riparian zones. Excluded are areas: (1) above specific dams identified in the FR notice; (2) above longstanding, natural impassable barriers (*i.e.*, natural waterfalls in existence for at least several hundred years); and (3) tribal lands.

Table 1. The scientific name, listing status under the Endangered Species Act (ESA), FR notice citation, and geographic distribution of the ESUs and DPS addressed in this Opinion.

	SONCC Coho Salmon ESU	NC Steelhead DPS	CC Chinook Salmon ESU
Scientific Name	<i>Oncorhynchus (O.) kisutch</i>	<i>O. mykiss</i>	<i>O. tshawytscha</i>
Listing Status	Threatened	Threatened	Threatened
<i>Federal Register Notice</i>	June 28, 2005 (70 FR 37160)	ESU listed on June 7, 2000 (65 FR 36074) Relisted as a DPS on January 5, 2006 (71 FR 834)	June 28, 2005 (70 FR 37160)
Geographic Distribution	from Cape Blanco, Oregon, to Punta Gorda, California	from Redwood Creek (Humboldt County), southward to, but not including, the Russian River	from Redwood Creek (Humboldt County) south to, and including, the Russian River
Critical Habitat Designation	May 5, 1999 (64 FR 24049)	September 2, 2005 (70 FR 52488)	September 2, 2005 (70 FR 52488)

The species' life cycle can be separated into five essential habitat types: (1) juvenile summer and winter rearing areas; (2) juvenile migration corridors; (3) areas for growth and development to adulthood; (4) adult migration corridors; and (5) spawning areas. Essential habitat types 1 and 5 are often located in small headwater streams, while essential habitat types 2 and 4 include these tributaries as well as mainstem reaches and estuarine zones. Growth and development to adulthood (essential habitat type 3) occur primarily in near- and off-shore marine waters, although final maturation takes place in freshwater when the adults return to spawn (May 5, 1999, 64 FR 24049). Habitat requirements of the species include: (1) space for individual and

population growth, and for normal behavior; (2) food, water, air, light, minerals, or other nutritional or physiological requirements; (3) cover or shelter; (4) sites for spawning and rearing; and (5) habitats protected from disturbance, or are representative of the historic, geographical, and ecological distributions of this species. Known physical and biological features essential to the conservation of the species also include food resources, water quality and quantity, and riparian vegetation (May 5, 1999, 64 FR 24049). Other elements include safe and accessible passage conditions, streambank stability, and large wood inputs.

Current condition of critical habitat for SONCC coho salmon is discussed in the “Factors Affecting the Species and Critical Habitat” section, below.

2. CC Chinook Salmon and NC Steelhead Designated Critical Habitat

Designated critical habitats for CC Chinook salmon and NC steelhead include the stream channels within the stream reaches, and a lateral extent as defined by the ordinary high-water line (33 CFR 329.11), from Redwood Creek (Humboldt County) south to the Russian River. In areas where the ordinary high-water line has not been defined pursuant to 33 CFR 329.11, the lateral extent will be defined by the bankfull elevation. Bankfull elevation is the level at which water begins to leave the channel and move into the floodplain, and is reached at a discharge which generally has a recurrence level of 1 to 2 years on the annual flood series. Critical habitat in estuaries is defined by the perimeter of the water body as displayed on standard 1:24,000 scale topographic maps or the elevation of extreme high water, whichever is greater.

In designating critical habitat, NMFS focuses on the known primary constituent elements (PCEs) essential for the conservation of the species. 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 and NC steelhead critical habitats 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 (September 2, 2005, 70 FR 52488).

B. Species Life History and Population Trends

1. Coho Salmon

a. General Life History

In contrast to the life history patterns of other Pacific salmonids, coho salmon generally exhibit a relatively simple 3-year life cycle. Coho salmon river entry timing is influenced by many factors, one of which appears to be river flow. Bjornn and Reiser (1991) found that most spawning activity occurs in fourth- and fifth-order streams, and Nickelson *et al.* (1992) found that spawning occurs in tributary streams with a gradient of 3 percent or less. Spawning occurs in clean gravel ranging in size from that of a pea to that of an orange (Nickelson *et al.* 1992), and is concentrated in riffles or in gravel deposits at the downstream end of pools with suitable depth and velocity (Weitkamp *et al.* 1995).

Coho salmon eggs incubate for approximately 35-50 days, and 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. As coho salmon fry grow, they disperse to establish and defend territories (Hassler 1987). Juvenile rearing usually occurs in tributary streams with a gradient of 3 percent or less, although they may move up to streams of 4 percent or 5 percent gradient. Juveniles have been found in streams as small as 3 to 6 feet wide. At a length of 1.5-1.75 inches, fry may migrate upstream a considerable distance to reach lakes or other rearing areas (Godfrey 1965 *op. cit.* Sandercock 1991, Nickelson *et al.* 1992). Coho salmon fry are most abundant in backwater pools during spring. During the summer, coho salmon fry prefer pools featuring adequate cover such as LWD, undercut banks, and overhanging vegetation. Juvenile coho salmon prefer to over-winter where there are velocity refuges in large mainstem pools, backwater areas and secondary pools with LWD, and undercut bank areas (Hassler 1987, Heifetz *et al.* 1986). The ideal rearing habitat for maximum coho salmon smolt production would have shallow depth (3-24 inches), fairly swift mid-stream flows (2 feet/second), numerous marginal back-eddies, narrow width, copious overhanging mixed vegetation, and banks permitting hiding places (Mundie 1969). Juvenile coho salmon are carnivorous opportunists that primarily eat aquatic and terrestrial insects (Sandercock 1991).

Coho salmon rear in freshwater for up to 15 months, then migrate to the sea as smolts between March and June (Weitkamp *et al.* 1995). Growth is very rapid once the smolts reach the estuary (Fisher *et al.* 1984 *op. cit.* Sandercock 1991). Coho salmon spend only a short time in the estuary before entering the ocean (Nickelson *et al.* 1992). Coho salmon typically spend two growing seasons in the ocean before returning to their natal streams to spawn as 3 year-olds. Precocious males, called "jacks," return to spawn after only 6 months at sea.

b. Range-wide (ESU) Status and Trends of SONCC Coho Salmon

All SONCC coho salmon ESU stocks are depressed relative to past abundance, and there are limited data to assess population numbers or trends (Good *et al.* 2005). Available historical and recent published coho salmon abundance information is summarized in the NMFS coast-wide status review (Weitkamp *et al.* 1995) and more recent update by Good *et al.* (2005).

An analysis of the occurrence of coho salmon in streams within the SONCC ESU historically known to support populations was done with data from 1987-1991 (Brown *et al.* 1994). Of 115 historical streams in the SONCC coho salmon ESU for which recent data were available, 63 percent were determined to still support coho salmon, and coho salmon were believed to have been lost from 37 percent. NMFS (1996) presented more recent data (1995-1996) that suggest a lower percentage of streams still supporting coho salmon than estimated by Brown *et al.* (1994). Of 176 streams in the SONCC coho salmon ESU, 52 percent were found to still support coho salmon.

The rivers and tributaries in the California portion of this ESU were estimated to have average recent runs of 7,080 natural spawners and 17,156 hatchery returns, with 4,480 identified as native fish occurring in tributaries having little history of supplementation with non-native fish. Combining recent run-size estimates for the California portion of this ESU with Rogue River

estimates provides a rough minimum run-size estimate for the entire ESU of about 10,000 natural fish and 20,000 hatchery fish (Weitkamp *et al.* 1995).

Schiewe (1997) reported that data on presence/absence in northern California streams that historically supported coho salmon indicated that a smaller percentage of streams in the ESU contained coho salmon compared to the percentage presence in an earlier study by Brown *et al.* (1994, table 2).

Table 2. Summary statistics of historical and current presence-absence data for coho salmon from the California portion of the SONCC ESU.

Area	Percent of streams with coho salmon present	
	Brown <i>et al.</i> (1994)	New data (refer to Schiewe 1997 for data sources used)
Del Norte County	55	46
Humboldt County	69	55
Total	63	52

California Department of Fish and Game (CDFG 1994) summarized most information for the California portion of this ESU. It concluded that coho salmon in California, including hatchery populations, could be less than 6 percent of their abundance during the 1940s, and have experienced at least a 70 percent decline in the 1960s. Further, it reported that coho salmon populations have been virtually eliminated in many streams. The loss of brood cycles also can contribute to further declines. In some coastal California streams, coho salmon only occur every third year, indicating the loss of 2 years worth of runs (CDFG 1994).

Higgins *et al.* (1992) characterized the extinction risk for anadromous fish runs in many streams in northwestern California. Within the SONCC coho salmon ESU, they listed eight watersheds containing coho salmon stocks of concern, and three watersheds with coho salmon stocks at high risk of extinction. Wilson Creek and Redwood Creek, within the project area, were listed as having coho salmon stocks of concern.

A more recent status update (Good *et al.* 2005) indicated a continued low abundance with no apparent trends in abundance and possible continued declines in several California populations. Based on the very depressed status of current coho salmon populations, as well as insufficient regulatory mechanisms and conservation efforts over the ESU as a whole, NMFS concluded that the ESU was likely to become endangered in the foreseeable future (June 28, 2005, 70 FR 37160).

2. Chinook Salmon

a. General Life History

Two generalized freshwater life-history types were described by Healey (1991): "stream-type" Chinook salmon reside in freshwater for a year or more following emergence, whereas "ocean-type" Chinook salmon migrate to the ocean within their first year, although yearling smolts do occur. Both life-history types are present in the CC Chinook salmon ESU, but the "ocean-type" is most prevalent.

Chinook salmon mature between 1 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).

Run timing for fall-run Chinook salmon varies depending on the size of the river, and when it is accessible from the ocean. Adult Eel River fall-run Chinook salmon return to freshwater in August and September and spawn in late October and early November (NMFS 1997). In other coastal rivers, fall-run freshwater entry begins later in October, with peak spawning in late November and December, often extending into January (Nicholas and Hankin 1989). This latter run-timing describes Chinook salmon in Redwood Creek.

The length of time required for Chinook salmon eggs to develop and hatch is dependent on water temperature and is quite variable, typically ranging from 3-5 months. The optimum temperature range for egg incubation is 45-54°F (Rich 1997). Incubating eggs show reduced egg viability and increased mortality at temperatures greater than 57°F, and show 100 percent mortality for temperatures greater than 63°F and less than 36°F before the eyed stage (CDFG 1998, Velson 1987). Emergence of Chinook salmon fry begins in December and continues into mid-April (Bell 1990, Leidy and Leidy 1984). Emigration of Chinook salmon in Klamath River system tributaries begins in February, and continues through mid-June. Chinook salmon exhibit a variety of life history strategies, which vary in length of time rearing in mainstem riverine reaches of coastal rivers and in estuaries, and in length of rearing time in freshwater and in the estuary (Nicholas and Hankin 1989). Ocean-type Chinook salmon reside in estuaries for longer periods as fry and fingerlings than do with yearling, stream-type, Chinook salmon smolts (Healey 1991, Kjelson *et al.* 1982, Reimers 1973.). Ocean-type juveniles enter saltwater during one of three distinct phases. "Immediate" fry migrate to the ocean soon after yolk resorption at 30-45 mm in length (Healey 1991, Lister *et al.* 1971). When environmental conditions are not conducive to subyearling emigration, ocean-type Chinook salmon may remain in freshwater for their entire first year. In most river systems, however, fry migrants, which migrate at 60-150 days post-hatching, and fingerling migrants, which migrate in the late summer or autumn of their first year, represent the majority of ocean-type emigrants.

Post-emergent fry seek out shallow, nearshore areas with slow current and good cover, and begin feeding on small insects and crustaceans. Fry use woody debris, interstitial spaces in cobble substrates, and undercut banks as cover (Everest and Chapman 1972). As they grow to 2-3 inches in length, the juvenile salmon move out into deeper, swifter water, but continue to use

available cover to minimize the risk of predation and reduce energy expenditure. The optimum range for rearing Chinook salmon fry is 50-55°F and for fingerlings, 55-61°F (Rich 1997).

b. Range-Wide (ESU) Status and Trends of CC Chinook Salmon

Available historical and recent published Chinook salmon abundance information are summarized in Myers *et al.* (1998). The following are excerpts from this document:

"Estimated escapement of this ESU was estimated at 73,000 fish, predominantly in the Eel River (55,500) with smaller populations in Redwood Creek, Mad River, Mattole River (5,000 each), Russian River (500), and several small streams in Del Norte and Humboldt Counties.

Data available to assess trends in abundance are limited. Recent trends have been mixed, with predominantly strong negative trends in the Eel River Basin, and mostly upward trends elsewhere. Previous assessments of stocks within this ESU have identified several stocks as being at risk or of concern. Nehlsen *et al.* (1991) identified Redwood Creek, Mad River, and Eel River stocks as stocks of concern. The Russian River stock was found by U.S. Fish and Wildlife Service (USFWS) to be extinct."

Observed widespread declines in abundance and the present distribution of small populations with sometimes sporadic occurrences contribute to the risks faced in this ESU. This is particularly true for spring-run Chinook salmon. It is possible that Russian River and spring-run Chinook salmon in the ESU may have been extirpated. Low abundance, generally negative trends in abundance, reduced distribution, and profound uncertainty as to risk related to the relative lack of population monitoring in California, have contributed to NMFS' outlook for CC Chinook to be at risk of becoming endangered in the foreseeable future throughout all or a significant portion of their range (September 16, 1999, 64 FR 50394; Good *et al.* 2005).

Historical and current information indicate that populations are depressed in basins where they are being monitored (Good *et al.* 2005). Uncertainty about abundance, natural productivity, introduction of hatchery fish, and distribution continues to substantially contribute to risks facing this ESU. Concerns about current abundances relative to historical abundances, mixed trends in the few time series available, and potential extirpations in the southern part of the range contributed to the majority of the Biological Review Team's (BRT) assessment as "likely to become endangered in the foreseeable future" (Good *et al.* 2005).

3. Steelhead

a. General Life History

Biologically, steelhead can be divided into two basic run-types, based on the state of sexual maturity at the time of river entry and duration of spawning migration (Burgner *et al.* 1992 *op. cit.* Busby *et al.* 1996). In the Pacific Northwest, steelhead that enter the river between May and October are termed summer steelhead, and steelhead that enter the river between November and April are termed winter steelhead. 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 relatively shortly after river entry (Barnhart 1986). Adams (2000) determined that winter and summer-run steelhead within a geographic area are typically more genetically similar to each other than either is to populations with similar run timings in different geographic areas. The BRT recognized, however, that there was some degree of reproductive isolation between winter and summer-runs. 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), and the Mattole River (Downie *et al.* 2002, in addition to the winter runs present in these basins. Adult summer steelhead are much less numerous than winter steelhead, are not abundant in any stream, and the run in most streams is very low (Busby *et al.* 1996). Gerstung (2001) believes only 20 streams in northern California are inhabited by summer steelhead.

Summer steelhead overwinter in the larger rivers, and resume migration in early spring to early summer toward natal streams in a sexually immature state, holding in deep pools during summer and fall that offer enough complexity and cold temperatures for them to survive through the summer's high temperatures and low flows. During this time, they are vulnerable to disturbance, heat stress, and predation. Summer steelhead from the Eel River are known to prefer cold deep pools 10 to 20 feet deep (Cannata *et al.* 2006) and water temperatures less than 66°F (Cannata *et al.* 2006), as well as ample cover. They spawn in December to February (Barnhart 1986, Meehan and Bjornn 1991, Nickelson *et al.* 1992), further upstream than winter steelhead in headwaters or smaller tributaries (Nickelson *et al.* 1992), and they remain spatially segregated from winter steelhead by occupying habitat not fully utilized by winter steelhead (Behnke 1992, Withler 1966).

Winter steelhead enter freshwater between November and April in the Pacific Northwest (Busby *et al.* 1996, Nickelson *et al.* 1992), migrate to spawning areas, and then spawn (Barnhart 1986). Some adults do not enter coastal streams until spring, just before spawning (Meehan and Bjornn 1991). Cover elements are required to reduce disturbance and predation of spawning steelhead (Giger 1973 *op. cit.* Bjornn and Reiser 1991). Steelhead spawn in cool, clear streams with a minimum depth of 7 inches, water velocity of 1-3 feet/second (Smith 1973, Thompson 1972), clean substrate 0.25-4 inches, gradient generally 3-5 percent (Nickelson *et al.* 1992), and water temperature of 39-49°F (Bell 1990). Intermittent streams may be used for spawning (Barnhart 1986, Everest 1973).

There is a high degree of overlap in spawn timing between populations within an ESU regardless of run type (Busby *et al.* 1996). Difficult field conditions at that time of year (January to February for summer steelhead, or April to May for winter steelhead), and the remoteness of spawning grounds contribute to the relative lack of specific information on steelhead spawning.

Unlike Pacific salmon, steelhead are iteroparous (Busby *et al.* 1996), but it is rare for steelhead to spawn more than twice before dying, and most that do so are females (Nickelson *et al.* 1992). Steelhead are known to complete up to four spawning migrations (Barnhart 1986, Hopelain 1998 *op. cit.* Cannata *et al.* 2006). Iteroparity is more common among southern steelhead populations than northern populations (Busby *et al.* 1996).

Depending on water temperature, steelhead eggs may incubate for 1.5-4 months before hatching, generally between February and June (Bell 1990). After 2 to 3 weeks following yolk sac absorption in late spring, alevin emerge from the gravel and begin actively feeding. Fry usually inhabit shallow water along banks of perennial streams (Nickelson *et al.* 1992). Older fry establish and defend territories. Initial rearing of juvenile steelhead generally takes place in small, moderate-gradient tributary streams (Nickelson *et al.* 1992). Summer rearing takes place primarily in the faster parts of pools, with young-of-the-year (YOY) migrating very little, abundant in glides and riffles, and commonly in habitats with cobble and boulder bottoms. Winter rearing occurs 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). Rearing juveniles prefer water temperatures ranging from 54-59°F (Reeves *et al.* 1987). Juvenile steelhead feed on a wide variety of 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. 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). Steelhead typically reside in marine waters for 2 years prior to returning to their natal stream to spawn. For coastal steelhead in Washington, Oregon, and northern California, the modal total age at maturity is 4 years, as they enter freshwater before spawning (Busby *et al.* 1996).

Some steelhead return to freshwater in a sexually immature state, after only 2 to 4 months in the ocean and are termed "half-pounders" (Snyder 1925). Half-pounders generally spend the winter in freshwater and then outmigrate again the following spring for several months before returning to freshwater to spawn. Half-pounders occur over a relatively small geographic range in northern California, and are only reported in the Klamath, Mad, and Eel Rivers (Barnhart 1986, Kesner and Barnhart 1972, Snyder 1925) and Redwood Creek (Cannata *et al.* 2006).

b. Range-Wide (DPS) Status and Trends of NC Steelhead

The BRT concluded that NC steelhead was not presently in danger of extinction, but that it is likely to become endangered in the future (Busby *et al.* 1996).

There is a notable lack of quantitative information on NC steelhead, but there are a few survey index estimates of stock trends. Most data come from fish counts from the 1930s and 1940s at three dams: Sweasey Dam on the Mad River (annual average 3,800 in the 1940s), Cape Horn Dam on the upper Eel River (4,400 annual average in the 1930s), and Benbow Dam on the South Fork Eel River (18,784 annual average in the 1940s; Murphy and Shapovalov 1951 *op. cit.* Busby *et al.* 1996; Shapovalov and Taft 1954). This can be compared to the annual average at Sweasey Dam at 2,000 in the 1960s, annual average at Cape Horn Dam in the 1980s at 1,000, and annual average at Benbow Dam at 3,355 in the 1970s (McEwan and Jackson 1996, Busby *et al.* 1996). In the mid-1960s, CDFG estimated steelhead spawning in many rivers in this ESU to total about 198,000 (McEwan and Jackson 1996).

The most abundant run is in the Middle Fork of the Eel River, with about 2,000 fish in 1996 (McEwan and Jackson 1996). Substantial declines from historical levels at major dams has indicated a probable decline from historical levels at the DPS scale.

Adams (2000) concluded that the status of the population had changed little since the 1996 status review. Based on this and a lack of implementation of State conservation measures, NMFS concluded that the NC steelhead ESU warranted listing as a threatened species (June 7, 2000, 65 FR 36074). Information on steelhead abundance estimates is summarized in the most recent NMFS west coast steelhead status reviews (Good *et al.* 2005). The BRT made a few conclusions, albeit with limited data: (1) population abundances are low, compared to historical estimates; (2) recent trends are downward (except for a few small summer-run stocks), and (3) summer-run steelhead abundance was “very low” (Good *et al.* 2005). Lack of data on run sizes within the DPS was a major source of uncertainty that the BRT had to contend with in its assessment.

C. Factors Affecting the Species and Critical Habitat

Salmonids on the west coast of the United States have experienced declines in abundance in the past several decades as a result of loss, damage or change to their natural environment. Studies indicate that in most western states, about 80-90 percent of the historic riparian habitat has been eliminated (Norse 1990, California State Lands Commission 1993). Loss of habitat complexity and habitat fragmentation have also contributed to the decline of salmonids. The California Advisory Committee on Salmon and Steelhead Trout (1988) reported habitat blockages from culverts and other instream structures, fragmentation, logging and agricultural activities, urbanization, and water withdrawals as the most predominant problems for anadromous salmonids in each major river system in California. Other habitat problems attributed to salmonid declines in California include placer and hydraulic mining, dam construction, water development, and road construction (Mills *et al.* 1997). Excessive sedimentation and unstable spawning gravels are also cited as major habitat problems in the region (Busby *et al.* 1996).

Since the 1980s and 1990s, effort has been focused on restoring freshwater habitat for listed salmonids across the ESUs and DPS, especially on Federal lands. Hundreds of miles of roads have been removed and weather-proofed, reducing active erosional sources and the risk of sediment inputs to downstream habitat. In addition, miles of instream habitat have been improved with the introduction of large wood or boulders, and hundreds of culverts have been upgraded to allow for fish passage at all life history stages, increasing the amount of accessible habitat. Thus, NMFS believes that the condition of designated critical habitats has improved since the 1990s, especially on Federal lands.

For more detailed discussions on factors for decline of SONCC coho salmon, refer to Weitkamp *et al.* (1995) as updated by Schiewe (1997) and CDFG (2002). Factors causing NC steelhead declines are described in Busby *et al.* (1996). Factors influencing CC Chinook salmon are discussed in Myers *et al.* (1998).

D. Summary of Status of the Species

To summarize the status of the species, we use the concept of viable salmonid populations (VSP) and the parameters for evaluating populations described by McElhany *et al.* (2000), which are population size, population growth rate, spatial structure, and diversity.

1. VSP Parameters

a. Population Size

In general, smaller populations face a host of risks intrinsic to their low abundance levels. A review of the status of the three listed species (Good *et al.* 2005) indicates that populations have declined well below historic levels. A host of factors have been responsible for these declines.

b. Population Growth Rate

The most recent data indicate continued declines in several populations of California populations of SONCC coho salmon and no apparent trends in the other SONCC coho salmon populations. Trends in NC steelhead populations show a preponderance of declines. The potential increases in NC steelhead populations are unclear, with introduced hatchery fish and increased monitoring efforts contributing to the uncertainty of the results. Information on CC Chinook salmon suggests mixed trends in populations. Recently improved ocean conditions likely factor into recently observed increases in abundance, but the persistence of this trend is unknown.

c. Population Spatial Structure

Recent information for SONCC coho salmon indicates that their range continues to shrink, as evidenced by an increasing number of previously occupied streams (CDFG 2002). Despite the declines noted for NC steelhead populations, available information does not indicate a collapsing spatial structure. However, the continuing declines may portend a reduction in spatial structure and the limited monitoring conducted to date is not sufficient to detect this. Data for CC Chinook salmon indicate that many of the populations are small and occur sporadically. This raises concern over the future stability of the spatial structure of this ESU.

d. Diversity

The primary factors affecting the diversity of SONCC coho salmon appear to be the influence of hatcheries and out-of-basin introductions, and reduced range of occupied habitat types. In addition, some brood years have abnormally low abundance levels or may even be absent in some areas, further restricting the diversity present in the ESU. For NC steelhead, low populations of summer steelhead and the influence of hatchery introductions threaten the diversity of this DPS. Little information exists on the current diversity of CC Chinook salmon. Spring-run populations of CC Chinook salmon were likely present in the Mad and Eel Rivers, but have since been extirpated. Trends and abundance information for CC Chinook salmon suggest that the diversity of the ESU is threatened by continued declines in abundance.

2. Current Condition and Conservation Value of Critical Habitat at the ESU Scale

As identified in the Status of Critical Habitat section, the essential habitat types of designated critical habitat for SONCC coho salmon and PCEs of designated critical habitat for NC steelhead and CC Chinook salmon are those accessible freshwater habitat areas that support spawning, incubation and rearing, migratory corridors free of obstruction or excessive predation, and estuarine areas with good water quality and that are free of excessive predation. As described in the previous subsections, timber harvest and associated activities, road construction, urbanization and increased impervious surfaces, migration barriers, water diversions, and large dams throughout a large portion of the freshwater range of the ESUs and DPS continue to result in habitat degradation, blockages to spawning and rearing habitat, and reduced streamflows. The result of these continuing poor land management practices that continue to persist in many locations has limited reproductive success, reduced rearing habitat quality and quantity, and caused migration barriers to both juveniles and adults. These factors likely limit the conservation value (*i.e.*, limiting the numbers of salmonids that can be supported) of designated critical habitat within freshwater habitats at the ESU/DPS scale. Where these impacts overlap with the potential effects of the proposed action, they are discussed in more detail in the *Environmental Baseline* section that follows.

Watershed restoration activities have improved freshwater critical habitat conditions in some areas. For instance, these activities continue to be funded, and are becoming more comprehensive and effective. The five northern California counties affected by the Federal listing of coho salmon (which include Humboldt and Del Norte Counties) have created a Five County Conservation Plan that will establish continuity among the counties for managing anadromous fish stocks (Voight and Waldvogel 2002).

IV. ENVIRONMENTAL BASELINE

The environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process (50 CFR 402.02).

The action area for the Plan includes the whole RNSP area, which encompasses 105,516 acres. The action area is located within the Redwood Creek watershed, including lower Redwood Creek and Prairie Creek, and part of the lower Smith River watershed. Also included in the action area are several small, unnamed, non-anadromous coastal streams that drain the west side of the Coast Range, directly west to Gold Bluffs Beach, on RNSP land. None of these streams contain anadromous salmonid habitat as a result of their steep gradients (RNSP 2006), and as implementation of the Plan within these streams will have no bearing on anadromous salmonids, these streams will not be described further in this document.

The subsections below first generally describe Redwood Creek and lower mainstem Smith River. Second, the distribution, abundance, and trends within the action area of the three listed

anadromous salmonid species are discussed. Third, the historic and current impacts that have shaped salmonid populations and their designated critical habitats within the action area, and the conservation value of those critical habitats are described. This information is summarized to describe the current condition of the species, in terms of its likelihood of survival and recovery, and the role that the action area plays in the overall conservation of the listed species and their designated critical habitats.

A. General Watershed Descriptions

1. Redwood Creek

The action area within the Redwood Creek watershed encompasses only Lower Redwood Creek and Prairie Creek, as described by Cannata *et al.* (2006). The 282-square mile Redwood Creek watershed is located in the Northern Coast Range of California, and flows into the Pacific Ocean near Orick (Cannata *et al.* 2006). The total length of the basin is about 65 miles, and its width varies from 4 to 7 miles (Janda *et al.* 1975). Total basin relief is about 5,300 feet, with a mean annual basin-wide precipitation of approximately 80 inches (Janda *et al.* 1975). Summertime is characterized by cool temperatures and fog by the coastal belt, with warmer temperatures and sunnier weather more inland. The majority of precipitation in the Redwood Creek watershed occurs November through March and ranges from 32 inches at lower elevations to 98 inches at the headwaters with frequent snow above 2,000 feet. Winter storms often bring heavy rainfall.

Due to excessive sedimentation and a reduction in shade canopy, the basin's streams are listed as sediment and temperature impaired under section 303(d) of the Clean Water Act [U.S. Environmental Protection Agency (EPA) 1998]. High water temperatures and excessive sediment loads have caused the habitat in Redwood Creek streams to be undesirable for salmonids, especially in mainstem Redwood Creek. Madej *et al.* (2006) estimated that thermal restriction may have reduced the historical distribution of juvenile coho salmon habitat by 75 percent in Redwood Creek. Madej *et al.* (2006) found that water temperatures in Redwood Creek reach their maximum in the middle basin and become cooler farther downstream, and suggest that perhaps "coastal fog, old-growth redwood trees in the riparian zone, and an abundance of cool-water tributaries and seeps" contribute to cooler temperatures in the lower basin.

Turbidity in the mainstem is believed to persist longer and at higher frequencies than in the past (Cannata *et al.* 2006). Sedimentation has caused persistent, long-lasting impacts such as impaired spawning habitat, a decrease in channel diversity and depth, increase in channel width, and streambank erosion. Logging and associated accelerated bank erosion has caused a decrease in amounts and recruitment of LWD. The loss of large wood has exacerbated the effects of sedimentation, and contributed to temperature increases and loss of channel stability and complexity, including deep pools important to oversummering adult salmonids such as summer steelhead, which require cold water refugia. Many of the Redwood Creek tributaries have cool water temperatures, but lack the structural complexity and diversity required to support healthy salmonid populations. Contributions from tributaries are unable to cool temperatures in mainstem Redwood Creek, but do provide cool water refugia at their confluences with mainstem

Redwood Creek. Other temperature refugia in the mainstem exist at the bottom of thermally stratified pools, and areas receiving inflow from springs and seeps (Cannata *et al.* 2006).

Impairment of habitat quality and ecological processes, as well as diminishment of area, in the Redwood Creek estuary caused by presence of the levees, built in 1968 as a response to the 1964 flood, is believed to have significantly contributed to anadromous fish population declines. The levees altered the physical and biological functions of the estuary and adjacent wetlands. In the spring, the estuary serves as an acclimation area as juveniles undergo the physiological transformation from freshwater to saltwater.

Land use activities in the watershed include cattle grazing (in upper Lacks Creek, particularly), gravel pit mining, logging, road construction, and residential use. Predators of juvenile and fry salmonids in the watershed include piscivorous fish and birds.

a. Prairie Creek

The Prairie Creek subwatershed, where much of the Plan will take place, encompasses 25,339 acres, with 18,247 acres of Federal ownership, and 6,629 acres of state ownership. It is the largest tributary of Redwood Creek, and flows into it at River Mile (RM) 3. It occupies a narrow channel with well-defined banks. Mass wasting is common in this subwatershed. The major drainages on the west side of Prairie Creek have gentle gradients at their headwaters, and end in flat valleys. Sandy parent material and low creek gradients create conditions for naturally fine-grained bed material in channels.

Prairie Creek contains 24 miles of anadromous salmonid habitat, which makes up about half of the tributary habitat in the entire Redwood Creek Basin. The Prairie Creek mainstem is accessible to all listed salmonids for nearly its entire length, including the area upstream from the West Ridge Road culvert (Duffy 2007). Prairie Creek supports the majority of the coho salmon population in Redwood Creek (Brown 1988, Cannata *et al.* 2006). The habitat downstream of the West Ridge Road culvert is suitable for salmonid spawning for coho salmon, Chinook salmon, and steelhead (Holden 2007). Much of the upper watershed of Prairie Creek, and its largest tributary, Lost Man Creek, retain old growth redwood forests and some of the highest quality fish habitat within Redwood Creek. The coolest water temperatures in Redwood Creek exist in the Prairie Creek subwatershed. Large debris accumulations may impede fish access to spawning grounds in Lost Man Creek above RM 2.9 (Cannata *et al.* 2006). Prairie Creek directly below and for at least 1/8 of a mile downstream of West Ridge Road is composed primarily of riffles, and no deep pools exist until further downstream in Prairie Creek (Holden 2007).

Past actions in Prairie Creek include logging, roading, cattle grazing, and highway construction, which caused excessive sedimentation of the creek and several tributaries. In particular, the logging and roading in this subwatershed have had lasting effects on fish habitat by causing accelerated erosion and excessive sedimentation, and removing large trees. An excessive amount of sediment was delivered into the creek as a result of the Highway 101 bypass construction in the early 1990s, and may still be impacting it. Exposed sand fills susceptible to erosion, and roadway sanding during icy conditions in the winter continue to cause major

sedimentation problems. Extensive road decommissioning and upgrades were completed in 2006 in the Lost Man Creek subwatershed. Sections of roads such as West Ridge Road are either failing or may fail, and have the potential to cause increased sedimentation into streams if left to further deteriorate.

b. Lower Redwood Creek

Lower Redwood Creek encompasses 44,488 acres, with 44,213 acres of Federal ownership. It includes the Beaver Hydrologic Subarea, which is one of the occupied areas of critical habitat in the Redwood Creek watershed. Lower Redwood Creek contains Copper Creek near its uppermost end, which is near the top of the action area. Rainfall ranges from 32 inches per year in the lower areas, to 98 inches annually in the headwaters. Seventy-two percent of this part of the watershed exhibits signs of very high or high landslide potential.

Lower Redwood Creek supports populations of coho salmon, Chinook salmon, and steelhead. It encompasses 17 miles of mainstem, and 122 miles of tributaries, and has 28 miles of anadromous fish habitat. The entire 17-mile mainstem reach is used for migration and rearing of anadromous fish. Spawning occurs in all but the lowermost 3 miles. Lower Redwood Creek has undergone reductions in riparian vegetation, tree cover, instream woody debris, pool depths, and adjacent wetlands, and valley drainage patterns were altered.

2. Smith River

Smith River drains 460,160 acres of the west slope of the Klamath geologic province, known as the Siskiyou Mountains. Approximately 3,100 miles of stream channels exist in the basin. Smith River has approximately 176 miles of anadromous fish habitat. Elevation in the basin ranges from sea level to 6,424 feet. The two Smith River subwatersheds in which the Plan will occur are Clark's Creek and Mill Creek.

Coho salmon are most abundant in the lower tributaries, especially in Mill Creek. Coho salmon migrate upstream and spawn in November and December. Based on cannery records (Bartson 1997 *op. cit.* Voight and Waldvogel 2002) and discussions with Tolowa tribal members (Voight and Waldvogel 2002), coho salmon were much more abundant than today.

Hatchery influence on the Smith River has involved intensive stocking of coho salmon from other river sources from the 1930s through the 1960s. Stocked species appear to have never established reproducing populations. Existing wild stocks in Smith River appear to be viable, so restoration potential is high.

Land use activities in the watershed include agriculture, a high-security prison, residential use, a salmonid hatchery, and gravel mining in the lower Smith River.

B. Distribution, Abundance, and Trends of Anadromous Salmonids

The anadromous fish populations of Redwood Creek have experienced a substantial reduction during the last 40 years (EPA 1998, Sparkman 2005). Available data on listed salmonids

specific to Prairie Creek and its tributaries are rare or not of the type that would facilitate accurate assessments of the population status and trends of listed salmonids in Redwood Creek tributaries (Cannata *et al.* 2006).

1. SONCC Coho Salmon in Redwood Creek

Coho salmon enter Redwood Creek beginning early September, and continue until February or early March. Recent data suggest that the peak of the spawning run is in late November (Anderson 1988). Most coho salmon in Redwood Creek are believed to rear for 12-15 months. Bell (2001) found that 28 percent of Prairie Creek smolts exhibited a 2-year freshwater phase, however. Coho salmon migrate downstream in the Redwood Creek system beginning in early March and April continuing until June (Sparkman 2006). Survey data from RNSP indicate that the smolts move directly into the ocean, with little time spent in the Redwood Creek estuary. Anderson (2002) found coho salmon to comprise 0.45 percent of total salmonids handled during Redwood Creek estuary sampling from June to October, and found no coho salmon in September or October, similar to previous years.

Coho salmon distribution in the Redwood Creek watershed is primarily limited to the mainstem, Prairie Creek, and the larger low gradient tributaries in Prairie Creek (Anderson and Brown 1982). Bensen (2006a) suspects that young-of-the-year (YOY) coho salmon migrate into tributaries of lower Redwood Creek, such as Prairie Creek, but that most of the YOY do not survive the warm temperatures in Redwood Creek. Sparkman (2006) further documents the current low numbers of coho salmon in Redwood Creek with a trapping study. From 2000 to 2006, no out-migrating coho salmon were captured from upper Redwood Creek, suggesting that for the past 7 years, coho salmon have not successfully spawned in the middle to upper portion of Redwood Creek (Sparkman 2006).

Cannata *et al.* (2006) surmised from historical information provided by Hallock *et al.* (1952) that in 1951, the lower Redwood Creek mainstem was cold enough and the pools deep enough to support juvenile coho salmon. This is a much different situation than currently in mainstem Redwood Creek. Anderson (1988) and Brown (1988) conducted general stream surveys of the watershed in 1980 and 1981 to describe and characterize the salmonid rearing habitat and distribution of juvenile salmonids. Natural migration barriers at tributary mouths were identified during these surveys, which included electrofishing above suspected barriers to confirm presence. However, subsequent surveys in the 1990s detected coho salmon in streams where they were not detected in 1980-81 in the lower and middle portions of Redwood Creek. Whether these barriers still exist, have changed to allow fish passage, or new barriers formed, is unknown.

Current coho salmon runs are far below those that occurred 70-80 years ago. Prairie Creek Hatchery propagated coho salmon in the basin from 1926-1992, planting non-indigenous coho salmon taken from outside the Redwood Creek watershed (Cannata *et al.* 2006). The total population of SONCC coho salmon in Redwood Creek may have conservatively numbered more than 2,000 adults at the time the hatchery closed, but the current adult population of SONCC coho salmon in Prairie Creek is almost certainly well below that number (Anderson 1988, Brown 1988). Documented escapement numbers of adult coho salmon in Prairie Creek in recent years indicate relatively low numbers of returning adult coho salmon (RNSP 2006). From the years

1998 to 2004, a range of spawners and carcasses in Prairie Creek was estimated from counts in Prairie Creek, Boyes Creek, and Streelow Creek combined. Numbers of live fish ranged from fewer than 60 in 1998-1999, to 660 in 2001-2002 (Duffy 2007). They currently remain in the range of several hundred fish. Duffy (2007) believes that coho salmon population fluctuations are related to ocean conditions, but that the population is currently stable in Prairie Creek.

Recent information about the historical population structure of coho salmon within the SONCC ESU provides insight into the importance of the coho salmon population within Redwood Creek. Williams *et al.* (2006) classified the historical coho salmon population within Redwood Creek as Functionally Independent, that is, “populations with a high likelihood of persisting over 100-year time scales,” and that conforms to the definition of independence offered by McElhany *et al.* (2000). According to McElhany *et al.* (2000), an independent population is “one whose population dynamics or extinction risk over a 100-year time period is not substantially altered by exchanges of individuals with other populations.” Functionally Independent populations are those that are viable in isolation, and were determined to have minimal demographic influence from adjacent populations. The classification of Functionally Independent populations can help determine watersheds of potential population strength within a larger geographical area, such as an ESU. Independent populations have high levels of self-recruitment, and provide more individuals to other populations than they receive, making Independent populations a source of individuals that can “seed” nearby watersheds. Thus, the Redwood Creek population is important for the recovery of the SONCC coho salmon ESU. In addition, the action area is vital to the Redwood Creek population, given that streams in Prairie Creek subwatershed contain some of the most productive habitat in Redwood Creek.

2. SONCC Coho Salmon in the Smith River

Coho salmon return to the Smith River between November and January, and may spawn into mid-January or early February. Coho salmon in the Smith River watershed are believed to rear for 12-15 months (Stillwater 2002, Voight and Waldvogel 2002), with some spending the winter in the lower river and estuary. Coho salmon migrate downstream beginning in early March and April, peaking in May (Voight and Waldvogel 2002).

Coho salmon spawning in the Smith River watershed is mainly confined to Rowdy Creek, Mill Creek, and to a lesser extent, Clark’s Creek, Cedar Creek, Little Mill Creek, Peacock Creek, and Sultan Creek. Coho salmon are also present in the North and South Forks of the Smith River (Voight and Waldvogel 2002). These creeks also serve as juvenile fish rearing areas as well as adult rearing areas, as cover is often complex, and deep pools and adequately cool water temperatures exist.

Coho salmon in Mill Creek are known mainly to spawn in the West Branch and East Fork, from surveys conducted since 1980 through the present time (Voight and Waldvogel 2002). Adult coho salmon escapement has been monitored since 1980 in West Branch Mill Creek and since 1993 in other areas of the Mill Creek basin. Approximately 10 miles of known anadromous salmonid spawning habitat in both West Branch Mill Creek and East Fork Mill Creek and its tributaries are surveyed. Numbers of adult coho salmon observed in West Branch Mill Creek have ranged from a high of 114 in 1993-1994 to a low of 3 in 1998. Numbers of adult coho

salmon observed in East Fork Mill Creek have ranged from a high of 45 in 1994-1995 to a low of 1 in 1998-1999. Coho salmon numbers appear to have declined over the years in both the East and West Forks of Mill Creek (Howard 1999). Redd counts conducted during the same period in the two branches have ranged from a high of 68 in 1996-1997 to a low of 1 in 1998-1999 (Howard 1999). Outmigrant YOY from traps in both tributaries in 1994 had high counts: 1,513 in the East Fork, and 4,580 in the West Branch. A low of 0 YOY in both tributaries was observed in 1999. Yearling smolts peaked in 2001 for both tributaries: 1,921 in the East Fork, and 3,682 in the West Branch. 1996 was a year of low outmigrant yearlings for both tributaries: 75 in the East Fork, and 195 in the West Branch.

The coho salmon population in the Smith River is considered to be a Functionally Independent population, and therefore important to the recovery of the SONCC coho salmon ESU. The relatively good habitat in Mill Creek and Clark's Creek, as well as other coho salmon-bearing tributaries in the watershed, and the prevailing protection and restoration goals for the watershed, add to the habitat value and sustainable nature of the population.

3. CC Chinook Salmon in Redwood Creek

Because timber harvest, levee construction, and accelerated erosion in the Redwood Creek watershed has led to temperature increases, LWD loss, instream habitat degradation, and large-scale habitat alterations at the estuary, the Redwood Creek Chinook salmon population has decreased over that which was known historically. Estimates of the historical abundance of Redwood Creek Chinook salmon range from 5,000 (CDFG 1965 *op. cit.* Good *et al.* 2005) to 1,000 (Wahle and Pearson 1987). These are estimates based on professional opinion and evaluation of habitat conditions, however, and not on rigorous field sampling (Good *et al.* 2005). They are presented here as a basis for comparison with more recent abundance estimates. No reliable estimate of the current adult population size of Chinook salmon in Redwood Creek is available. However, spawning survey information is presented here to give an idea of ranges of abundance. Existing data do not allow an assessment of population stability.

Chinook salmon spawn in upper, middle, and lower Redwood Creek mainstem, Redwood Creek tributaries, and Prairie Creek and its tributaries, during November to January. Mainstem Redwood Creek may be where the majority of spawning occurs (Cannata *et al.* 2006). Most Chinook salmon outmigrate during their first year from April to May, but some are known to reside in tributaries where temperatures are cool enough, and outmigrate in the late fall, or overwinter and outmigrate the following spring (Cannata *et al.* 2006). Holden (2007) has never seen 1+ Chinook salmon in Prairie Creek, and they have not been detected in Redwood Creek estuary sampling, either. Turbid conditions and difficult access have prevented consistent, widespread sampling efforts to determine spawner populations throughout the watershed, but sampling of Prairie Creek and two other main tributaries has occurred over the past 6 years. Duffy (2007) collected data on the Chinook salmon spawning population between 1998-2004 in four reaches of Prairie Creek, as well as Prairie Creek tributaries Boyes Creek and Streelow Creek. The highest number of live adult Chinook salmon observed in Prairie Creek in any of those years was 531 in 2001-2002, and in the same season, 257 carcasses were counted (Duffy 2007). The lowest among those six seasons was in 2002-2003, in which 106 live adult Chinook salmon and 195 carcasses were counted. Based on the past 6-7 years of monitoring, Duffy

(2007) believes that Chinook salmon have declined in Prairie Creek, as the spawning population declined from over 500 adults to about 10-15 in the past 2 seasons (2005-2006 and 2006-2007).

CDFG has trapped outmigrants leaving upper Redwood Creek in spring to summer since March 2000, using rotary screw traps placed in upper and lower Redwood Creek (Sparkman 2005). Sparkman (2005, 2006) found a declining trend in populations of 0+ and 1+ Chinook salmon over the past several years from the upper and lower traps in Redwood Creek. Sparkman (2006) found a 95.8 percent reduction in catch of 0+ Chinook salmon in the trap in 2006 from the previous 6-year average. He found no 1+ Chinook salmon this year, a 100 percent reduction in 1+ Chinook salmon from the previous 6-year average. This has not been found to be statistically significant, however. More sampling is required to detect statistically significant trends. The low number (987) of Chinook salmon emigrating in 2003 indicated a year class failure, and 84 percent of the variation in population emigration over the 5-year period was explained by high winter flows during the egg incubation period (Sparkman 2005a).

Redwood Creek Chinook salmon are declining precipitously, based on seine net counts during every summer between 1997 and 2006 (Anderson 2006). Bjorkstedt *et al.* (2005) determined that the population of Redwood Creek Chinook salmon is Functionally Independent, meaning that the population is not dependent upon outside sources, and is important to the recovery of the CC Chinook salmon ESU. In addition, given that Prairie Creek represents some of the most productive habitat in the Redwood Creek watershed, the action area is vital to Redwood Creek populations.

4. NC Steelhead in Redwood Creek

NC steelhead occupies 133 miles of riverine and estuarine habitat in Redwood Creek, including Prairie Creek and its tributaries. Summer-run and winter-run steelhead are both present in Redwood Creek, in addition to a half-pounder run.

Steelhead generally return to Redwood Creek between January and April. Steelhead/trout are found in most small order, high gradient tributaries. They are able to leap above barriers that might impede coho salmon. The majority of juvenile steelhead in Redwood Creek spend their second year of life in the estuary and lower part of Redwood Creek (Anderson 1988). Peak outmigration of juveniles from the stream environment to the ocean occurs sometime between March and May, with high variability between years (Sparkman 2005). They reside in marine waters for 1 to 4 years prior to returning to their natal streams to spawn.

Both USFWS (1960 *op. cit.* Cannata *et al.* 2006) and CDFG (1965 *op. cit.* Good *et al.* 2005) estimated that the number of steelhead in Redwood Creek was 10,000 individuals. Both of these estimates were derived from data on other streams, and were meant to be used as only a general magnitude of runs. Steelhead have likely decreased in numbers from historical abundances (Cannata *et al.* 2006).

Juvenile steelhead/trout are common and widely distributed in the Redwood Creek watershed. During sampling efforts in the summers of 1980 and 1981, steelhead/trout occurred in 57 of the 111 tributaries surveyed (Brown 1988). During CDFG surveys in the Redwood Creek watershed

in 2001, YOY steelhead/trout were abundant in all streams surveyed (Cannata *et al.* 2006). The relatively high percentage of 1+ steelhead/trout (greater than 25 percent) found in those surveys may be a positive index of habitat suitability.

The most recent population estimates from CDFG's outmigrant trapping study in Redwood Creek are from the 2006 outmigration data from the upper trap (Sparkman 2007). Each season, CDFG found that large numbers of 0+ steelhead/trout emigrated from upper Redwood Creek, as evidenced by total annual trap catches ranging from 55,126 to 128,885 individuals over 6 years (Sparkman 2005). Sparkman (2006) described that between the years 2000 and 2006, there has been a negative trend in juvenile smolt production. The 2006 sampling effort saw reductions in all age classes over the last 6 years, and less fish in all age classes compared to those trapped in 2005 (Sparkman 2006).

As described above, juvenile steelhead can display diverse life history strategies. Some may residualize in the lower creek or estuary for several months, or even another year before they go to the ocean (Anderson 1988). While they can achieve higher growth rates within the estuary because of more food resources and relatively abundant living space, they may also suffer higher predation than in the creek in the summer and fall (Cannata *et al.* 2006). Anderson (1997) found through many years of sampling that after the estuary mouth closes, numbers of Chinook salmon and steelhead decline, which may be the result of mortality of juveniles while trapped in the estuary, or from fish moving back upstream to rear in the lower river and tributaries.

RNSP initiated winter spawning and carcass surveys of steelhead in the 1980s in tributaries and along the mainstem of Redwood Creek. Steelhead surveys have yielded counts that have all been well below historical abundances (Schiewe 1997a). Turbidity and flow levels are obstacles to visual observations in Lower Redwood Creek (Cannata *et al.* 2006).

Summer steelhead have declined severely from historical levels in Redwood Creek. Native Americans used to depend on the harvest of summer steelhead for subsistence (Moyle *et al.* 1995 *op. cit.* Cannata *et al.* 2006). Gerstung (2001 *op. cit.* Cannata *et al.* 2006) extolled the abundance of summer steelhead as 10 to 25 in every pool, some of which were 20 feet deep. Summer steelhead surveys began in RNSP in 1981 in mainstem Redwood Creek, and survey data have indicated a decline since that time (Anderson 2005). No other streams in the Redwood Creek watershed within RNSP have been surveyed for summer steelhead, as the smaller streams do not have pools large enough to support fish during the warm summer months. Over the course of 14 years, 0-44 adult summer steelhead were observed during surveys in a 16-mile index reach of mainstem Redwood Creek (Anderson 2005). Snorkel surveys have not been conducted in the same reach every year, which may explain some of the variability.

Factors that limit the number of adult summer steelhead in Redwood Creek include: (1) access to Redwood Creek if the sand berm blocks the mouth in late June, July, and August; (2) high summer water temperatures; (3) few deep holding pools (Sparkman 2006); and (4) humans displacing them when they swim in deep pools, causing steelhead to use energy reserves and to possibly be exposed to less than optimal habitat (RNSP 2006). The 1964 flood likely caused excessive sedimentation, creating a widespread decrease in deep pools, and this has had a negative effect on summer steelhead such that the current population's breeding size may not be

enough to sustain a viable population (Meffe 1986 *op. cit.* Cannata *et al.* 2006). Summer steelhead are considered to be the salmonid most at risk of being extirpated in Redwood Creek.

Nehlsen *et al.* (1991) identified summer steelhead in Redwood Creek to be at risk of extinction, along with Mad and Eel River summer steelhead stocks. Higgins *et al.* (1992) identified 11 summer steelhead runs in California's north coast region to be at risk of extinction, and 8 of those, including Redwood Creek, to be at high risk of extinction.

Recent information about the historical population structure of NC steelhead within the DPS provides insight into the importance of the steelhead population within Redwood Creek. Bjorkstedt *et al.* (2005) classified the historical steelhead population within Redwood Creek as Functionally Independent (see above sections on local coho salmon and Chinook salmon populations for clarification of this classification). Although the current population of steelhead in the Redwood Creek watershed is well below historic levels, because it has a high likelihood of persisting over 100-year time scales, the potential Redwood Creek population is important for eventual recovery of the NC steelhead DPS. In addition, given that Prairie Creek represents some of the most productive habitat in the Redwood Creek watershed, this portion of the action area is vital to Redwood Creek populations.

C. Historic and Current Impacts to Listed Salmonids and Critical Habitat

1. Redwood Creek

In California streams, juvenile coho salmon and steelhead are probably most heavily preyed upon by juvenile steelhead. Freshwater sculpins (*Cottus* sp.) are other important predators in most Pacific Coast streams. During the period immediately following emergence from the gravel, some young fish may also be eaten by juvenile coho salmon of older year classes. Other predators on salmonid fry in California streams are the dipper and garter snakes. Larger fish are subject to predation by piscivorous birds such as kingfishers and blue herons (Shapovalov and Taft 1954).

Habitat conditions, including the condition of designated critical habitats, are quite degraded relative to pristine conditions, and continue to contribute to the decline of all salmonids at all life stages. The upper 60 percent of the Redwood Creek watershed is in private ownership, and many impacts to the mainstem originate outside of RNSP. Sparkman (2004, 2005) concluded that upper Redwood Creek, upstream of RNSP, is more important for the production of Chinook salmon and steelhead than is the lower part of Redwood Creek.

a. Logging and Road Construction

Historical large-scale logging exacerbated naturally unstable geological conditions in the action area. The associated, intensive roading has contributed to increases in peak runoff and accelerated erosion, interruption of natural hillslope processes, and destabilization of hillslopes and channel banks. Increased erosion, and depletion of riparian and instream LWD are key sources of other adverse impacts to fish, such as increases in water temperature, decrease in channel stability, complexity, and depth, loss of instream cover elements and suitable spawning

gravel, and loss of functional riparian areas that once supplied shade, food web resources, and LWD recruitment. High turbidity levels due to accelerated erosion occur more frequently and persist longer than in the past, which can cause problems with fish's gills and sight feeding. Although channel deepening and pool development has been observed in all but the lower few miles of the creek, the mainstem of Redwood Creek generally lacks an adequate pool-riffle structure, and cover. Coarse sediment deposited in the mainstem allows a large proportion of summer base flows to infiltrate and flow subsurface, thereby limiting the surface water available to fish and increasing surface water temperatures. Tributary water temperatures are generally suitable for salmonids, but water temperatures are suboptimal, or lethal, for fish along much of the mainstem of Redwood Creek. Large deltas block some tributary mouths and impede migration of fish. The lack of suitable rearing habitat in the mainstem and some areas of the tributaries may be resulting in some juvenile fish rearing in the estuary earlier than if the tributary habitat was in better condition.

Canopy closure along the upper reaches of Redwood Creek is increasing, but is still far less than it was in the early 1900s. The reduction in shade canopy from conifers along the stream eliminates air cooling microclimate effects to water temperature. Without large wood to influence the shape of the channel, the channel widens and becomes aggraded, which can aid erosion. These conditions are likely to persist into the future as deciduous willows and alders take the place of evergreen conifers along much of the mainstem and tributaries. Large, dense stands of second-growth exist throughout the action area (Bensen 2007), and as they stagnate, prevent large trees from growing and being recruited into the channel and riparian areas.

b. Sport Fishing

Impacts from recreational catch-and-release fishing on Redwood Creek is also considered to be a factor causing increased mortality, particularly to summer steelhead (Taylor and Barnhart 1997 *op. cit.* RNSP 2003). Taylor and Barnhart (1997 *op. cit.* RNSP 2003) showed increasing summer steelhead angling mortality with increasing water temperature beginning at 61 °F, 10 percent mortality at 68°F, and 35 percent mortality at 75°F. Any incidental angling mortality on adult fish is significant to the small summer steelhead population and damaging to the potential for overall recovery. RNSP superintendents have requested a seasonal fishing closure between June and September in the 3.9-mile reach of Redwood Creek between the confluences of McArthur and Bond Creeks, which has not been granted by the California Fish and Game Commission.

c. RNSP Management

Redwood Creek has been and is benefiting by RNSP management. This includes protection from unsustainable land use practices, an extensive watershed restoration program that includes large-scale road decommissioning and upgrades, proactive road maintenance program, a fire management plan, second-growth timber management, fire management strategy, an exotic plant eradication program, and a recreation program that includes a significant public education component.

2. Smith River

The information from this section has been taken from U.S. Department of Agriculture-Forest Service (1995) and Voight and Waldvogel (2002). Because of the paucity of information about the action area within the Smith River watershed, NMFS assumes that the habitat condition in the action area is similar to that described in the above two documents.

The combined effects of the construction and maintenance of Highway 199, floods, failed road crossings, logging, and mining have contributed to declines in salmonid habitat conditions, and likely, to decreases in salmonid abundance. The construction and maintenance of Highway 199, which parallels the Middle Fork Smith River, has caused landslides which deposited large amounts of sediment into the stream channel. Landslide failures along this corridor have been mostly caused by the straightening of river meanders or relocation of sections of channel as part of the highway construction. Parts of the highway base replaced riparian areas, and riprap and concrete prevents regrowth of riparian canopy. Also, current highway maintenance includes removal of young riparian tree stands that reduce line-of-sight around long sweeping curves. Habitat degradation by forestry activities has mostly occurred in tributaries, which affects spawning, incubation, and rearing habitat. Reduced recruitment of large trees to stream channels has negatively affected spawning habitat and shelter for salmonids, as large trees provide cover, sort gravels, enhance channel stability, and provide many other ecological functions to streams. Mainstem reaches have also been severely aggraded, reducing their function and capacity, as a result of post 1955- and 1964-flood sediment inputs from harvested slopes which are reflected in increased water temperatures and sedimentation of substrate. Filled pools, degraded gravel quality, and reduced macroinvertebrate production have occurred due to accelerated sediment delivery to the mainstem reaches from road building and maintenance activities, and the legacy left by timber harvest and mining in mainstem habitat quality, reducing available food, space, and cover. These conditions have contributed to a reduction in overall habitat complexity in the Smith River portion of the action area, which in turn reduces the survival of salmonid populations.

3. Conservation Value of Designated Critical Habitat

a. Redwood Creek

Habitat conditions, including the condition of designated critical habitats, are still quite degraded relative to pristine conditions. NMFS described the conservation value of the Redwood Creek watershed within the CC Chinook salmon ESU and the NC steelhead DPS (December 10, 2004, 69 FR 71880). Fish distribution and habitat use data compiled by the Critical Habitat Analytical Review Team identified approximately 107 miles of occupied riverine and estuarine critical habitat for CC Chinook salmon and 138 miles of occupied riverine and estuarine critical habitat for NC steelhead (December 10, 2004, 69 FR 71880). The Redwood Creek Subbasin includes three occupied hydrologic subarea (HSA) watersheds. Redwood Creek within RNSP includes the Beaver and Orick HSAs. NMFS concluded that all occupied areas contain one or more PCEs for both the CC Chinook salmon ESU and the NC steelhead DPS (December 10, 2004, 69 FR 71880). PCEs include habitat characteristics such as spawning sites, feeding sites, seasonal water quality or quantity, geological formation, vegetation type, and specific soil types

(December 10, 2004, 69 FR 71880). Of the three occupied HSA watersheds, two were rated by a Technical Recovery Team as having high conservation value and one as having medium conservation value to the CC Chinook salmon ESU and the NC steelhead DPS on the basis of the physical and biological habitat requirements of CC Chinook salmon and NC steelhead consistent with the PCEs identified. NMFS did not identify which HSA watersheds had high conservation value, or which had medium conservation value. Restoration activities in the watersheds within RNSP, as well as protective management strategies, have contributed to positive influences on the watersheds.

The essential habitat types of juvenile rearing areas, juvenile migration corridors, areas for growth and development, and adult migration corridors and spawning areas are all present in SONCC coho salmon critical habitat in the Redwood Creek watershed. However, some areas of the watershed, *i.e.*, Redwood Creek mainstem and Redwood Creek estuary, have a paucity of essential features to support coho salmon. Some factors that have affected the essential habitat requirements for salmonids within RNSP include livestock grazing, logging, gravel mining, road building activities, and mining.

The following summarizes the conservation value of designated critical habitat in the different subwatersheds of the action area within Redwood Creek:

- (1) *Prairie Creek*. Prairie Creek is the largest tributary of Redwood Creek, and is the largest producer of coho salmon in the watershed (Cannata *et al.* 2006). Conditions in the Prairie Creek watershed range from near pristine in the upper watershed, to degraded critical habitat elements in parts of the lower watershed, creating a wide range of conditions in features such as spawning and rearing habitat. Prairie Creek provides a migration corridor with natural cover, and is free from obstruction for much of its length for both juveniles and adults. Because it provides high quality PCEs and essential habitat types in parts of the watershed, and because of its relative importance within the Redwood Creek watershed, Prairie Creek critical habitat has high value for the conservation of salmonids.
- (2) *Lower Redwood Creek*. This subwatershed provides critical habitat elements for salmonids in all life stages, but mostly in the tributaries, which are cool water refugia. Mainstem Redwood Creek does not provide adequately cool water temperatures for juvenile fish rearing, aside from microsites in the location of springs, seeps, stratified pools, intragravel flow, or tributary confluences. There is no spawning in the lower 3 miles. High sediment embedddness and decreased LWD in the mainstem and some of the tributaries, and decreased streamside canopy in the mainstem, are factors limiting salmonid production and the conservation value in this subwatershed. Lower Redwood Creek is functional as a migratory corridor free of obstruction, however.

b. Smith River

Streams in the two subwatersheds where the Plan will be implemented, Mill Creek and Clark's Creek, provide critical habitat elements for coho salmon at all life stages. Spawning takes place primarily in a few key tributaries, such as West Branch of Mill Creek. Complex cover, deep pools, and adequately cool water temperatures in these creeks provide juvenile fish rearing areas.

The mainstem Smith River provides a migratory pathway for both adults swimming upstream and juveniles swimming downstream.

Mill Creek is one of the most productive streams of salmon and steelhead in the Smith River watershed, even though the watershed has been extensively logged and roaded (Voight and Waldvogel 2002). Mill Creek has provided high value habitat for coho salmon despite degradation due to reduced LWD, sediment inputs from the road system, water diversion, and loss of riparian habitats. Clark's Creek has recently had a passage barrier repaired. It is located entirely within Jedediah Smith State Park, flows in a gently sloping gradient through a dense redwood forest, and has abundant LWD (Voight and Waldvogel 2002). The critical habitat within Mill and Clark's Creek has high value for the conservation of SONCC coho salmon.

V. EFFECTS OF THE ACTION

This Opinion addresses RNSP's implementation of the Trails and Backcountry Management Plan in Redwood Creek, Smith River, and other coastal watersheds that flow directly into the Pacific Ocean. An overview of the Plan is provided in the *Description of the Proposed Action* section of this Opinion. The *Status of the Species* has been summarized at the ESU and DPS scales. The *Environmental Baseline* summarizes the effects of past and present Federal, State, local and private activities on SONCC coho salmon, CC Chinook salmon, NC steelhead, and designated critical habitats within the action area.

Pursuant to section 7(a)(2) of the ESA (16 U.S.C. 1531 *et seq.*), Federal agencies are directed to ensure that their activities are not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of designated critical habitat. In this section of the Opinion, as required by the ESA and its implementing regulations (50 CFR 402), NMFS assesses the direct and indirect effects of the proposed action, and any interrelated and interdependent actions on SONCC coho salmon, CC Chinook salmon, NC steelhead, and their designated critical habitats. As defined by 50 CFR 402.02, "*indirect effects*" are caused by or result from the proposed action, are later in time, and are reasonably certain to occur. The purpose of this assessment is to determine if the proposed action: (1) is likely to have effects on SONCC coho salmon, CC Chinook salmon, or NC steelhead that appreciably reduce their likelihood of both survival and recovery in the wild by reducing their numbers, reproduction, or distribution (the jeopardy standard identified in 50 CFR 402.02); and (2) is likely to appreciably diminish the value of designated critical habitat for the conservation of SONCC coho salmon, CC Chinook salmon, and NC steelhead in the wild.

A. Insignificant or Discountable Effects

1. Trail Construction, Rerouting, Closure, Restoration, and Removal; Trailhead Construction and Redesign, Backcountry Camp Construction and Retrofit, Backcountry Horse Camp Retrofit and Relocation, and Annual Facilities Maintenance

Insignificant or discountable effects are expected to occur from: (1) construction of new hiking trails, (2) construction of new bike trails, (3) rerouting of hiking trails, (4) construction of new

equestrian trails, (5) the closure and restoration of existing trail, (6) the complete removal of approximately 5 miles of existing trail/road, (7) construction of new trailheads, (8) redesign of trailheads, (9) construction of new backcountry camps, (10) the retrofit of an existing backcountry camp for increased accessibility, (11) the retrofit and relocation of a backcountry horse camp for increased accessibility, and (12) annual maintenance of facilities.

The low-impact nature of the above activities, including trail bridge construction and armored stream crossings (*i.e.*, use of hand tools, no heavy equipment, compaction of soil into the trail tread and use of mulching to decrease erosion, work not being conducted when soils are saturated or during spawning times, and stabilization of cut material in stable locations), are expected to result in no more than negligible effects on listed salmonid species. All refueling will take place at least 150 feet from any streamcourse, minimizing the potential for accidental spills and pollution. The following measures minimize sediment delivery to the stream and potential suffocation, gill abrasion, and reduced feeding opportunities of juvenile anadromous salmonids: (1) abutments located outside active stream channels, (2) erosion control, (3) minimal vegetation removal, (4) culverts that accommodate at least the 100-year flood, (5) keeping materials out of the stream, and (6) spill containment. These measures will protect water quality and the integrity of the adjacent riparian zone, and not result in impacts that are greater than insignificant or discountable.

2. Watershed Restoration

The culvert removal on Prairie Creek will generate some effects considered insignificant or discountable by NMFS, and these include the effects from removal of understory vegetation, noise and vibration disturbance from heavy equipment use, and effects to the food web from turbidity blocking sunlight and inhibiting primary production. The removal of understory vegetation is not expected to adversely affect salmonids because: (1) the post excavation overstory vegetation should provide adequate shading, (2) reestablishment of vegetation on excavated areas is expected to be rapid because of the many surrounding seed sources and good growing conditions, (3) water temperatures are not expected to increase as a result of removing the crossing, and (4) the effect of temporarily removing habitat for terrestrial insects by removing riparian vegetation is considered by NMFS to be so small as to be insignificant. These effects are not expected to cause other than insignificant disturbance to salmonids present at the time of the activity or afterwards. Noise and vibration disturbance from heavy equipment use at the Prairie Creek crossing removal is not expected to affect adult listed salmonids in the action area, because they are not likely to be present at the time of the activity. It may disrupt juvenile salmonid migration and holding patterns by frightening fish, but this effect will be short-term. Results from monitoring similar projects have revealed that the noise or vibration from heavy equipment next to a stream results in only mild disturbance to fish (Halligan 1997, 1998, and 1999; Jensen 2000). The turbidity that will be generated from the culvert removal activity may block sunlight from the streambed, but will be a one-time, short duration situation that will not affect primary production to any measurable degree.

This activity also contains elements that will have an adverse effect on salmonids and their critical habitats. See Adverse Effects section V.C. for a description of adverse effects generated by watershed restoration activities of the Plan.

3. Trail Use

Insignificant or discountable effects from use of the Mill Creek Horse Loop Trail Connector may occur to SONCC coho salmon in Mill Creek. Both fords of the trail are located on relatively fast-flowing pool tails or riffles, which offer little in the way of rearing habitat. Juvenile coho salmon in the Smith River watershed spend the vast majority of their time foraging and seeking cover in pools containing sufficient complex structure (Voight and Waldvogel 2002). They also may feed opportunistically on concentrated prey found at the head of pools just below riffles and pool tails. Juvenile coho salmon use pool tails and riffles while transiting from pool to pool and are in any one location in a pool tail or riffle for a few seconds (Bensen 2006a, Voight and Waldvogel 2002). The chance of being crushed by a passing hiker or horse is therefore discountable. Adult coho salmon return to spawn when sufficient water volume exists in Mill Creek to allow upstream migration, generally in late November, and are done spawning by late February (Voight and Waldvogel 2002). The north ford is not known as a spawning area, and does not provide good spawning habitat. In addition, both fords on the trail are closed seasonally to visitors crossing on foot or by horseback during the time that adults are present in Mill Creek: October 15 to May 31 on the south ford and October 15 to March 31 on the north ford. Thus, there is a discountable potential for coho salmon to be affected by visitors or horses.

The proposed East Side Trail will allow visitor access up Redwood Creek to near the proposed Copper Creek back country camp. The potential for disturbance from park visitors using this trail to summer steelhead adults holding, or juvenile steelhead or coho salmon rearing in cooler, deeper pools found in this reach is expected to be low because of the expected low visitation to the new camp, despite the increased access, and the visitor education program. The proposed trail is at least 0.25 to 0.5 miles from Redwood Creek, with dense old growth or second growth forest, thick brush, and steep slopes or cliffs in between. NMFS does not expect increased access to and swimming by visitors in Redwood Creek because the new East Side Trail will not be within easy access of Redwood Creek.

Another potential effect considered because of increased access to Redwood Creek from use of the new trail is an inadvertent camp stove fuel spill by a backpacker using it to ignite a wood fire along Redwood Creek gravel bars. The two types of backpacking petroleum fuel stoves that are used in the United States make petroleum pollution extremely unlikely, because spills are improbable by design, and because the type of fuel spilled would vaporize when exposed to the atmosphere. No petroleum residues would remain to pollute the stream. Backpacking stoves pose a negligible potential to adversely affect listed salmonids and their critical habitats. Dispersed camping along the gravel bars will continue to be allowed under the Plan, but visitors will have to obtain a backcountry camping permit and associated conservation education materials.

B. Beneficial Effects

The interpretive programs that educate visitors about minimizing their impacts on salmonids would likely benefit listed salmonids. Interpretive programs are expected to reduce the amount of disturbance from recreational visitors. One objective of the program is to reduce the number

of visitors swimming in the deeper pools of Redwood Creek in the summer when salmonids are present. Backcountry interpretive staff and patrolling law enforcement staff will discuss the issue during casual visitor contacts, particularly near the proposed Copper Creek backcountry camp. Permits will be issued along with an interpretive message which describes the potential negative impacts to summer steelhead from swimming in deep pools, and how to avoid disturbing them. Visitors will likely avoid disturbing summer steelhead as a result. Another interpretive emphasis is to teach visitors about salmonid spawning behaviors and how to avoid disturbing spawning fish.

C. Adverse Effects

One culvert removal will result in disturbance to the bed and banks of Prairie Creek as part of the conversion of the West Ridge Road to a trail. Conversion of the West Ridge Road to a trail will substantially reduce the potential for debris torrents, chronic sediment inputs, and remove a partial migration barrier by removing the existing aging galvanized steel culvert, and by restoring the natural drainage patterns to the hillslope.

During the channel excavation associated with the stream crossing removal, short-term elevated turbidity and suspended sediment levels will likely result, and heavy equipment entering the stream channel will create a source of turbidity during excavation or disturbance above the wetted stream. Some sediment typically spills from the equipment as it is hauled to the disposal site, which causes turbidity and sedimentation of downstream areas. The remaining road fill, wedged in the interstices of the original stream bed, may be mobilized and very small portions of channel banks may settle or slide. Sediment is expected to be mobilized from the culvert removal site to a distance of approximately 1/8 of a mile downstream.

Removal of the culvert and the associated channel excavation in Prairie Creek will likely cause short-term negative effects on salmonids and their critical habitat, such as water quality and substrate, through sediment mobilization and increased turbidity immediately after the culvert removal during the channel re-watering, and for up to a year afterwards during rain events. Pulses of sediment will be mobilized to a greater extent during the first few storms of the season, and to a lesser degree during those storms following the first few events of the season. Juvenile coho salmon and steelhead will likely be affected from capture and relocation activities which will precede dewatering of the channel in preparation for the culvert removal.

1. Fish presence in the impact area (i.e., culvert removal site and one-eighth of a mile downstream in Prairie Creek)

Fish life history phases expected to be present during the project, including the capture and relocation, and during the first few storms of the season, which usually begin in November, include: (1) rearing coho salmon and steelhead, (2) adult coho salmon and Chinook salmon during their respective spawning phases, and (3) coho salmon and Chinook salmon incubating eggs within redds.

The habitat from West Ridge Road and downstream in Prairie Creek to a distance of approximately one-eighth of a mile, does not present optimal rearing habitat, which does exist

downstream of the area, where it is characterized by deep pools (Holden 2007). Thus, rearing fish will be present, but not in great concentrations.

Coho salmon first enter Redwood Creek in September, after fall rains breach the estuary berm, and migrate upstream and spawn through early March. Chinook salmon enter the system soon after fall rains breach the berm, and spawn in November. Peak Chinook salmon spawning occurs in December, and continues until January.

Egg incubation times vary upon ambient conditions, particularly temperature (Groot *et al.* 1995). The season in which redds with live eggs will be present for each species depends upon environmental conditions and spawning times, so a range is presented here: (1) coho salmon redds can be expected to be present in the impact area between November and April (CDFG 2002), (2) Chinook salmon redds can be expected to be present November to approximately April (Weatherley and Gill 1995), and (3) steelhead redds can be expected to be present January through approximately June (Shapavalov and Taft 1954).

Chinook salmon YOY are expected to be present in the affected area from late winter to early spring (Cannata *et al.* 2006). Most Chinook salmon juveniles will likely have emigrated out of the segment of Prairie Creek in mid-April to early May (Sparkman 2003 *op cit.* Cannata *et al.* 2006). Coho salmon smolts would be migrating through the impact area from early March through June. Steelhead smolts would be outmigrating through the impact area during March through May. Smolts are not expected to suffer adverse impacts from the culvert removal, as they would not be in the impact area.

Steelhead enter Redwood Creek in January, and continue upstream migration and spawning until April. They cannot enter Redwood Creek until the first storms breach the estuary, which can happen in September, and it takes some time before adults would reach the impact area. Thus, steelhead adults and incubating eggs will likely not be present during the first storms of the season, although it is likely they will be present for storms occurring subsequently.

Effects during and after implementation are expected to be short-term, localized, and minor, because of the measures taken to minimize impacts. The work will take place between September 16 and October 14.

2. Capture and Relocation of Juvenile SONCC Coho Salmon and NC Steelhead

NMFS expects that most juvenile salmonids present during the time of excavation will likely avoid the site or flee before the activity begins. Remaining fish will be removed prior to excavation, and relocated to a suitable location immediately upstream of the work area. Qualified fishery biologists will use nets and/or electroshockers to capture and relocate listed fish, stressing some and increasing their risk of death or injury.

Electroshocking will be necessary if fish are observed escaping the nets. Electroshocking will be consistent with NMFS (2000) guidelines, minimizing potential negative effects to listed salmonids. Data from 2 years of fish relocation activities in Humboldt County associated with projects authorized by the U.S. Army Corps of Engineers indicate that mortality rates associated

with fish relocation range from one to three percent (Collins 2004). Consequently, NMFS expects less than three percent of all fry and juveniles present would die or be injured from both electroshocking and netting.

Fish relocation activities are conducted to minimize impacts to fry and juvenile coho salmon and steelhead by removing them from restoration project sites where they would likely experience high rates of injury and mortality. Fish relocation activities are anticipated to kill, injure, or impair a small number of rearing coho salmon and/or steelhead within a small stream reach at and near the restoration project site and relocation release site(s). Adverse effects resulting from capture and relocation activities include increased risk of predation, and expenditure of energy while escaping, which can result in less growth. Most of the harm to fish associated with fish relocation activities is anticipated to be non-lethal. However, a very low number of rearing (mostly YOY) coho salmon and/or steelhead captured would likely die or become injured.

Steelhead juveniles and fry, particularly the younger, smaller individuals, have a notably docile response to disturbance. They rely on nearby substrate for cover more than other salmonids (Chapman and Bjornn 1969, Everest and Chapman 1972). Steelhead juveniles and fry, and coho salmon juveniles and fry, are at risk of being trampled at riffle locations and along shallow channel margins, as workers attempt to net them for relocation. A portion of smaller juveniles would likely take cover within the gravel, and of those, a smaller portion would likely be crushed as workers walk in the stream attempting to capture them. NMFS' observations indicate that wading fishermen can crush juvenile salmonids hiding within gravel substrate. Therefore, NMFS believes that scaring, herding, or chasing smaller juveniles and fry effectively from the stream crossing ahead of equipment would likely be minimally effective. For example, Halligan (2002) documented the death by stranding of at least 48 steelhead fry during the May 29, 2002, berm construction operations for the Humboldt Bay Municipal Water District on the Mad River, despite significant efforts to herd fish to safer locations. Halligan (2002) observed steelhead fry readily using interstitial spaces between gravel and cobbles for cover and rescued many fish by turning over cobbles, capturing the fish, and moving them to the main flow. Larger juveniles are less prone to crushing from heavy equipment crossings as they can swim faster and do not tend to burrow into the substrate. Some of these juveniles will flee and encounter predators, resulting in mortality or injury.

A small number of steelhead and coho salmon juveniles and fry would likely die by workers trampling during crossing excavation and removal. Juveniles that do not escape or get captured before the stream is diverted will likely die if they become stranded.

3. Stream Crossing Removal and Associated Channel Excavation

Injury or death is expected to occur through the smothering or trapping of salmonid eggs and fry due to sediment deposition onto redds, and turbidity impacting the sight-feeding ability and other behavior of juvenile salmon and steelhead.

a. Fine Sediment Deposition onto Redds

Based on past experience, and corroborated by a RNSP geologist (Klein 2007), NMFS thinks sediment plumes from culvert removal projects would likely deposit approximately one-eighth mile downstream in low gradient, coastal streams. Redds constructed by any of the three listed species would likely be in the reach within an eighth-mile distance downstream of the stream crossing removal (Holden 2007). Both coho salmon and Chinook salmon have been documented spawning in this reach (Duffy 2007). Although surveys have not been conducted to determine if steelhead use the reach for spawning, it is suitable steelhead spawning habitat (Holden 2007).

Redds within an eighth-mile distance downstream of the project site will likely be impacted by sediment deposition during rain events in the first year after crossing removal. When suspended sediment deposits on redds, it suffocates or entombs incubating salmonid eggs or alevin, which reduces the egg-to-alevin survival (Sigler *et al.* 1984). An increase in fine sediment deposited in spawning gravel reduces interstitial water flow, leading to depressed dissolved oxygen concentrations, and physically trapping emerging fry in the gravel (Koski 1966, Tappel and Bjornn 1983). RNSP will be implementing minimization measures that will limit the amount of sediment that delivers into the creek.

Another factor limiting the impact of fine sediment on redds is the timing of spawning and the timing of the estuary being breached. If the first storms opening up the estuary berm also cause the excavation site to flush out of most of the sediment that will be mobilized, the amount of sediment mobilized into the action area during spawning will be less, and will be deposited on the channel substrate. Some of this will be cleaned when salmon and steelhead construct their redds. The closer redds are to the stream crossing removal, the more likely sediment will deposit on them, and in heavier concentrations than redds downstream. The heavier depositions of sediment will have a more pronounced adverse effect on redds closer to the project site. As the plume travels downstream, there will be less and less deposition, and less effects on redds, for up to an eighth-mile distance (Klein 2007). NMFS expects that most of the eggs and alevins of Chinook and coho salmon will die as a result of sediment deposition within up to four redds closest downstream of the culvert removal site.

b. Turbidity Impacts on Salmon and Steelhead Feeding, and Other Behaviors

Prairie Creek is known to have high water clarity at base flows in the winter, but exhibit turbidity during winter storms. The channel excavation would likely result in higher turbidities over baseline turbidity in Prairie Creek during subsequent storms (Klein 2007). Few juvenile salmonids would likely remain in the affected area because it is not preferred rearing habitat. Additionally, high turbidity during storms will likely cause juvenile and adult fish to move downstream to find less turbid water. The salmonids remaining in the impact area during storms within the first year after project implementation would likely suffer gill damage, reduced feeding and/or growth, or increased predation, resulting in injury or death.

Fish subjected to turbidity soon after emergence are likely to emigrate. The emigrants that do not secure suitable habitat in downstream areas, because of reduced visibility, or if it is occupied, are likely to not grow to as large a size as those fish that are not subjected to turbidity and

subsequently emigrate. Being a smaller size is likely to result in higher predation rates, and a lower likelihood of survival (Sigler *et al.* 1984). Because the outcome of aggressive encounters is usually decided by size, survival to smolt for smaller emigrants would probably be reduced (Chapman 1962 *op. cit.* Sigler *et al.* 1984). Lloyd *et al.* (1987) summarized 15 different effects of excessive sediment, including fatality, stress, altered behavior, and reductions in growth and abundance.

D. Effects on SONCC Coho Salmon, Chinook Salmon, and NC Steelhead Critical Habitat

Critical habitat elements such as water quality and substrate in the reach up to one-eighth of a mile downstream of the road crossing removal will be affected, primarily from turbidity and sedimentation occurring during the activity and immediately afterwards, and as the channel readjusts during storms for up to 1 year after excavation. Effects on salmonid habitat, which includes critical habitat, have been discussed earlier and are expected to include decreased spawning habitat quality and decreased water quality because of increased turbidity. In addition, access and use of the dewatered area will be precluded during the culvert removal. Effects are expected to be short lived because of the nature of the action.

VI. CUMULATIVE EFFECTS

Cumulative effects as defined in 50 CFR 402.02 are those effects of future State or private activities not involving Federal activities that are reasonably certain to occur within the action area considered in this Opinion. The entire action area lies within RNSP ownership. Therefore, there are no reasonably foreseeable future non-Federal actions that will affect Plan impacts.

VII. INTEGRATION AND SYNTHESIS OF THE EFFECTS

The preceding analyses focused on the expected effects from implementation of the Plan on listed anadromous salmonids and their designated critical habitats. This portion of the effects analysis summarizes this information for each species and considers the overall effects on the ESUs and DPS in the context of other activities occurring within the action area or influencing conditions within the action area (*Environmental Baseline* and *Cumulative Effects* sections). Most of the activities in the Plan will not affect listed salmonids, or have insignificant or discountable effects. Adverse effects are expected from the removal of the West Ridge Road crossing over Prairie Creek.

A. Effects on SONCC Coho Salmon ESU

Trampling a small number of coho salmon juveniles in Prairie Creek will likely occur during capture and relocation of fish just prior to the culvert removal activity. In addition, NMFS expects that no more than three percent of the total amount of juveniles and fry present in the vicinity of the stream crossing removal in Prairie Creek will likely be injured or die as a result of the capture and relocation activity. The coho salmon juveniles that escape capture or herding away from the site before Prairie Creek is diverted in preparation for the culvert removal will

likely strand and die. The few juveniles remaining in the impact area during storms within the first year after project implementation would likely suffer gill damage, reduced feeding and/or growth, or increased predation, resulting in injury or death. NMFS expects that the eggs and alevins of up to four Chinook or coho salmon redds in any combination within a distance of up to an eighth-mile downstream of the culvert removal site in Prairie Creek will likely be smothered or entombed during storms over the subsequent year following the culvert removal activity.

These low mortality rates are not expected to have a detectable effect on the Redwood Creek population of SONCC coho salmon. This is due to the fact that only a small portion of the Redwood Creek population of juveniles, eggs, and alevins over a small area (one-eighth of a mile) will be affected. The habitat effects will be temporary, and no project effects are expected to occur after the first year following the project completion. Based on the species life history and life stage survival rates, these losses are unlikely to result in appreciable losses to returning adults in Redwood Creek. Therefore, the slight reduction in juvenile coho salmon numbers in Redwood Creek is not expected to reduce the numbers, reproduction, or distribution that appreciably reduces their likelihood of survival or recovery in the wild.

B. Effects on the CC Chinook Salmon ESU

NMFS expects that the eggs and alevins of up to four Chinook and coho salmon redds in any combination within a distance of up to an eighth-mile downstream of the culvert removal site in Prairie Creek will likely be smothered or entombed during storms over the subsequent year following the culvert removal activity. This low mortality rate are not expected to have a detectable effect on the Redwood Creek population of CC Chinook salmon. This is due to the fact that only a small portion of the Redwood Creek population of eggs and alevins over a small area (one-eighth of a mile) will be affected. The habitat effects will be temporary, and no project effects are expected to occur after the first year following the project completion. Based on the species life history and life stage survival rates, these losses are unlikely to result in appreciable losses to returning adults in Redwood Creek. Therefore, the slight reduction in juvenile Chinook salmon numbers in Redwood Creek is not expected to reduce the numbers, reproduction, or distribution that appreciably reduces their likelihood of survival or recovery in the wild.

C. Effects on the NC Steelhead DPS

Trampling of a small amount of steelhead juveniles in Prairie Creek will likely occur during capture and relocation of fish just prior to the culvert removal activity. In addition, NMFS expects that no more than three percent of the total amount of juveniles and present in the vicinity of the stream crossing removal in Prairie Creek will be injured or die as a result of the capture and relocation activity. A small number of individual steelhead juveniles will likely strand and die if they are not captured or scared off before Prairie Creek is diverted in preparation for the culvert removal. The few juveniles remaining in the impact area during storms within the first year after project implementation would likely suffer gill damage, reduced feeding and/or growth, or increased predation, resulting in injury or death.

These low mortality rates are not expected to have a detectable effect on the Redwood Creek population of NC steelhead. This is due to the fact that only a small portion of the Redwood

Creek population of juveniles over a small area (one-eighth of a mile) will be affected. The effects will be temporary, and no habitat effects are expected to occur after the first year following the project completion. Based on the species life history and life stage survival rates, these losses are unlikely to result in appreciable losses to returning adults in Redwood Creek. Therefore, the slight reduction in juvenile steelhead numbers in Redwood Creek is not expected to reduce the numbers, reproduction, or distribution that appreciably reduces their likelihood of survival or recovery in the wild.

D. Effects on SONCC Coho Salmon, CC Chinook Salmon, and NC Steelhead Critical Habitat

Implementation of the Plan will result in minor, short-term negative effects to SONCC coho salmon, CC Chinook salmon, and NC steelhead critical habitat. Primarily, spawning habitat will likely experience a short-term decrease in quality within an eighth-mile of the stream crossing removal for up to a year following the action. Space for individual growth will be impacted when redds become clogged with sediment, reducing oxygen for developing embryos. Rearing areas will be reduced in quality when turbidity causes impacts, as mentioned above. Dewatering will preclude use or access to the critical habitat during that time, which will be a short-term, temporary effect.

Since we do not expect more than a slight decline in habitat quantity or quality, and since we expect this slight decline to be of short duration, the conservation value of the three listed species' critical habitat will not be appreciably diminished.

VIII. CONCLUSION

After reviewing the best available information, current status of SONCC coho salmon, CC Chinook salmon, NC steelhead, and their designated critical habitats, the environmental baseline, the anticipated effects of the Plan, and the cumulative effects, it is NMFS' biological opinion that implementation of the Plan, as proposed, is not likely to jeopardize the continued existence of SONCC coho salmon, CC Chinook salmon, or NC steelhead, and is not likely to destroy or adversely modify SONCC coho salmon, CC Chinook salmon or NC steelhead designated critical habitat.

IX. INCIDENTAL TAKE STATEMENT

Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by NMFS as an act which kills or injures fish or wildlife. Such an act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2) of the ESA, taking that is incidental to and not intended as part of the agency action is not considered to be

prohibited taking under the ESA provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are non-discretionary, and must be undertaken by RNSP so that they become binding conditions of any grant, permit or contract issued for Plan implementation, as appropriate, for the exemption in section 7(o)(2) to apply. RNSP has a continuing duty to regulate the activity covered by this Incidental Take Statement. If RNSP (1) fails to assume and implement the terms and conditions; or (2) fails to require contractors, grantees, or permittees to adhere to the terms and conditions of the Incidental Take Statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, RNSP must report the progress of the action and its impact on the species to NMFS as specified in the Incidental Take Statement [50 CFR 402.14(i)(3)].

A. Amount or Extent of Take Anticipated

NMFS anticipates that the culvert removal on Prairie Creek will result in incidental take of SONCC coho salmon juveniles, eggs, and alevin, CC Chinook salmon eggs and alevin, and NC steelhead juveniles. Based on known low mortality rates for relocation efforts and the small number of salmonids expected in the impact area, NMFS anticipates a small number, and no more than three percent, of juvenile SONCC coho salmon and NC steelhead present to be harmed or killed during the capture and relocation efforts. NMFS expects that only a few juvenile SONCC coho salmon and NC steelhead present would be killed or injured from stranding following stream dewatering and diversion. NMFS expects that most of the eggs and alevins of up to four Chinook and coho salmon redds will be subject to harm or death from sedimentation after the crossing removal and during the first few storms. NMFS also expects a few individuals of each of the three listed species to be injured or suffer mortality resulting from the increased turbidity within a one-eighth mile reach downstream on Prairie Creek. The take of listed salmonids will be difficult to detect because finding a dead or injured salmonid is unlikely, as the species occur in habitat that makes such detection difficult. Therefore, anticipated incidental take may be exceeded if the Project is not implemented as described in this Opinion, as described above, or if the Project is not in compliance with the terms and conditions of this Incidental Take Statement.

B. Effect of the Take

In the Opinion, NMFS determined that this level of anticipated take is not likely to jeopardize the continued existence of SONCC coho salmon, CC Chinook salmon, or NC steelhead.

C. Reasonable and Prudent Measures

NMFS believes that the following reasonable and prudent measure is necessary and appropriate to minimize take of SONCC coho salmon, NC steelhead, and CC Chinook resulting from the Plan.

RNSP shall take measures to reduce and monitor injury and mortality to listed salmonids associated with dewatering, relocation, and construction activities.

D. Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the ESA, RNSP and their designee(s) must comply with the following terms and conditions, which implement the reasonable and prudent measure described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary.

The following terms and conditions implement the Reasonable and Prudent Measure.

1. Multiple passes with the electroshocker shall be utilized to ensure maximum capture success.
2. All captured fish shall be held in water with temperatures not greater than ambient in-stream temperatures. If cooling is used, water temperatures shall not be allowed to cool more than 41° Fahrenheit (5° Celsius) below ambient in-stream temperatures. All captured fish shall be held in well oxygenated water, with a dissolved oxygen level of 7 parts per million or greater. Prior to release, the following information shall be recorded: (1) number of fish by species; (2) visual determination of age of listed salmonids (*e.g.*, fry, 1+, or 2+ juvenile); (3) number of injuries and mortalities by age class and species; (4) length of time fish held, and (5) date and time of release to the relocation site. Listed salmonids shall be subject to minimal handling and holding. All captured fish shall be allowed to recover from electroshocking and other capture gear before returned to the stream.
3. In order to monitor the impact of incidental take associated with fish relocation activities, RNSP shall submit a report to NMFS Arcata Area Office prior to December 1 of the year in which the stream crossing removal is completed. The report shall include: (1) the names and qualifications of biologists who conducted capture and relocation activities, (2) information outlined in Term and Condition 1b above, (3) any other relevant information regarding fish injuries or mortalities, (4) the extent of the area dewatered and duration of dewatering, and (5) water and air temperatures at the beginning and end of the fish relocation effort. The report shall be sent to:

NMFS-Arcata Area Office
Attn: Irma Lagomarsino
1655 Heindon Road
Arcata, CA 95521-4573

4. All listed salmonid mortalities shall be retained, placed in a sealed plastic bag, labeled with the date and time of collection, fork length, location of collection, and frozen as soon as possible. Frozen samples shall be retained until specific instructions are provided by NMFS.

X. Conservation Recommendations

Section 7(a)(1) of the ESA directs Federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of threatened and endangered species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

NMFS thinks the following conservation recommendation are consistent with these obligations, and therefore should be implemented by RNSP:

1. RNSP should monitor the north ford crossing on Mill Creek to determine if coho salmon are present and at risk of being injured or killed by horses or people crossing Mill Creek at this location. RNSP fisheries biologists should monitor the north ford of Mill Creek no sooner than a week before March 31, and continue on a weekly basis until approximately May 31, to determine if redds are present below the crossing, and also to determine if coho salmon juveniles are present at this location. If redds are detected downstream of the crossing, a path should be set up downstream of the redds using ropes to guide horses and people through the stream. This path should be monitored at least weekly to determine if redds continue to be absent, and to maintain the path.

XI. REINITIATION OF CONSULTATION

This concludes formal consultation on the Plan. As provided in 50 CFR 402.16, re-initiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded, (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this Opinion, (3) the agency action is subsequently modified in a manner that causes an effect on listed species or critical habitat not considered in this Opinion, or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount of incidental take is exceeded, formal consultation shall be reinitiated immediately.

XII. LITERATURE CITED

Section 7(a)(2) of the ESA requires biological opinions to be based on “the best scientific and commercial data available.” This section of the Opinion identifies the data, information, and references used in developing this Opinion.

Adams, P. 2000. Memorandum to Rodney McInnis: Status review update for the steelhead Northern California Evolutionarily Significant Unit. National Marine Fisheries Service, Southwest Fisheries Science Center, Santa Cruz/Tiburon Laboratory, Tiburon, California.

- Anderson, D. G. 1988. Juvenile salmonid habitat of the Redwood Creek Basin. Humboldt County, California. M. S. Thesis, Humboldt State University. Arcata, California.
- Anderson, D. G. 1997. Redwood Creek estuary annual monitoring report. Redwood National and State Parks, National Park Service, Orick, California.
- Anderson, D. G. 2002. 2001 Redwood Creek Estuary Annual Monitoring Report. Redwood National and State Parks, National Park Service, Orick, California. 47 p.
- Anderson, D. G. 2005. 2005 Redwood Creek Summer Steelhead Survey. Redwood National and State Parks, National Park Service, Orick, California.
- Anderson, D. G. 2006. Personal communication. Fisheries Biologist, Redwood National and State Parks, National Park Service, Orick, California.
- Anderson, D. G., and R. A. Brown. 1982. Anadromous salmonid nursery habitat in the Redwood Creek watershed. *In* Biennial Conference of Research in California's National Parks, p. 225-229. Proceedings, Davis, California.
- Barnhart, R. A. 1986. Species profiles: Life histories and environmental requirements of coastal fishes and invertebrates (Pacific Southwest)--steelhead. U.S. Fish and Wildlife Service Biological Report 82(11.60). 21 p.
- Bartson, A. P. 1997. Restoration strategy for the fisheries of the Smith River (Draft). Institute for River Ecosystems, Humboldt State University, Arcata, California. 96 p.
- Behnke, R. J. 1992. Native trout of western North America. American Fisheries Society Monograph 6. American Fisheries Society, Bethesda, Maryland.
- Bell, E. 2001. Survival, growth and movement of juvenile coho salmon (*Oncorhynchus kisutch*) over wintering in alcoves, backwaters, and main channel pools in Prairie Creek, California. M.S. Thesis, Humboldt State University, Arcata, California.
- Bell, M. C. 1990. Fisheries handbook of engineering requirements and biological criteria. Third edition. U.S. Army Corps of Engineers, Office of the Chief of Engineers, Fish Passage Development and Evaluation Program, North Pacific Division, Portland, Oregon.
- Bensen, K. 2006. Electronic mail to Allen Taylor, National Marine Fisheries Service, requesting a suspension of consultation due to terrestrial threatened and endangered species issues. Fish and Wildlife Biologist, Redwood National and State Parks, National Park Service, Orick, California. January 10.
- Bensen, K. 2006a. Personal communication. Fish and Wildlife Biologist, Redwood National and State Parks, National Park Service, Orick, California.

- Bensen, K. 2007. Personal communication. Fish and Wildlife Biologist, Redwood National and State Parks, National Park Service, Orick, California.
- Bjorkstedt, E. P., B. C. Spence, J. C. Garza, D. G. Hankin, D. Fuller, W. E. Jones, J. J. Smith, and R. Macedo. 2005. An analysis of historical population structure for evolutionarily significant units of Chinook salmon, coho salmon, and steelhead in the north-central California Coast recovery domain. NOAA-TM-NMFS-SWFSC-382. October. 195 p. plus 15 plates.
- Bjornn, T. C. and D. W. Reiser. 1991. Habitat requirements of salmonids in streams. *In* W. R. Meehan (Editor), *Influences of Forest and Rangeland Management on Salmonid Fishes and Their Habitats*, p. 83-138. American Fisheries Society Special Publication 19. Bethesda, Maryland.
- Brown, L. R., P. B. Moyle, and R. M. Yoshiyama. 1994. Historical decline and current status of coho salmon in California. *North American Journal of Fisheries Management* 14:237-261.
- Brown, R. A. 1988. Physical rearing habitat for anadromous salmonids in the Redwood Creek Basin, Humboldt County, California. M. S. Thesis, Humboldt State University, Arcata, CA.
- Burgner, R. L., J. T. Light, L. Margolis, T. Okazaki, A. Tautz, and S. Ito. 1992. Distribution and origins of steelhead trout (*Oncorhynchus mykiss*) in offshore waters of the North Pacific Ocean. *International Northern Pacific Fisheries Commission Bulletin* 51.
- Busby, P. J., T. C. Wainwright, G. J. Bryant, L. J. Lierheimer, R. S. Waples, F. W. Waknitz, and I. V. Lagomarsino. 1996. Status review of west coast steelhead from Washington, Idaho, Oregon, and California. National Marine Fisheries Service, Northwest Fisheries Science Center Technical Memorandum -27, Seattle, Washington.
- California Advisory Committee on Salmon and Steelhead Trout. 1988. Restoring the balance. California Department of Fish and Game, Annual Report 124-J. Sacramento, California.
- California Department of Fish and Game. 1965. California Fish and Wildlife Plan, Vol. I: Summary, 110 p.; Vol. II: Fish and Wildlife Plans, 216 p. Vol. III: Supporting Data, 180 p. Sacramento, California.
- California Department of Fish and Game. 1994. Petition to the California Board of Forestry to list coho salmon (*Oncorhynchus kisutch*) as a sensitive species. California Department of Fish and Game Report. Sacramento, California. 35 p.
- California Department of Fish and Game. 1998. A report to the Fish and Game Commission: A status review of the spring-run (*Oncorhynchus tshawytscha*) in the Sacramento River drainage. Candidate Species Status Report 98-01. June.
- California Department of Fish and Game. 2002. Status Review of California Coho Salmon North of San Francisco: Report to the California Fish and Game Commission. April.

- California State Lands Commission. 1993. California's rivers, a public trust report. 304 p.
- Cannata, S., R. Henly, J. Erler, J. Falls, D. McGuire and J. Sunahara. 2006. Redwood Creek Watershed Assessment Report. Coastal Watershed Planning and Assessment Program and North Coast Watershed Assessment Program. California Resources Agency and California Environmental Protection Agency, Sacramento, California.
- Chapman, D. W. 1962. Aggressive behavior in juvenile coho salmon as a cause of emigration. *J. Fish. Res. Board Can.* 19: 1047-1080.
- Chapman, D. W., and T. C. Bjornn. 1969. Distribution of salmonids in streams, with special reference to food and feeding. *In* T. G. Northcote (Editor), *Symposium on Salmon and Trout in Streams*, p. 153 - 176. H. R. Macmillan Lectures in Fisheries. Institute of Fisheries, University of British Columbia, Vancouver, British Columbia.
- Collins, B.W. 2004. Report to the National Marine Fisheries Service for Instream Fish Relocation Activities associated with Fisheries Habitat Restoration Program Projects Conducted Under Department of the Army (Permit No. 22323N) within the United States Army Corps of Engineers, San Francisco District During 2002 and 2003. California Department of Fish and Game, Northern California and North Coast Region. Fortuna, California. March 24.
- Downie, S. T., C. W. Davenport, E. Dudik, F. Yee, and J. Clements. 2002. Mattole River Watershed Assessment Report. North Coast Watershed Assessment Program. California Resources Agency and California Environmental Protection Agency, Sacramento, California. 441 p. plus appendices.
- Duffy, W. 2007. Personal communication. Ph.D., California Coop Fish Research Unit, Humboldt State University, Arcata, California. January 22.
- Everest, F. H. 1973. Ecology and management of summer steelhead in the Rogue River. Oregon State Game Commission Fisheries Resource Report No. 7, Corvallis, Oregon.
- Everest, F. H. and D. W. Chapman. 1972. Habitat selection and spatial interaction by juvenile Chinook salmon and steelhead trout in two Idaho streams. *Journal of the Fisheries Research Board of Canada* 29:91-100.
- Fisher, J. P., W. G. Pearcy, and A. W. Chung. 1984. Studies of juvenile salmonids off the Oregon and Washington coast, 1983. Oregon State Univ. Coll. Oceanogr. Cruise Rep. 84-2; Oregon State Univ. Sea Grant Coll. Program ORESU-T-85-004. 29 p.
- Gerstung, E. R. 2001. The status and management of summer steelhead in Redwood Creek – Draft. Department of Fish and Game, Sacramento, California.

- Giger, R. D. 1973. Streamflow requirements of salmonids. Oregon Wildlife Commission, Job Final Report, Project AFS-62-1. Portland, Oregon.
- Godfrey, H. 1965. Coho salmon in offshore waters. *In* Salmon of the North Pacific Ocean. Part IX. Coho, Chinook, and masu salmon in offshore waters, p. 1-39. International North Pacific Fisheries Commission, Bulletin 16.
- Good, T. P., R. S. Waples, and P. Adams (editors). 2005. Updated status of federally listed ESUs of West Coast salmon and steelhead. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-66. 598 p.
- Groot, C., L. Margolis, and W. C. Clarke. 1995. Physiological Ecology of Pacific Salmon. UBC Press, Vancouver, British Columbia, Canada.
- Halligan, D. 1997. Final Report on the results of the 1996 fisheries monitoring program on the Trinity and lower Mad, Eel, and Van Duzen Rivers. Natural Resources Management Corporation, 1434 Third Street, Eureka, California 95501. 30 p. plus appendices. January 15.
- Halligan, D. 1998. Final Report, 1997 Fisheries monitoring program for gravel extraction operations on the Mad, Van Duzen, and Trinity Rivers. Natural Management Corporation, 1434 Third Street, Eureka, California 95501. 24 p. plus appendices. January 5.
- Halligan, D. 1999. Final Report, 1998 Fisheries monitoring program for gravel extraction operations on the Mad, Van Duzen, and Trinity Rivers. Natural Management Corporation, 1434 Third Street, Eureka, CA 95501. 20 p. plus appendices. January 6.
- Halligan, D. 2002. Humboldt Bay Municipal Water District 2002 Essex Berm Construction Biological Inspection. Natural Resources Management Corporation. June 3.
- Hallock, R. J., G. H. Warner, and D. H. Fry, Jr. 1952. California's part in a three-state salmon fingerling marking program. California Department of Fish and Game 38 (3):301-332.
- Hassler, T. J. 1987. Species profiles: Life histories and environmental requirements of coastal fishes and invertebrates (Pacific Southwest)--coho salmon. U.S. Fish and Wildlife Service Biological Report 82(11.70). 19 p.
- Healey, M. C. 1991. The life history of Chinook salmon (*Oncorhynchus tshawytscha*). *In* C. Groot and L. Margolis (Editors), Life history of Pacific salmon, p. 213-393. University of British Columbia Press. Vancouver, British Columbia, Canada.
- Heifetz, J., M. L. Murphy, and K. V. Koski. 1986. Effects of logging on winter habitat of juvenile salmonids in Alaska streams. North American Journal of Fisheries Management 6:52-58.

- Higgins, P., S. Dobush, and D. Fuller. 1992. Factors in northern California threatening stocks with extinction. Unpublished manuscript, Humboldt Chapter American Fisheries Society, 24 p. Available from Humboldt Chapter of the American Fisheries Society, P.O. Box 210, Arcata, California 95521.
- Holden, B. 2007. Personal communication. Fisheries Biologist, Redwood National and State Parks, National Park Service, Orick, California.
- Hopelain, J. S. 1998. Age, growth, and life history of Klamath River Basin steelhead trout (*Oncorhynchus mykiss irideus*) as determined from scale analysis. Department of Fish and Game, Inland Fisheries Division. Sacramento, California.
- Howard, C. 1999. Chinook and coho salmon spawning escapement estimates for Rock Creek and Mill Creek. Fifth Interim Report 1993/94 - 1998/99) for Stimson Lumber Company.
- Janda, R. J., K. M. Nolan, D. R. Harden, and S. M. Colman. 1975. Watershed conditions in the drainage basin of Redwood Creek. Humboldt County, California: U.S. Geological Survey Open-File Report 75-568. 266 p.
- Jensen, A. 2000. Final Report, 1999 fisheries monitoring program for gravel extraction operations on the Mad, Van Duzen, and Trinity rivers. Natural Management Corporation, 1434 Third Street, Eureka, California 95501. 42 p. plus appendices. January 13.
- Kesner, W. D. and R. A. Barnhart. 1972. Characteristics of the fall-run steelhead trout (*Salmo gairdneri gairdneri*) of the Klamath River system with emphasis on the half-pounder. California Fish and Game 58(3):204-220.
- Kjelson, M. A., P. F. Raquel, and F. W. Fisher. 1982. Life history of fall juvenile Chinook salmon, *Oncorhynchus tshawytscha*, in the Sacramento-San Joaquin estuary, California. In V. S. Kennedy (Editor), Estuarine Comparisons, p. 393-411. Academic Press, New York, New York.
- Klein, R. 2007. Personal communication. Geologist, Redwood National and State Parks, National Park Service, Arcata, California.
- Koski, K. V. 1966. The survival of coho salmon (*Oncorhynchus kisutch*) from egg deposition to emergence in three Oregon coastal streams. Master's thesis. Oregon State University, Salem, Oregon. 98 p.
- Leidy, R. A. and G. R. Leidy. 1984. Life stage periodicities of anadromous salmonids in the Klamath River Basin, northwest California. U.S. Fish and Wildlife Service, Division of Ecological Services. Sacramento, California.
- Lister, D. B., C. E. Walker, and M. A. Giles. 1971. Cowichan River chinook salmon escapement and juvenile production 1965-1967. Canadian Fish. Serv. 8 p.

- Lloyd, D. S., J. P. Koenings, and J. D. Laperriere. 1987. Effects of turbidity in fresh waters of Alaska. *North American Journal of Fisheries Management* 7:18-33.
- Madej, M. A., C. Currens, V. Ozaki, J. Yee, and D. G. Anderson. 2006. Assessing possible thermal rearing restrictions for juvenile coho salmon (*Oncorhynchus kisutch*) through thermal infrared imaging and in-stream monitoring, Redwood Creek, California. *Can. J. Fish. Aquat. Sci.* 63:1384-1396.
- McElhany, P., M. H. Ruckelshaus, M. J. Ford, T. C. Wainwright, and E. P. Bjorkstedt. 2000. Viable salmonid populations and the recovery of evolutionarily significant units. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-42. 156 p.
- McEwan, D. and T. A. Jackson. 1996. Steelhead Restoration and Management Plan for California. California Department of Fish and Game, Sacramento, California.
- Meehan, W. R. and T. C. Bjornn. 1991. Salmonid distributions and life histories. In W. R. Meehan (Editor), *Influences of Forest and Rangeland Management on Salmonid Fishes and Their Habitats*, p. 47-82. American Fisheries Society Special Publication 19, Bethesda, Maryland. 751 p.
- Meffe, G. K. 1986. Conservation genetics and the management of endangered fishes. *Fisheries* 11:14-23.
- Miller, R. J., and E. L. Brannon. 1982. The origin and development of life-history patterns in Pacific Salmon. In E. L. Brannon and E.O. Salo, (Editors), *Proceedings of the Salmon and Trout Migratory Behavior Symposium*, p. 296-309. University of Washington Press. Seattle, Washington.
- Mills, T. J., D. McEwan, and M. R. Jennings. 1997. California Salmon and Steelhead: Beyond the Crossroads. In D. Stouder, P. A. Bisson, and R. J. Naiman (Editors), *Pacific salmon and their ecosystems: status and future options*, p. 91-111. Chapman and Hall, New York, New York.
- Moyle, P. B., R. M. Yoshiyama, J. E. Williams, and E. D. Wikramanayake. 1995. Fish species of special concern in California. University of California. Davis, California.
- Mundie, J. H. 1969. Ecological implications of the diet of juvenile coho in streams. In Northcote, T. J. (Editor), *Symposium on salmon and trout in streams*. H. R. MacMillan Lectures in Fisheries, p. 135 - 152. University of British Columbia, Institute of Fisheries, Vancouver, British Columbia, Canada.
- Murphy, G. I. and L. Shapovalov. 1951. A preliminary analysis of California salmon and steelhead runs. *Calif. Fish Game* 37(4):497-507.
- Myers, J. M, R. G. Kope, G. J. Bryant, D. Teel, L. J. Lierheimer, T. C. Wainwright, W. S. Grant, F. W. Waknitz, K. Neely, S. T. Lindley, and R. S. Waples. 1998. Status review of Chinook

- salmon from Washington, Idaho, Oregon, and California. U.S. Department Of Commerce, NOAA Technical Memorandum NMFS-NWFSC-35.
- National Marine Fisheries Service. 1996. Status Update of West Coast Coho Salmon. Northwest Fisheries Science Center, Seattle, Washington.
- National Marine Fisheries Service. 1997. Review of the status of Chinook salmon (*Oncorhynchus tshawytscha*) from Washington, Oregon, California, and Idaho under the U.S. Endangered Species Act. West Coast Salmon Biological Review Team, December 17.
- National Marine Fisheries Service. 2000. Guidelines for Electrofishing Waters Containing Salmonids Listed Under the Endangered Species Act. June.
- National Marine Fisheries Service. 2001. Water-Drafting Specifications. NMFS, Southwest Region, Long Beach, California.
- Nehlsen, W., J. E. Williams, and J. A. Lichatowich. 1991. Pacific salmon at the crossroads: stocks at risk from California, Oregon, Idaho, and Washington. Fisheries 16(2):4-21.
- Nicholas, J. W., and D. G. Hankin. 1989. Chinook salmon populations in Oregon coastal river basins: Description of life histories and assessment of recent trends in run strengths. Ore. Dep. Fish Wildl., Fish. Div. Info. Rep., No. 88-1. 359 p.
- Nickelson, T. E., J. W. Nicholas, A. M. McGie, R. B. Lindsay, D. L. Bottom, R. J. Kaiser, and S. E. Jacobs. 1992 (unpublished). Status of anadromous salmonids in Oregon coastal basins. Oregon Dept. Fish Wildl., Research and Development Section, Corvallis, and Ocean Salmon Management. Newport, Oregon.
- Norse, E. A. 1990. Ancient forests of the Pacific Northwest. Washington, DC: Island Press. 314 p.
- Redwood National and State Parks. 2003. Letter to California Fish and Game Commission. July 21.
- Redwood National and State Parks. 2006. A Biological Assessment of Impacts to Threatened Anadromous Salmonids from the Trail and Backcountry Management Plan in Redwood National and State Parks (RNSP). August 22.
- Reeves, G. H., F. H. Everest, and J. D. Hall. 1987. Interactions between the redbside shiner (*Richardsonius balteatus*) and the steelhead trout (*Salmo gairdneri*) in western Oregon: the influence of water temperature. Canadian Journal of Fisheries and Aquatic Sciences 44:1603-1613.
- Reimers, P. E. 1973. The length of residence of juvenile fall chinook salmon in the Sixes River, Oregon. Oregon Fish Comm. 4, 2-43 p.

- Rich, A. A. 1997. Testimony of Alice A. Rich, Ph.D., regarding water rights applications for the Delta Wetlands Project, proposed by Delta Wetlands Properties for Water Storage on Webb Tract, Bacon Island, Bouldin Island, and Holland Tract in Contra Costa and San Joaquin Counties. California Department of Fish and Game Exhibit DFG-7. Submitted to State Water Resources Control Board.
- Sandercock, F. K. 1991. Life history of coho salmon. In C. Groot and L. Margolis (Editors), Pacific salmon life histories, p. 397-445. University of British Columbia Press, Vancouver, British Columbia, Canada.
- Schiewe, M. H. 1997. Memorandum to W. Stelle and W. Hogarth. Conclusions regarding the updated status of coho salmon from Northern California and Southern Oregon Coasts. National Marine Fisheries Service, Northwest Fisheries Science Center. Seattle, Washington.
- Schiewe, M. H. 1997a. Memorandum to W. Stelle and W. Hogarth. Status of deferred and candidate ESUs of West Coast steelhead. National Marine Fisheries Service, Northwest Fisheries Science Center. Seattle, Washington.
- Shapovalov, L. and A. C. Taft. 1954. The life histories of the steelhead rainbow trout (*Salmo gairdneri gairdneri*) and silver salmon (*Oncorhynchus kisutch*) with special reference to Waddell Creek, California, and recommendations regarding their management. California Department of Fish and Game, Fisheries Bulletin 98.
- Sigler, J. W., T. C. Bjornn, and F. H. Everest. 1984. Effects of chronic turbidity on density and growth of steelheads and coho salmon. Transactions of the American Fisheries Society. 113:142-150.
- Smith, A. K. 1973. Development and application of spawning velocity and depth criteria for Oregon salmonids. Transactions of the American Fisheries Society 102(2):312-316.
- Snyder, J. O. 1925. The half-pounder of Eel River, a steelhead trout. California Fish and Game 11(2):49-55.
- Sparkman, M. D. 2003. Annual Report: Upper Redwood Creek juvenile salmonid downstream migration study, 2000-2003 seasons. California Department of Fish and Game, 2004, Project 2a5.
- Sparkman, M. D. 2005. Lower Redwood Creek juvenile salmonid (smolt) downstream migration study, 2004-2005 seasons. California Department of Fish and Game, Anadromous Fisheries Resource Assessment Monitoring Program. Project 2a7. 111 p.
- Sparkman, M. D. 2005a. Upper Redwood Creek juvenile salmonid (smolt) downstream migration study, 2000-2005 seasons. California Department of Fish and Game, Anadromous Fisheries Resource Assessment Monitoring Program. Project 2a5. 114 p.

- Sparkman, M. D. 2006. Lower Redwood Creek juvenile salmonid (smolt) downstream migration study, study year 2005. California Department of Fish and Game, Anadromous Fisheries Resource Assessment Monitoring Program, Project 2a7, 2005 Annual Report. 105 p.
- Sparkman, M. D. 2007. Personal communication. Fisheries Biologist. CDFG, Anadromous Fisheries Resource Assessment and Monitoring Program. Arcata, California.
- Tappel, P. D. and T. C. Bjornn. 1983. A new method of relating size of spawning gravel to salmonid embryo survival. *North American Journal of Fisheries Management* 3:123-135.
- Taylor, G. and R. Barnhart. 1997. Mortality of angler caught and released summer steelhead. California Cooperative Fishery Research Unit and Humboldt State University Foundation. Contract Number FG 5018 IF. California Department of Fish and Game Steelhead Trout Catch Report - Restoration Card.
- Thompson, K. 1972. Determining stream flows for fish life. *In* Proceedings, instream flow requirements workshop, p. 31 - 50. Pacific Northwest River Basins Commission, Vancouver, Washington.
- U.S. Department of Agriculture – Forest Service. 1995. Ecosystem Analysis of the Smith River at the Basin and Subbasin Scales. Smith River National Recreation Area, Six Rivers National Forest.
- U.S. Environmental Protection Agency. 1998. Total Maximum Daily Load for Sediment, Redwood Creek. U.S. Environmental Protection Agency, Region IX. San Francisco, California. 73 p.
- Velson, F. P. 1987. Temperature and incubation in Pacific salmon and rainbow trout, a compilation of data on median hatching time, mortality, and embryonic staging. Canadian Data Report of Fisheries and Aquatic Sciences, No. 626.
- Voight, H. and J. Waldvogel. 2002. Smith River Anadromous Fish Action Plan (SRAFAP). Smith River Advisory Council and California Department of Fish and Game Contract #P9985009.
- Wahle, R. J. and R. E. Pearson. 1987. A listing of Pacific coast spawning streams and hatcheries producing Chinook and coho salmon with estimates on numbers of spawners and data on hatchery releases. U.S. Dept. of Commer. NOAA Tech. Memo. NMFS F/NWC-122.
- Weatherley, A. H. and H. S. Gill. 1995. Growth. *In* C. Groot, L. Margolis, and W. C. Clarke (Editors), *Physiological Ecology of Pacific Salmon*, p. 101-158. UBC Press, Vancouver, British Columbia, Canada.
- Weitkamp, L. A., T. C. Wainwright, G. J. Bryant, G. B. Milner, D. J. Teel, R. G. Kope, and R. S. Waples. 1995. Status review of coho salmon from Washington, Oregon, and California.

U.S. Dep. Commer., NOAA Tech Memo. NMFS-NWFSC-24. Northwest Fisheries Science Center, Seattle, Washington.

Williams, T. H., E. P. Bjorkstedt, W. G. Duffy, D. Hillemeier, G. Kautsky, T. E. Lisle, M. McCain, M. Rode, R. G. Szerlong, R. S. Schick, M. N. Goslin, and A. Agrawal. 2006. Historical population structure of coho salmon in the southern Oregon/Northern California Coasts Evolutionarily Significant Unit. NOAA-TM-NMFS-SWFSC-390. 85 p.

Withler, I. L. 1966. Variability in life history characteristics of steelhead trout (*Salmo gairdneri*) along the Pacific coast of North America. Journal of the Fisheries Research Board of Canada 23:365-393.

A. Federal Register Notices Cited

64 FR 24049. National Marine Fisheries Service. Designated Critical Habitat; Central California Coast and Southern Oregon/Northern California Coasts Coho Salmon. May 5, 1999.

64 FR 50394. National Marine Fisheries Service. Endangered and Threatened Species: Threatened Status for Two Chinook Salmon Evolutionarily Significant Units (ESUs) in California. September 16, 1999.

65 FR 36074. National Marine Fisheries Service. Endangered and Threatened Species: Threatened Status for One Steelhead Evolutionarily Significant Unit (ESU) in California. June 7, 2000.

69 FR 71880. National Marine Fisheries Service. Endangered and Threatened Species: Designation of Critical Habitat for Seven Evolutionarily Significant Units of Pacific Salmon (*Oncorhynchus tshawytscha*) and Steelhead (*O. mykiss*) in California. December 10, 2004.

70 FR 37160. National Marine Fisheries Service. Final Rule. Endangered and Threatened Species: Final Listing Determinations for 16 ESUs of West Coast Salmon, and Final 4(d) Protective Regulations for Threatened Salmonid ESUs. June 28, 2005.

70 FR 52488. National Marine Fisheries Service. Final Rule. Endangered and Threatened Species: Designation of Critical Habitat for Seven Evolutionarily Significant Units of Pacific Salmon and Steelhead in California. September 2, 2005.

71 FR 834. National Marine Fisheries Service. Final Rule. Endangered and Threatened Species: Final Listing Determinations for 10 Distinct Population Segments of West Coast Steelhead. January 5, 2006.

Magnuson-Stevens Fishery Conservation and Management Act

**ESSENTIAL FISH HABITAT CONSULTATION AND
CONSERVATION RECOMMENDATIONS**

The 1996 amendments to the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) set forth new mandates for NOAA's National Marine Fisheries Service (NMFS), regional fishery management councils, and Federal action agencies to identify and protect important marine and anadromous fish habitat. The Councils, with assistance from NMFS, are required to delineate "essential fish habitat" (EFH) in fishery management plans (FMPs) or FMP amendments for all managed species. Federal action agencies which fund, permit, or carry out activities that may adversely affect EFH are required to consult with NMFS regarding potential adverse effects of their actions on EFH, and respond in writing to NMFS' conservation recommendations. In addition, NMFS is required to comment on any state agency activities that would impact EFH.

Identification of Essential Fish Habitat

Essential fish habitat is defined in the MSFCMA as "...those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity..." NMFS regulations further define "waters" to include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate; "substrate" to include sediment, hard bottom, structures underlying the waters, and associated biological communities; "necessary" to mean the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and "spawning, breeding, feeding, or growth to maturity" to cover a species' full life cycle (50 CFR 600.10).

The Pacific Fishery Management Council (PFMC) has delineated EFH for Pacific Coast Salmon (PFMC 1999). Chinook salmon (*Oncorhynchus tshawytscha*) and coho salmon (*O. kisutch*) from the Pacific Coast Salmon FMP occur within the action area of the preceding biological opinion.

Proposed Action

The Trails and Backcountry Management Plan (Plan) is detailed in the *Description of the Proposed Action* section of the associated biological opinion. In general, Redwood National and State Parks proposes to convert West Ridge Road to a trail, and restore the crossing over Prairie Creek by removing one culvert. The Plan also includes: approximately 35.3 miles of new hiking trails, approximately 10 miles of new bike trails, 2 miles of rerouted hiking trail, almost 16 miles of new equestrian trails, the closure and restoration of approximately 3.5 miles of existing trail, the complete removal of approximately 5 miles of existing trail/road, 5 new trailheads, 2 redesigned trailheads, 2 new backcountry camps, the retrofit of an existing backcountry camp for increased accessibility, the retrofit and relocation of one backcountry horse camp for increased accessibility, the opening of a portion of the West Side Access Road to the public, the seasonal

closure of two trail fords across Mill Creek, a new visitor education emphasis on the impacts of harassing spawning fish, and continued but modified issuing of backcountry permits to all visitors staying overnight in the backcountry. Construction of all proposed trails, trailheads, and backcountry camps, as well as the restoration of existing trails and roads, will be completed within 10 years (Bensen 2007). The Plan will be implemented through December 31, 2017.

Effects of the Proposed Action

As described in the *Effects of the Action* section of the associated biological opinion, the Plan is likely to adversely affect designated critical habitat for Southern Oregon/Northern California Coast coho salmon and California Coastal Chinook salmon. NMFS expects that impacts to coho salmon and Chinook salmon EFH to occur in the same manner, as described in the *Effects of the Action* section of the biological opinion. Since coho salmon and Chinook salmon critical habitat and EFH are very similar, NMFS concludes that the Plan may adversely affect coho salmon and Chinook salmon EFH.

EFH Effect Determination

NMFS determines that the Plan may adversely affect EFH for Chinook salmon and coho salmon.

EFH Conservation Recommendations

Because the anticipated adverse effects to EFH are short-term and minimal, with a long-term benefit to EFH, no EFH Conservation Recommendations are necessary.

Statutory Response Requirement

Please be advised that regulations at section 305(b)(4)(B) of the MSFCMA and 50 CFR 600.920(k) of the MSFCMA require your office to provide a written response to this letter within 30 days of its receipt and at least 10 days prior to final approval of the action. A preliminary response is acceptable if final action cannot be completed within 30 days. Your final response must include a description of measures to be required to avoid, mitigate, or offset the adverse impacts of the activity. If your response is inconsistent with our EFH conservation recommendations, you must provide an explanation of the reasons for not implementing those recommendations. The reasons must include the scientific justification for any disagreements over the anticipated effects of the proposed action and the measures needed to avoid, minimize, mitigate, or offset such effects.

References

Bensen, K. 2007. Personal communication. Fish and Wildlife Biologist, Redwood National Park, National Park Service. Orick, California.

Pacific Fishery Management Council. 1999. Amendment 14 to the Pacific Coast Salmon Plan, Appendix A: Identification and description of essential fish habitat, adverse impacts, and recommended conservation measures for salmon. Portland, Oregon. 146 p. August.