Appendix E (part 2): Fisheries Biological Opinion

September 19, 2005

Prepared by:
National Marine Fisheries Service

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 19 2005

In response refer to:
151422SWR2003AR8926:AST

Ms. J. Sharon Heywood
U.S. Department of Agriculture
Shasta-Trinity National Forest
3644 Avtech Parkway
Redding, California 96002

Dear Ms. Heywood:

This letter transmits NOAA's National Marine Fisheries Service's (NMFS) biological opinion (Opinion) for the U.S. Department of Agriculture-Forest Service's (USDA-FS) Browns Project (Project), located northeast of the town of Weaverville in Trinity County, California. The Opinion (enclosure 1) addresses the effects of the Project on Southern Oregon/Northern California Coast (SONCC) coho salmon (*Oncorhynchus kisutch*) and its designated critical habitat in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq*.). In addition, this letter transmits NMFS' conservation recommendations for essential fish habitat (EFH) pursuant to section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA, enclosure 2).

ESA Consultation

After reviewing the best available scientific and commercial information, current status of SONCC coho salmon and its designated critical habitat, and environmental baseline for the action area, and after assessing and considering the effects of the Project, NMFS concludes that the Browns Project is not likely to jeopardize the continued existence of SONCC coho salmon, and is not likely to result in the destruction or adverse modification of SONCC coho salmon critical habitat. In the Opinion, NMFS determined that the Project would result in the incidental taking of SONCC coho salmon. Therefore, an incidental take statement is provided, containing reasonable and prudent measures, and terms and conditions.

MSFCMA/EFH Consultation

The Project may adversely affect EFH related to various life stages of Pacific Coast salmon. EFH conservation recommendations are provided. Section 305(b)(4)(B) of the MSFCMA requires the action agency to provide NMFS with a detailed written response to the conservation recommendations within 30 days, including a description of measures adopted by the action agency for avoiding, minimizing, or mitigating the effects of the Project on EFH [50 CFR 600.920(j)]. In the case of a response that is inconsistent with the EFH conservation recommendation, the action agency must explain the reason for not following the recommendation, including a scientific justification for any disagreement over the anticipated effects and the measures needed to avoid, minimize, or offset such effects.

Please contact Mr. Allen Taylor at (707) 825-5180, or via e-mail at allen.s.taylor@noaa.gov if you have any questions concerning these consultations.

Sincerely,

for Rodney R. McInnis
Regional Administrator

Enclosures (2)

cc: Loren Everest, USDA-FS, Trinity River Management Unit

Enclosure 1

Endangered Species Act – Section 7 Consultation

BIOLOGICAL OPINION

ACTION AGENCY:	U.S. Department of Agriculture - Forest Service, Shasta Trinity National Forest
ACTIVITY:	Browns Project (Timber Harvest and Fuels Treatments)
CONSULTATION CONDUCTED BY:	Southwest Region, National Marine Fisheries Service
FILE NUMBER:	151422SWR2003AR8926
DATE ISSUED:	SEP 19 2005

I. BACKGROUND AND CONSULTATION HISTORY

A. Background

This biological opinion (Opinion) addresses the effects of the Browns Project (Project) on Southern Oregon/Northern California Coast (SONCC) coho salmon (*Oncorhynchus kisutch*) and their designated critical habitat (CH) in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*, ESA). The Project is proposed as part of the U.S. Department of Agriculture-Forest Service (USDA-FS) Shasta-Trinity National Forest's (STNF) fuels management and timber sale program, and involves commercial timber harvesting within mixed conifer stands, fuels treatment, road construction, road rehabilitation, and road maintenance (see appendix A for maps showing the location of Project activities). The Project is situated within the Weaverville/Lewiston Management Area (Area 7) as identified in the STNF's Land and Resource Management Plan (LRMP, USDA-FS 1995), included herein by reference. The LRMP further identifies the Project as being within an Adaptive Management Area (AMA), on Matrix Lands, and outside of Key Watersheds. Riparian Reserves (RR) are contained within all land allocations. Both management direction and standards and guidelines for RRs override those of the surrounding land allocations. Complete management directions, management prescriptions, and standards and guidelines for each management area and allocation can be found in the LRMP. The LRMP adopted standards and guidelines set forth in the Final Supplemental Environmental Impact Statement Record of Decision for Amendments to USDA-FS and U.S. Department of Interior-Bureau of Land Management (USDI-BLM) Planning Documents within the Range of the Northern Spotted Owl (ROD, USDA-FS and USDI-BLM 1994b). The ROD evolved from the Forest Ecosystem Management Assessment Team (FEMAT 1993) and the Final Supplemental Environmental Impact Statement (USDA-FS and USDI-BLM 1994a). Collectively, these documents are known as the Northwest Forest Plan (NWFP). The standards and guidelines of the STNF's LRMP (USDA-FS 1995) were adopted from the ROD (USDA-FS and USDI-BLM 1994b). A primary component of the NWFP, the Aquatic Conservation Strategy (ACS), was designed to protect salmon and steelhead habitat by maintaining and restoring ecosystem health at watershed and landscape scales. The ACS was amended by the Final Supplemental Environmental Impact Statement Clarifying Provisions Relating to the ACS (USDA-FS and USDI-BLM 2003), for which NOAA's National Marine Fisheries Service (NMFS) issued its biological opinion (NMFS 2004).

In the Project area, RRs have been designated based on guidelines in the ROD and on the Weaverville Watershed Analysis (WA, USDA-FS 2004). RRs of intermittent and ephemeral streams that display annual scour will have a minimum 150-foot RR based upon the average maximum height of 200-year-old trees for the site. RRs of fish-bearing streams will have a 300-foot RR based upon twice the average maximum height of 200-year-old trees for the site.

A new procedure titled *Analytical Process for Developing Biological Assessments for Federal Actions Affecting Fish within the Northwest Forest Plan Area* (AP) was developed by an interagency team (AP team) comprised of representatives from NMFS, U.S. Fish and Wildlife Service (USFWS), USDI-BLM, and USDA-FS, and was issued November 5, 2004 (USDA-FS *et al.* 2004). The AP was designed to facilitate and standardize evaluations of timber sale actions for consultations on Federally-listed salmonids within the NWFP area under section 7(a)(2) of the ESA. The Project Biological Assessment (BA, USDA-FS 2005a) used the AP, and divided the Project into separate project elements (PEs) that were analyzed for their effects on SONCC coho salmon and their CH by assessing impacts to habitat pathway indicators (Indicators), including: "Water Temperature" (*Temperature*), "Suspended Sediment-Intergravel Dissolved Oxygen/Turbidity" (*Turbidity*), "Chemical Contaminants/Nutrients" (*Chemical Contamination/Nutrients*), "Physical Barriers" (*Physical Barriers*), "Substrate Character and Embeddedness" (*Substrate*), "Large Woody Debris" (*Large Woody Debris*), "Pool Frequency and Quality" (*Pool Frequency and Quality*), "Off-Channel Habitat" (*Off-Channel Habitat*), "Refugia" (*Refugia*), "Average Wetted Width/Maximum Depth Ratio in Scour Pools of a Reach" (*Width/Depth Ratio*), "Streambank Condition" (*Streambank Condition*), "Floodplain Connectivity" (*Floodplain Connectivity*), "Change in Peak/Base Flows" (*Change in Peak/Base Flows*), "Increase in Drainage Network" (*Increase in Drainage Network*), "Road Density and Location" (*Road Density and Location*), "Disturbance History" (*Disturbance History*), and "Riparian Reserves" (*Riparian Reserves*). The STNF used Indicators and values based on locally applicable reference conditions. The analysis in the BA considered eight factors in order to evaluate the effects of the PEs on Indicators, and subsequently, the effects on SONCC coho salmon and their CH. These eight factors are proximity, probability, magnitude (severity and intensity), nature, distribution, frequency, duration, and timing. Factor analysis performed on each PE/Indicator combination identified those combinations that would result in insignificant negative, neutral, or insignificant positive effects to SONCC coho salmon or their CH after analyzing only the first three factors (proximity, probability, and magnitude). Factor analysis was conducted for all eight factors for those PE/Indicator combinations that would result in effects to Indicators that could not be characterized as insignificant negative, as described in the *Effects of the Action* section below.

The objective of this Opinion is to determine the effects of the Project on SONCC coho salmon and their CH (both of which occur within the action area), determine whether or not the Project is likely to jeopardize the continued existence of SONCC coho salmon or result in the destruction or adverse modification of their critical habitat, and summarize the information on which the Opinion is based. This Opinion relies heavily on the analysis contained in the BA, but supplements that analysis to support both the conclusions of the BA that NMFS agreed with, and NMFS' conclusions that are contrary to those of the BA. NMFS has determined, for several PE/Indicator combinations, insignificant negative effects where the BA determined neutral effects (see appendix B). The administrative record for this consultation is on file at the NMFS Arcata Area Office.

B. Consultation History

USDA-FS and NMFS Level 1 team representatives met several times in 2004 and 2005 to discuss the Project. Level 1 team review of the draft BA occurred from November 29, 2004, through April 27, 2005. In addition, the AP team reviewed the draft BA on March 10 and April 12, 2005. On May 2, 2005, NMFS received the STNF's May 2, 2005, request for initiation of formal consultation and accompanying final BA. On May 31, 2005, NMFS sent a letter that acknowledged initiation of formal consultation and requested a 30-day extension to the 60-day timeframe given for completing the Opinion under the streamlining agreement (USDA-FS *et al.* 1999) for a total of 90 days. The request for extension was discussed during a June 1, 2005, Level 2 conference call where the STNF Forest Supervisor acknowledged the complex nature of the consultation stemming from implementation of the AP and agreed to the extension. The streamlining agreement (USDA-FS *et al.* 1999), however, acknowledges exceptions to the 60-day timeframe to complete formal consultations for complex projects, such as this consultation. NMFS received a June 16, 2005, addendum to the BA that was prepared to address water drafting, which had been inadvertently omitted from the May 2, 2005, BA.

II. DESCRIPTION OF THE PROPOSED ACTION

The STNF proposes to harvest timber and conduct fuels treatments, road construction, road rehabilitation, and road maintenance over a 5-year period as part of its timber sale and fuels management program.

A. Project Location and Timing

The Project is expected to occur during calendar years 2006 through 2010, and may involve multiple timber sale and service contracts to accomplish Project activities.

The Project is located northeast of the town of Weaverville in Trinity County, California. The legal locations (all within the Mt. Diablo Meridian in Trinity County) are: T34N, R10W, Sections 27, 34, and 36; T33N, R10W, Section 1; T34N, R9W, Sections 16, 20-22, and 27-34; and T33N, R9W, Section 6 (appendix A).

B. Action Area

Action area is defined as "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). NMFS has determined that the action area for the Project includes the Little Browns Creek watershed downstream to Weaver Creek, the East Weaver Creek watershed downstream to Weaver Creek, the Weaver Creek watershed from the East Weaver Creek confluence downstream to the Trinity River, and the Rush Creek watershed from a natural barrier approximately 1.3 miles upstream of the Highway 3 crossing downstream to the Trinity River.

C. Project Activities

Most Project activities would occur during the May 15 to November 15 normal operating period (NOP). Ground-disturbing activities would not occur during wet weather conditions. Ground-disturbing activities would only occur outside the NOP when the STNF earth scientist determines soils are dry down to 12 inches or conditions are such that the operations would not result in compaction or accelerated erosion.

An erosion control plan is required by the Timber Sale contract to be prepared by the contractor and approved by the STNF, but is not available until a contractor prepares it. Appendix B of the BA provides an example of areas covered, and authorities for ensuring that Best Management Practices (BMPs) are implemented.

The Project includes the following eight PEs: (1) timber harvest, (2) yarding, (3) fuels treatment, (4) hauling, (5) road construction, (6) road reconstruction, (7) road rehabilitation, and (8) water drafting.

1. Timber Harvest

Commercial timber harvest would occur within mixed conifer stands resulting in a total yield of approximately 8.7 million board feet of timber. Acres, harvest prescriptions, yarding systems, and fuels treatments for individual harvest units (86 units total) are presented in table 1.

Intermediate harvest (thinning) would occur on approximately 754 acres (65 units total). The largest, most vigorous trees will not be harvested, while the less healthy understory-positioned trees will be harvested. The BA indicated that the residual conifer canopy closure objective is 40 percent outside of RRs (674 acres in 48 units) and 60 percent within RRs where initially available. NMFS assumes canopy cover will not be reduced below these levels. RR thinning (80.6 acres in 17 units) would occur down to, but not within, the inner gorge of each channel, leaving an approximately 100-foot no-cut buffer on fish-bearing streams, depending on site-specific conditions. All trees harvested within RRs would be less than 16 inches in diameter at breast height.

Table 1. Individual Unit Harvest and Fuels Treatments

Unit	Acres	Harvest Prescription	Yarding System	Fuels Treatment	Unit	Acres	Harvest Prescription	Yarding System	Fuels Treatment
2	5.9	Thinning	tractor	WTY, RS, BC, DL	15D	0.8	Thinning	cable	WTY, RS, BC, HL
3	47.9	Thinning	tractor	WTY, RS, BC, TP, DL	15E	2.7	Thinning	cable	WTY, RS, BC, HL
3B	19.1	Thinning	tractor	WTY, RS, BC, DL	15F	4.2	Thinning	cable	WTY, RS, BC, HL
3C	8.2	Thinning	tractor	WTY, RS, BC, TP, DL	16	66.0	Thinning	tractor	WTY, RS, BC, TP, DL
3D	4.6	Thinning	tractor	WTY, RS, BC, DL	17	74.3	Thinning	tractor	WTY, RS, BC, TP, DL
3E	1.5	Thinning	cable	WTY, RS, BC, HL	100	26.1	RR Thinning	tractor	WTY, RS
3F	2.8	Thinning	cable	WTY, RS, BC, HL	101	13.6	RR Thinning	tractor	WTY, RS
3G	11.2	Thinning	cable	WTY, RS, BC, HL	102	8.4	RR Thinning	tractor	WTY
3H	5.6	Thinning	cable	WTY, RS, BC, HL	103	6.8	RR Thinning	tractor	WTY
3I	7.9	Thinning	tractor	WTY, RS, BC, DL	104	0.7	RR Thinning	cable	WTY
3J	4.9	Thinning	cable	WTY, RS, BC, HL	105	2.5	RR Thinning	tractor	WTY
3K	11.9	Thinning	tractor	WTY, RS, BC, DL	106	4.2	RR Thinning	tractor	WTY, RS
3L	27.7	Thinning	tractor	WTY, RS, BC, DL	107	3.4	RR Thinning	tractor	WTY
5A	14.1	Thinning	cable	WTY, RS, BC, HL	108	0.9	RR Thinning	tractor	WTY
5B	14.4	Thinning	tractor	WTY, RS, BC, DL	109	3.1	RR Thinning	cable	WTY
5C	13.3	Thinning	cable	WTY, RS, BC, HL	110	1.2	RR Thinning	cable	WTY
5D	58.8	Thinning	tractor	WTY, RS, BC, TP, DL	111	2.5	RR Thinning	cable	WTY
5F	16.5	Thinning	tractor	WTY, RS, BC, DL	112	3.3	RR Thinning	cable	WTY, RS
5G	1.4	Thinning	cable	WTY, RS, BC, HL	113	0.8	RR Thinning	tractor	WTY, RS
5H	1.9	Thinning	cable	WTY, RS, BC, HL	114	1.4	RR Thinning	cable	WTY
7	14.6	Thinning	tractor	WTY, RS, BC, DL	115	1.0	RR Thinning	tractor	WTY, RS
8	4.7	Thinning	tractor	WTY, RS, BC, DL	RR5G	0.7	RR Thinning	cable	WTY
9A	20.1	Thinning	cable	WTY, RS, BC, HL	R03A	2.1	Regen	tractor	WTY, BB,DL
9B	17.0	Thinning	cable	WTY, RS, BC, HL	R03B	1.8	Regen	tractor	WTY, BB,DL
9C	22.6	Thinning	tractor	WTY, RS, BC, TP, DL	R03C	1.8	Regen	tractor	WTY, BB,DL
9D	5.6	Thinning	cable	WTY, RS, BC, HL	R3C	2.2	Regen	tractor	WTY, BB,DL
9E	20.2	Thinning	cable	WTY, RS, BC, HL	R5A	1.9	Regen	cable	WTY, BB,HL
10A	15.2	Thinning	tractor	WTY, RS, BC, DL	R5C	2.0	Regen	cable	WTY, BB,HL
10B	1.1	Thinning	tractor	WTY, RS, BC, DL	R5DA	0.9	Regen	tractor	WTY, BB,DL
10C	5.8	Thinning	cable	WTY, RS, BC, HL	R5DB	2.4	Regen	tractor	WTY, BB,DL
10D	6.8	Thinning	tractor	WTY, RS, BC,	R9AA	1.7	Regen	cable	WTY, BB,HL

Unit	Acres	Harvest Prescription	Yarding System	Fuels Treatment	Unit	Acres	Harvest Prescription	Yarding System	Fuels Treatment
				DL					
10E	1.9	Thinning	cable	WTY, RS, BC, HL	R9AB	1.6	Regen	cable	WTY, BB,HL
10F	24.6	Thinning	tractor	WTY, RS, BC, DL	R9B	1.9	Regen	cable	WTY, BB,HL
10G	6.6	Thinning	cable	WTY, RS, BC, HL	R9CB	1.5	Regen	tractor	WTY, BB,DL
10H	6.6	Thinning	cable	WTY, RS, BC, HL	R10G	2.4	Regen	cable	WTY, BB,HL
10I	6.6	Thinning	cable	WTY, RS, BC, HL	R12A	1.9	Regen	tractor	WTY, BB,DL
11	10.1	Thinning	tractor	WTY, RS, BC, DL	R12B	2.1	Regen	tractor	WTY, BB,DL
12	23.7	Thinning	tractor	WTY, RS, BC, TP, DL	R14	1.5	Regen	cable	WTY, BB,HL
13	8.5	Thinning	cable	WTY, RS, BC, HL	R16	1.6	Regen	tractor	WTY, BB,DL
14	8.3	Thinning	cable	WTY, RS, BC, HL	R17A	2.2	Regen	tractor	WTY, BB,DL
15A	5.0	Thinning	tractor	WTY, RS, BC, DL	R17B	1.8	Regen	tractor	WTY, BB,DL
15B	4.7	Thinning	tractor	WTY, RS, BC, DL	R17C	1.9	Regen	tractor	WTY, BB,DL
15C	6.1	Thinning	tractor	WTY, RS, BC, DL	R17D	1.5	Regen	tractor	WTY, BB,DL

Fuels Treatment Definitions	
WTY	Whole Tree Yard
RS	Roadside pile/burn
BC	Burn Concentrations
TP	Tractor pile/burn
BB	Broadcast Burn
HL	Handline
DL	Dozerline

Group regeneration harvest would occur on about 39 acres (21 units total). After removal of all live trees, regeneration units would be contour ripped with a winged subsoiler down to a depth of 12 inches to break up compaction after timber harvest and fuels treatments, seeded, and mulched (straw or slash). Tree planting would then occur in the small openings (less than 2.5 acres) created by regeneration harvest.

2. Yarding

Trees would be removed using tractor yarding (595.4 acres in 49 units, including 67.7 acres in 10 units of RR) on slopes less than 35 percent, and cable yarding (197.8 acres in 37 units, including 12.2 acres in 6 units of RR) on slopes steeper than 35 percent. Minimal tractor yarding may occur on slopes greater than 35 percent for short pitches where STNF determines that negative environmental effects would not occur. The exception to the less than 35 percent slope restriction is necessary to allow ground-based skidding in areas of uneven terrain within flat areas of a unit. In these instances, trees will be felled to lead or endlined, as appropriate, to minimize skidding on slopes greater than 35 percent. Generally, these pitches are less than 150 feet. Mechanical harvesters and forwarders would be used on thinning units to reduce ground compaction and limit the number of mechanical equipment entries into units. Fine slash material would be spread on primary skid trails when they occur on slopes greater than 35 percent to maintain post-treatment soil cover at 50 percent or greater. All yarding would entail one-end log suspension (leading end of the log) and there would be no cable yarding across stream channels.

Skid roads, trails, and landings may occupy up to 15 percent of any individual unit. Skid roads and trails would be located by the sale administrator on the ground during harvest activities. Skid trails would be constructed for tractor yarding with the objective of designing a skidding pattern that best fits the terrain and limits the impact on the soil. Pre-designated skid trails, felling to the lead, using existing primary skid trails where available, and end lining would be employed to achieve this objective. Where skid trails occur within RRs, trail grade would not exceed 20 percent and would be located to minimize ground and vegetative disturbance. Skid trail-disturbed mineral soil would be rehabilitated within 50 feet slope distance of defined channel limits using available organic material, resulting in a minimum 50 percent ground cover post-treatment.

Eighty-nine landings are proposed for construction. Twenty-three of those landings are within regeneration units that would be used for piling and burning treetops and slash generated from harvest. Preexisting landings would be used where available. No landings are proposed within RRs, however several landings are proposed adjacent to RRs. Approximate locations of landings are provided in appendix D of the BA.

Main skid trails and landings (excluding the adjacent road corridor) would be contour ripped (using a winged subsoiler to a depth of 12 inches) to break up compaction, seeded, and mulched, including all identifiable skid trails in units 3, 16, and 17 as specified in the BA. Forest cultivators and/or disks may be used where soils are not subject to compaction. Soil would be loosened across the entire treatment area to achieve a soil condition where 85 percent of the soil would pass through a 2-inch opening. Waterbarring and outsloping of skid trails is not necessary, as the intent of subsoiling is to loosen the soil and attain a permeable soil condition where runoff would not occur. However, waterbarring may occur where sections of skid trails are steep enough that a potential exists for surface runoff prior to revegetation. NMFS assumes that any construction of waterbars would follow the recommended spacing for cross-drainage specified in the current USDA-FS Timber Sale Administration Handbook.

3. Fuels Treatment

Fuels treatment activities would occur in all units after harvest. Table 1 describes the fuels treatment methods prescribed for each unit. Whole tree yarding will occur in all units. The tops of trees to be yarded would be lopped below three inches in diameter. Remaining treetops, broken trees, bark, and limb wood would be lopped and scattered. Fuels within a 50-foot strip along roads within or adjacent to 54 harvest units would be hand piled and burned. The only fuels treatment activities occurring in RR units (units that contain RRs) are roadside piling and burning, and lop and scatter.

Firelines would be constructed around all non-RR units prior to burning. Dozer line construction would occur around tractor units, and handline construction would occur around cable units.

Firelines would not be constructed in RRs or maintained into the future. Fireline width and clearing would be the minimum necessary to contain a low-intensity fire and would be waterbarred as necessary after use. NMFS assumes the width of all fireline construction will not exceed 8 feet.

Fuels treatments in non-RR thinning units include tractor piling and burning in seven units, with the remaining units being hand piled and burned. Burning of hand piles, tractor piles, and other concentrations would occur approximately 1 year after harvest and at a rate of about 100 acres per year. NMFS assumes that all thinning units will be burned within the term of the Project.

Fuels treatments in group regeneration harvest units include the following: (1) Activity fuels generated from whole tree yarding would be piled and treated in openings created from regeneration harvest; (2) Regeneration units would be broadcast burned and kept as cool as possible to attain desired burn conditions; and (3) Coarse woody debris would be retained to the extent possible, provided that the amount of coarse woody debris does not exceed fuel management objectives.

4. Hauling

Unit-specific haul routes are described in table 2 of the BA. Hauling activities would not occur during wet weather conditions. STNF roads would be graded as necessary before and after hauling.

5. Road Construction

Approximately 4.7 miles of new system road construction would occur (followed by decommissioning of 3.3 miles of the new roads, discussed under the Road Rehabilitation PE, and 1.4 miles remaining permanent). Table 2 provides a list of road management activities. New road construction would occur within RRs for approximately 0.25 miles. This construction would enter RRs at one location in unit 102 and two locations in unit 103, with one stream crossing to be constructed in each of these units. These crossings are on intermittent channels 0.25 miles or more away from CH.

Approximately 3.6 miles of temporary roads (existing non-system roads) would be constructed in addition to the 4.7 miles of new construction indicated above, and would be rehabilitated after use. In addition to those temporary roads identified in table 2, temporary roads would also be constructed as needed to complete harvest in non-RR units 3, 5D, 9B, 9C, 10D, 12, and 17. The approximate location of these roads is provided in appendix D of the BA, however the precise location would be at the discretion of the sale administrator.

Table 2. Road Management Activities by Forest Road Number

Road Number	Activity	Length (ft)	Road Number	Activity	Length (ft)
34N47	New System Construction, then Rehabilitate	4,752	U232B	Rehabilitate	778
34N47A	New System Construction, then Rehabilitate	1,584	U230A	Rehabilitate and Remove 1 Culvert	1,531
34N87	New System Construction, then Restricted Use	6,864	U34N77B	Rehabilitate	828
34N87A	New System Construction, then Rehabilitate	4,752	34N95E	Rehabilitate	3,151
34N88	New System Construction, then Rehabilitate	6,336	U3TRI05	Rehabilitate	665
U34N52YD	Use Existing Nonsystem as Temp, then Rehabilitate	3,168	U3TRI05-2	Rehabilitate	531
U34N05YB	Use Existing Nonsystem as Temp, then Rehabilitate	528	U3TRI05-3	Rehabilitate	444
U34N52YC	Use Existing Nonsystem as Temp, then Rehabilitate	2,640	U3TRI05-4	Rehabilitate	189
U34N52YB	Use Existing Nonsystem as Temp, then Rehabilitate	1,584	34N52YA-13	Rehabilitate	109
U232A	Use Existing Nonsystem as Temp, then Rehabilitate	2,112	U3TRI04	Rehabilitate	764
U34N95H	Use Existing Nonsystem as Temp, then Rehabilitate	2,640	U3TRI04A	Rehabilitate	284
U3TRI03	Use Existing Nonsystem as Temp, then Rehabilitate	528	U34N05YA	Rehabilitate	142
Unit 17	New temp construction then rehabilitate	528	U34N95J	Rehabilitate	2,619
Unit 3H	New Temp Construction, then Rehabilitate	1,056	U34N77C	Rehabilitate and Remove 1 Culvert	896
Unit 10C	New Temp Construction, then Rehabilitate	528	34N96C	Rehabilitate and Remove 3 Culverts	2,469
Unit 10F	New Temp Construction, then Rehabilitate	528	U34N96G	Rehabilitate	229
Unit 9B	New Temp Construction, then Rehabilitate	528	U3TRI05A	Rehabilitate	295
Unit 9C	New Temp Construction, then Rehabilitate	528	U3TRI05A-1	Rehabilitate	467
Unit 9D	New Temp Construction, then Rehabilitate	528	U34N95I-1	Rehabilitate	1,244
Unit 5B	New Temp Construction, then Rehabilitate	528	U3TRI03D	Rehabilitate	288
Unit 5D (2seg)	New Temp Construction, then Rehabilitate	528	U3TRI03E	Rehabilitate	215
Unit 12 (2seg)	New Temp Construction, then Rehabilitate	528	34N95F	Rehabilitate	1,436
34N95	Reconstruct, Surface, Replace Culvert (54")	10,032	34N95F-1	Rehabilitate	231
34N77	Reconstruct and Surface	5,808	34N96B-3	Rehabilitate	337
34N52Y	Reconstruct, Surface, Replace 2 Culverts (54", 42")	2,640	U34N95B	Rehabilitate and Remove 2 Culverts	425
34N52YA	Reconstruct and Surface	528	U34N96B-4	Rehabilitate	91
U34N33YA	Rehabilitate and Remove 2 Culverts	2,577	U34N96BA	Rehabilitate	363
U34N96D	Rehabilitate	5,357	U34N96F	Rehabilitate	3,709
34N96-5	Rehabilitate and Remove 1 Culvert	1,825	U34N96H	Rehabilitate	704
U34N96E	Rehabilitate	218	34N96B	Rehabilitate and Remove 5 Culverts	4,160

Road Number	Activity	Length (ft)	Road Number	Activity	Length (ft)
34N96-6	Rehabilitate	1,532	34N96-1	Rehabilitate	2,081
U34N96AB	Rehabilitate	811	34N96B-5	Rehabilitate	1,816
34N95B	Rehabilitate	1,644	34N96C-1	Rehabilitate	2,337
U3TRI03A	Rehabilitate	1,072	34N52Y-10	Rehabilitate	271
U34N95L	Rehabilitate	208	34N52Y-14	Rehabilitate	773
U3TRI03B	Rehabilitate	596	34N95A-1	Rehabilitate	138
U3TRI03C	Rehabilitate	152	34N95C-1	Rehabilitate	365
U3TRI03G	Rehabilitate	205	34N96B-4	Rehabilitate	810
U34N95AA	Rehabilitate	2,121	34N52YA-11	Rehabilitate	221
U34N95O	Rehabilitate	4,480	U34N52YCA	Rehabilitate	229
34N95A	Rehabilitate and Remove 4 Culverts	3,098	34N95C	Rehabilitate	3,008
U34N95I	Rehabilitate	1,314	34N96-2	Rehabilitate	1,844
U34N95M	Rehabilitate	1,195	34N96B-2	Rehabilitate	299
U34N95A	Rehabilitate	1,170	UT34N96BA	Rehabilitate	623
34N95-10	Rehabilitate	692	34N95-7	Rehabilitate	1,018
34N83B	Rehabilitate	1,342	34N96-3	Rehabilitate	332
34N95-9	Rehabilitate	217	34N96-4	Rehabilitate	703
U34N95N	Rehabilitate	1,520	34N96B-1	Rehabilitate	1,365
34N83A	Rehabilitate	1,808	U34N05YC	Rehabilitate	702
U34N95P	Rehabilitate	153	U34N52YCB	Rehabilitate	208
33N38F	Rehabilitate and Remove 2 culverts	3,665	34N95-1	Rehabilitate	1,015
34N89	Rehabilitate and Replace 1 Culvert	4,211	U34N96AC	Rehabilitate	1,212
34N89A	Rehabilitate and Replace 2 Culverts	2,541	U34N96AD	Rehabilitate	222
34N95-11	Rehabilitate	417	U34N96AE	Rehabilitate	287
34N95-12	Rehabilitate	440	34N95-14	Rehabilitate	224
34N95-13	Rehabilitate	188	34N95-16	Rehabilitate	247
34N95-25	Rehabilitate	401	34N95-17	Rehabilitate	1,614
U34N34B	Rehabilitate	4,335	34N95-18	Rehabilitate	1,315
U34N34B-2	Rehabilitate	576	34N95-19	Rehabilitate	140
U34N95K	Rehabilitate	703	34N95-20	Rehabilitate	167
U34N77A	Rehabilitate	1,996	34N95-21	Rehabilitate	266
U34N77A-1	Rehabilitate	91	34N95-22	Rehabilitate	1,055
U34N77AA	Rehabilitate	2,934	34N95-23	Rehabilitate	1,219
U3TRI02	Rehabilitate	217	34N95G-1	Rehabilitate	83
U3TRI01	Rehabilitate	671	34N95G-2	Rehabilitate	727
U3TRI01A	Rehabilitate	300	U34N34B-1	Rehabilitate	215
U3TRI03F	Rehabilitate	812	U34N95J-1	Rehabilitate	699
UC232-1	Rehabilitate	364	U34N95J-2	Rehabilitate	188
U34N77AAB	Rehabilitate	155	UT34N95C-1	Rehabilitate	504
34N52Y	Rehabilitate and Remove 3 Culverts	3,548			

Approximately 0.7 miles of existing nonsystem roads would be located within RR units 100 and 101 approximately 1.4 miles slope distance or more upstream of CH in Little Browns Creek. Two designated temporary road channel crossings are proposed in RR unit 100 and one is proposed in RR unit 101. Designated channel crossings on temporary roads would be 1.7 miles slope distance or more upstream of CH in Little Browns Creek and would be located at areas of previous skid trail or road crossings that would require minimal ground disturbance. All three crossings are on temporary roads over intermittent channels. Forest Road U232A is the closest temporary road to CH; it is about 0.10 mile away from Little Browns Creek and is separated by County Road (CR) 232.

All channel crossings would be built, used, and rehabilitated during the NOP within a single season. NMFS assumes that channel rehabilitation entails returning the channel to pre-crossing shape. Crossing grade would not exceed 20 percent and would be located to minimize ground and vegetative disturbance. Mulching with organic material for 50 feet (slope distance) on each side of the crossing would occur to provide at least 50 percent ground cover post-treatment to filter and arrest sediment from runoff that occurs. No culverts would be used at crossings.

6. Road Reconstruction

Approximately 3.6 miles of road reconstruction would occur, crossing RRs in three locations. Table 2 provides a list of road management activities. Activities associated with road reconstruction include felling hazard trees, surfacing roads with crushed rock, ditch cleaning, culvert inlet cleanout, constructing rocked water dips, and replacing three culverts at intermittent stream crossings in non-fish-bearing streams. Hazard trees felled along roads to be reconstructed within RRs would be left in place.

7. Road Rehabilitation

Approximately 27 miles of Forest Roads would be rehabilitated (decommissioned or obliterated) as part of this Project. Forest Roads proposed for rehabilitation range from 25 feet to over 2 miles away from CH. Forest Road U34N77A is located on the floodplain of Little Browns Creek. Several other Forest Roads, including U34N77A-1, U34N77AA, U3TRI02, U3TRI01, U3TRI01A, and U3TRI03F, are located within 150 feet of Little Browns Creek. Forest Roads in Rush and East Weaver Creek subwatersheds are at least 0.2 miles from CH. Culverts to be removed range from 0.1 to 2.1 miles from CH. No hazard trees will be felled for road rehabilitation. Road rehabilitation by subwatershed includes 2.3 miles in the Rush Creek subwatershed, 15.9 miles in the Little Browns Creek subwatershed, and 8.8 miles in the East Weaver Creek subwatershed. Table 2 provides a list of road management activities.

Road decommissioning involves removing culverts, waterbarring, ripping and outsloping road surfaces, and "tank trapping." Other site-specific activities may occur if unique problems are found during development of road decommissioning contracts. These would most likely be bank stabilization activities or work at spring sites that require unique prescriptions to restore natural processes. The goal is to control or prevent surface runoff, erosion, and mass failure that could otherwise leave the roadbed unavailable for future use. Of the 4.7 miles of new system roads constructed for this Project, 3.3 miles would be decommissioned near the conclusion of the Project.

Approximately 3.6 miles of road obliteration would occur, entailing removal of all culverts, ripping, and slope recontouring. Contour ripping to 12 inches soil depth would be accomplished using a winged subsoiler, and would be followed by seeding and straw mulching. Roads proposed for obliteration include all temporary roads used for the Project, and would be obliterated once harvest, yarding, and fuels treatments are completed. The goal of road obliteration is to restore full hydrologic function and productivity. These roads would receive long-term BMP effectiveness monitoring (BMP 2-26, USDA-FS 2000). Access to temporary roads would be blocked after subsoiling. A total of 27 culverts would be removed as part of the Project, with up to 750 yd^3 fill volumes to be removed at each site. Table 2 specifies the number of culverts to be removed by Forest Road. The STNF expects the intermittent tributary channels to be dry during culvert removal. NMFS assumes that culvert removal work would occur only when channels are dry.

8. Water Drafting

The Project includes dust abatement during road construction, road reconstruction, and hauling. Water needed for dust abatement would be drafted from three locations within the Project area: (1) Rush Creek near Rush Creek Campground, (2) Little Browns Creek upstream of CR 232, and (3) East Weaver Creek near East Weaver Campground. Approximately 10,000 gallons of water per day for 5 days per week would be drafted for the Project. All three water drafting (drafting) sites are located within SONCC coho salmon CH, and SONCC coho salmon currently have access to the East Weaver Creek and Rush Creek drafting sites. The Little Browns Creek site is approximately 0.20 miles upstream of CR 232; culverts on this road currently present a complete barrier to migrating SONCC coho salmon. However, NMFS believes there is a high probability that this barrier will be removed within the duration of the Project and SONCC coho salmon will gain access to the Little Browns Creek drafting site. Drafting would only occur at the three sites when immediate downstream discharge is maintained at 1.5 cubic feet per second or greater. In addition, the NMFS Water Drafting Specifications (NMFS 2001) would be adhered to at all three sites, with the following conditions:

1) Surveys for SONCC coho salmon presence would be completed each year that drafting occurs, and would be conducted from the drafting sites in Rush and East Weaver Creeks upstream to the limits of SONCC coho salmon CH. If any given survey determines SONCC coho salmon presence in these streams, then Operating Guideline (OG) #1 of the Drafting Specifications would be followed (draft only from 1 hour after sunrise to 1 hour before sunset) for the drafting site on that stream in order to prevent vehicle lights from attracting fish to the drafting area. If the survey does not determine SONCC coho salmon presence within each stream, then OG #1 would not be applicable, and thus, not followed.

2) Surveys to determine SONCC coho salmon presence in Little Browns Creek would only be conducted after the barrier at the CR 232 crossing has been removed, after which time SONCC coho salmon would likely occur upstream of the previous barrier. If surveys determine SONCC coho salmon presence in Little Browns Creek, then OG #1 would be followed (draft only from 1 hour after sunrise to 1 hour before sunset) for that drafting site to prevent vehicle lights from attracting fish to the drafting area. If the survey does not determine SONCC coho salmon presence within the creek after barrier removal, then OG #1 would not be applicable, and thus, not followed.

NMFS anticipates that the fish surveys will be planned and conducted by fisheries biologists from the STNF whom are experienced and proficient with surveys of this kind, and therefore, will have a high likelihood of determining presence or inferring absence of SONCC coho salmon for the current year.

D. Interrelated and Interdependent Actions

Neither STNF nor NMFS have identified any actions that are interrelated with or interdependent to the proposed action.

III. STATUS OF THE SPECIES AND CRITICAL HABITAT

NMFS listed the SONCC coho salmon Evolutionarily Significant Unit (ESU) as threatened under the ESA on May 6, 1997 (62 FR 24588). Following updated status reviews, NMFS re-listed the SONCC coho salmon ESU as threatened under the ESA on June 28, 2005 (70 FR 37160). This ESU includes populations of coho salmon between Cape Blanco, Oregon and Punta Gorda, California. This section summarizes the status of SONCC coho salmon and their CH, and species' life history and population trends at the ESU scale. The *Environmental Baseline* section that follows summarizes SONCC coho salmon abundance and distribution, along with a description of SONCC coho salmon habitat and their CH, within the action area.

A. Status of SONCC Coho Salmon

1. General Life History

SONCC coho salmon exhibit anadromous and semelparous life histories. This means that as adults they migrate from a marine environment into the fresh water streams and rivers of their birth (anadromous) where they spawn and die (semelparous). In contrast to the life history patterns of other Pacific salmonids, coho salmon generally exhibit a comparatively simple 3-year life cycle, spending approximately 18 months in freshwater and 18 months in salt water (Gilbert 1912, Pritchard 1940, Briggs 1953, Shapovalov and Taft 1954, Loeffel and Wendler 1968). Coho salmon spawn from November to January (Hassler 1987), and occasionally into February and March (Weitkamp *et al.* 1995). Coho salmon river entry timing is influenced by many factors, one of which is river flow. In addition, many small California stream systems have their mouths blocked by sandbars for most of the year except winter. In these systems, coho salmon and other Pacific salmonid species are unable to enter the rivers until sufficiently strong freshets open passages through the bars (Weitkamp *et al.* 1995). In larger river systems like the Klamath River, coho salmon have a broad period of freshwater entry spanning from August until December (Leidy and Leidy 1984). Overall, earlier migrating fish spawn farther upstream within a basin than later migrating fish, which enter rivers in a more advanced state of sexual maturity (Sandercock 1991). Adult coho salmon normally migrate during daylight hours at water temperatures of 45-60°F, a minimum water depth of approximately 17.8 cm, and streamflow velocities less than 2.44 m/s (Bjornn and Reiser 1991). If conditions are not right, coho salmon will wait at the mouth of the river or stream for the correct conditions.

Although coho salmon may spawn in a few third-order streams, they typically choose fourth- and fifth-order streams (Bjornn and Reiser 1991), preferring streams with a gradient of 3 percent or less (Nickelson *et al.* 1992). Coho salmon build their redds at the head of riffles in clean gravel ranging in size from that of a pea to that of an orange (Nickelson *et al.* 1992), at stream velocities of 0.30 to 0.55 m/s (Gribanov 1948) and water temperatures of 42-56°F (Briggs 1953).

The favorable range for coho salmon egg incubation is 50-55°F (Bell 1991). Eggs typically hatch at approximately 35 to 50 days, and start emerging from the gravel 2 to 3 weeks after hatching (Hassler 1987, Nickelson *et al.* 1992), depending on ambient water temperature (Shapovalov and Taft 1954).

Following emergence, young coho salmon fry hide in gravel and under large rocks during daylight hours. After several days growth, attaining a length of 38-45 mm, the fry may migrate upstream a considerable distance to reach lakes or other rearing areas (Godfrey 1965, Nickelson *et al.* 1992). These rearing areas may include streams of 4-5 percent gradient, and as small as one to two meters wide. Brett (1952) found that coho salmon juveniles had an upper lethal water temperature of 77°F with a preferred rearing and emigration range of 53.6-57.2°F. Coho salmon fry are most abundant in backwater pools during spring. During the summer, coho salmon fry prefer pools featuring adequate cover such as large woody debris (LWD), undercut banks, and overhanging vegetation. Juvenile coho salmon prefer to overwinter in large mainstem pools, backwater areas and secondary pools with LWD, and undercut bank areas (Heifetz *et al.* 1986, Hassler 1987). The ideal food channel for maximum coho salmon smolt production would have shallow depth (7-60 cm), fairly swift midstream flows (60 cm/sec), numerous marginal back-eddies, narrow width (3-6 cm), copious overhanging mixed vegetation (to lower water temperatures, provide leaf fall, and contribute terrestrial insects), and structural elements permitting hiding places (Boussu 1954). The early diets of emerging coho salmon fry include chironomid larvae and pupae (Mundie 1969). Juvenile coho salmon are carnivorous opportunists that primarily eat aquatic and terrestrial insects.

Coho salmon smolts typically migrate to the sea between March and June (Weitkamp *et al.* 1995), but some level of emigration may occur all year long. Taking advantage of cooler ambient temperatures and the afforded protection from predators, the bulk of seaward migration occurs at night. Peak outmigration generally occurs in May, about a year after they emerge from the gravel. In California, smolts migrate to the ocean somewhat earlier, from mid-April to mid-May.

Little is known about residence time or habitat use in estuaries during seaward migration, although it is usually assumed that coho salmon spend only a short time in the estuary before entering the ocean (Nickelson *et al.* 1992). Growth is very rapid once the smolts reach the estuary (Fisher *et al.* 1984). After entering the ocean, immature coho salmon initially remain in near-shore waters close to the parent stream. In general, coded-wire tag (CWT) recoveries indicate that coho salmon remain closer to their river of origin than do Chinook salmon. However, coho salmon have been captured several hundred to several thousand kilometers away from their natal stream (Hassler 1987). After about 12 months at sea, coho salmon gradually migrate south and along the coast, but some appear to follow a counterclockwise circuit in the Gulf of Alaska (Sandercock 1991). Coho salmon typically spend two growing seasons in the ocean before returning to their natal streams to spawn as three year-olds. Some precocious males, called "jacks," return to spawn after only 6 months at sea.

2. Range-Wide (ESU) Status and Trends of SONCC Coho Salmon

For a detailed summary of historical and current distributions of SONCC coho salmon in northern California, refer to the California Department of Fish and Game (CDFG) coho salmon status review (CDFG 2002), as well as the presence and absence update for the northern California portion of the SONCC coho salmon ESU (Brownell *et al.* 1999). NMFS summarized the available historic SONCC coho salmon abundance information in a coast-wide status review (Weitkamp *et al.* 1995), and status review updates (NMFS 2001b, Good *et al.* 2005).

All SONCC coho salmon stocks between Punta Gorda and Cape Blanco are depressed relative to past abundance (Weitkamp *et al.* 1995). NMFS (2001b) concluded that population trend data for SONCC coho salmon taken from 1989-2000 show a continued downward trend throughout most of the California portion of the SONCC coho salmon ESU. The main stocks in the SONCC coho salmon ESU (Rogue River, Klamath River, and Trinity River) remain heavily influenced by hatcheries and have little natural production in mainstem rivers (Weitkamp *et al.* 1995). The Trinity River Hatchery maintains high production, with a significant number of hatchery SONCC coho salmon straying into the wild population (NMFS 2001b). Mad River and Iron Gate Hatcheries have both reduced production in recent years (NMFS 2001b). The apparent decline in wild production in these rivers, in conjunction with significant hatchery production, suggests that their natural populations are not self sustaining (Weitkamp *et al.* 1995).

Brown *et al.* (1994) surveyed 115 of the 396 streams within the SONCC coho salmon ESU identified as once having coho salmon runs and reported that 42 (36 percent) of those streams - all within the Eel and Klamath River systems - have lost their runs. A more recent update of the California portion of the SONCC coho salmon ESU reported that the percent of streams with at least one brood year of coho salmon present has declined from 80 percent of the streams surveyed between 1989 and 1995, to 69 percent in the most recent three-year interval (NMFS 2001b). Nehlsen *et al.* (1991) considered all but one coho salmon population in Oregon south of Cape Blanco, to be at "high risk of extinction."

No regular spawning escapement estimates exist for natural SONCC coho salmon in California streams. Brown and Moyle (1991) suggested that naturally-spawned adult coho salmon runs in California streams were less than 1 percent of their abundance at mid-century, and estimated that wild coho salmon populations in California did not exceed 100 to 1,300 individuals. CDFG (1994 *op cit* Weitkamp *et al.* 1995) summarized most information for the northern California region of this ESU, and concluded that "coho salmon in California, including hatchery stocks, could be less than 6 percent of their abundance during the 1940's, and have experienced at least a 70 percent decline in numbers since the 1960's." Further, CDFG (1994) reported that coho salmon populations have been virtually eliminated in many streams, and that adults are observed only every third year in some streams, suggesting that two of three brood cycles may already have been eliminated. Weitkamp *et al.* (1995) estimated that the rivers and tributaries in the California portion of the SONCC coho salmon ESU had "recently" produced 7,080 naturally spawning coho salmon and 17,156 hatchery returns, including 4,480 "native" fish occurring in tributaries having little history of supplementation with nonnative fish. Combining the California run-size estimates with Rogue River estimates, Weitkamp *et al.* (1995) arrived at a rough minimum run-size estimate for the SONCC coho salmon ESU of about 10,000 natural fish and 20,000 hatchery fish.

Both presence-absence and trend data suggest that many populations within the SONCC coho salmon ESU continue to decline (NMFS 2001b, Good *et al.* 2005). NMFS and the Biological Review Team (BRT) have concluded that the California portion of the SONCC coho salmon ESU is likely to become endangered in the foreseeable future (NMFS 2001b).

An "Updated Status of Federally listed ESUs of West Coast Salmon and Steelhead" (including SONCC coho salmon) was completed in June 2005 (Good *et al.* 2005). The status update included limited new information for SONCC coho salmon. In the status update, the BRT stated that, "None of these data contradict the conclusions the BRT reached previously. Nor do any recent data (1995 to present) suggest any marked change, either positive or negative, in the abundance or distribution of coho salmon within the SONCC ESU."

3. Status of SONCC Coho Salmon in the Trinity River Basin

In northern California, populations of SONCC coho salmon are present in the Klamath River Basin, inclusive of the Trinity River. However, population trend data is scarce (NMFS 2001b).

Adult SONCC coho salmon counts at the Trinity River weir reflect the total number of adult SONCC coho salmon found in the Trinity River because the counts are made relatively low in the system, near the town of Willow Creek, California, below much of the spawning habitat. Unfortunately, these counts are incomplete as well because the weir is typically removed by the second week of November and trapping does not occur every day. Therefore, the trapping effort may not include a portion of the run and even relatively small day-to-day differences in fish counts may skew the results. In addition, the majority of the fish trapped are of hatchery origin, and 100 percent marking of hatchery SONCC coho salmon has only recently occurred, so estimates of naturally-produced SONCC coho salmon are only available since the 1997 return year (CDFG 2000). The results of counting from these 3 years yielded an estimated 198, 1,001, and 491 naturally produced adult SONCC coho salmon for the 1997-1998, 1998-1999, and 1999-2000 seasons, respectively (CDFG 2000).

Trapping near Willow Creek on the Trinity River yielded an average of 2,975 SONCC coho salmon smolts (range: 565-5,084) for the period of 1991 to 2000 (USFWS 2000). These low numbers provide insight into the limited size of SONCC coho salmon populations in the Trinity River Basin, although some early outmigrants were missed. Even if these numbers were doubled to account for time when trapping did not occur, these populations are extremely low.

a. Synthesis of Adult SONCC Coho Salmon Information

McElhany *et al.* (2000) suggested that for species like SONCC coho salmon, for which the age structure is relatively fixed (*e.g.*, SONCC coho salmon often mature at 3 years), cohorts within a breeding group could technically belong to separate populations as NMFS has defined them. CDFG (1994) reported that SONCC coho salmon populations have been virtually eliminated in many streams, and that adults are observed only every third year, suggesting that two of three brood cycles (cohorts) may already have been eliminated. The limited adult SONCC coho salmon data indicates that there is high variance in abundance from year to year in the Trinity

River Basin. This high variance in adult SONCC coho salmon from one year to the next makes the population more vulnerable to anthropogenic or natural perturbations, and therefore more at risk of extinction.

B. Status of SONCC Coho Salmon Critical Habitat

CH is defined in section 3(5)(A) of the ESA as "(i) the specific areas within the geographical area occupied by the species at the time it is listed . . . on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protection; and (ii) specific areas outside the geographical area occupied by the species at the time it is listed . . . upon a determination by the Secretary of Commerce (Secretary) that such areas are essential for the conservation of the species" [16 U.S.C. 1532(5)(A)]. The term "conservation," as defined in section 3(3) of the ESA, means ". . . to use and the use of 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 this Act are no longer necessary" [16 U.S.C. 1532(3)]. Therefore, CH includes geographic areas and habitat functions necessary for the recovery of the species.

CH for SONCC coho salmon encompasses accessible reaches of all rivers (including estuarine areas and tributaries) between the Elk River in Oregon and the Mattole River in California, inclusive (May 5, 1999 64 FR 24049). Excluded from SONCC coho salmon CH are: (1) areas above specific dams identified in the FR notice; (2) areas above longstanding natural impassible barriers (*i.e.*, natural waterfalls in existence for at least several hundred years); and (3) tribal lands. No dams identified in the FR notice are present in the action area.

The final rule designating SONCC coho salmon CH (May 5, 1999, 64 FR 24049) indicated that the essential habitat types for: (1) juvenile summer and winter rearing areas and adult spawning are often located in small headwater streams and side channels; (2) juvenile migration corridors and adult migration corridors include the small headwater streams and side channels as well as mainstem reaches and estuarine zones; and (3) growth and development to adulthood occurs primarily in near- and off-shore marine waters, although final maturation takes place in freshwater tributaries when the adults return to spawn. For the purpose of this consultation, "essential habitat types" represent the primary constituent elements (PCEs) of SONCC coho salmon CH. Within the PCEs, essential features of SONCC coho salmon CH include adequate: (1) substrate, (2) water quality, (3) water quantity, (4) water temperature, (5) water velocity, (6) cover/shelter, (7) food, (8) riparian vegetation, (9) space, and (10) safe passage conditions.

The current condition of SONCC coho salmon CH is discussed in the *Factors Affecting the Species and Critical Habitat* section below. The *Environmental Baseline* section describes habitat conditions within the action area. Furthermore, the *Effects of the Action* section is largely organized around anticipated effects on SONCC coho salmon habitat and their CH.

C. Factors Affecting the Species and Critical Habitat

SONCC coho salmon have experienced declines in abundance in the past several decades as a result of loss, damage or change to their habitat. Studies indicate that in most western states, about 80 to 90 percent of the historic riparian habitat has been eliminated (Norse 1990, California State Lands Commission 1993). Loss of habitat complexity and fragmentation of habitat have also contributed to the decline of SONCC coho salmon. For example, in national forests within the range of the northern spotted owl in western and eastern Washington, there has been a 58 percent reduction in large, deep pools due to sedimentation and loss of pool-forming structures such as boulders and large wood (FEMAT 1993). The California Advisory Committee on Salmon and Steelhead Trout (1988) reported habitat blockages and fragmentation, logging and agricultural activities, urbanization, and water withdrawals as the most predominant problems for anadromous salmonids in California's coastal basins. It identified factors associated with habitat degradation for each major river system in California. CDFG (1965, Vol. III, Part B) reported that the most vital habitat factor for coastal California streams was "degradation due to improper logging followed by massive siltation, log jams, *etc.*" In addition, CDFG (1965) cited road building as another cause of siltation in some areas, and identified a variety of factors associated with habitat degradation in individual basins, including extremes of natural flows (Redwood Creek and Eel River), logging practices (Mad, Eel and Mattole Rivers), dams with no passage facilities (Eel River), and water diversions (Eel River).

The factors for decline among populations of SONCC coho salmon are discussed below. 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).

1. Timber Harvest

Timber harvest and associated activities occur over a large portion of the SONCC coho salmon ESU. Timber harvest has caused widespread increases in sediment delivery to channels through both increased landsliding and surface erosion from harvest units and log decks. Much of the riparian vegetation has been removed, reducing future sources of LWD needed to form and maintain stream habitat that salmonids depend on for various life stages. Cumulatively, the increased sediment delivery and reduced woody debris supply have led to widespread impacts to stream habitats and salmonids. These impacts include reduced spawning habitat quality, loss of pool habitat for adult holding and juvenile rearing, loss of velocity refugia, and increases in the levels and duration of turbidity which reduces the ability of juvenile fish to feed, and, in some cases may cause physical harm by abrading the gills of individual fish. These changes in habitat have led to widespread decreases in the carrying capacity of the streams that support salmonids.

Since adoption of the NWFP in 1994, timber harvest has decreased dramatically on Federal lands within in the range of the Northern spotted owl, including Federal lands contained within the SONCC coho salmon ESU. This reduction in the timber harvest is expected to result, over time, in an increase in LWD, a decrease in stream temperatures and a decrease in timber harvest-related sediment delivered to streams. Although the recovery times are expected to take decades, over time the likelihood of recovery of SONCC coho salmon should increase due to reductions in timber harvest on Federal lands.

2. Road Construction

Road construction, whether associated with timber harvest or other activities, has caused widespread impacts to salmonids (Furniss *et al.* 1991). Where roads cross salmonid-bearing streams, improperly placed culverts have blocked access to many stream reaches. Landsliding and chronic surface erosion from road surfaces are large sources of sediment across the affected species' ranges. Roads also have the potential to increase peak flows with consequent effects on the stability of stream substrates and banks. Roads have led to widespread impacts on salmonids by increasing the sediment loads. The consequent impacts on habitat include reductions in spawning, rearing and holding habitat, and increases in turbidity. These effects are similar to those described for timber harvest above.

Adoption and implementation of the NWFP has also resulted in a reduction of road construction on Federal lands across the SONCC coho salmon ESU. This reduction in new road construction will result in a reduction of road-related impacts to SONCC coho salmon. NMFS anticipates that reductions in road construction on Federal lands will increase the likelihood of recovery for SONCC coho salmon.

3. Hatcheries

Artificial propagation is also a factor in the decline of salmonids due to the genetic impacts on indigenous, naturally-reproducing populations, disease transmission, predation of wild fish, depletion of wild stock to enhance brood stock, and replacement rather than supplementation of wild stocks through competition and the continued annual introduction of hatchery fish. Artificial propagation and other human activities such as harvest and habitat modification can genetically change natural populations so much that they no longer represent an evolutionarily significant component of the species (Waples 1991).

4. Water Diversions

Diversion of water, both on a large (*e.g.*, major dams) and small (*e.g.*, irrigation ditches) scale, have altered the hydrology, magnitude, and timing of water flows throughout the range of SONCC coho salmon. Unscreened diversions for agricultural, domestic and industrial uses are a significant factor for salmonid declines in many basins. Reduced streamflows due to diversions reduces the amount of habitat available to salmonids and can degrade existing water quality, particularly where return flows enter the river. Reductions in the quantity of water in a given stream reach will reduce the carrying capacity of the reach. Where warm return flows enter the stream, fish may seek reaches with cooler water, thus increasing competitive pressures in other areas. In the Trinity River Basin, water diversions have fragmented anadromous fish habitat and altered hydrographs, including within the action area. Initial diversions, began in the mid 1800s, were localized for irrigation and mining. Some of these, used for irrigation and domestic use, persist today. The Weaverville Community Service District (WCSD) withdraws significant amounts of water from West and East Weaver Creek for domestic and irrigation purposes. Rush Creek Subdivision uses water from Rush Creek, resulting in very low late-summer flows. In 1963, Trinity Dam was completed, eliminating over 100 miles of important anadromous fish habitat. This facility changed the hydrograph and temperature regime for the remaining portion of the river that was available to anadromous fish by diverting up to 90 percent of the river's flow to the Sacramento River. Degraded habitat from the lack of river flow may be the single greatest limiting factor in anadromous fish populations of the Trinity River (USDA-FS 2005).

5. Predation

Predation was not thought to have been a major cause in the decline in population. However, it may have had substantial impacts in local areas. For example, Higgins *et al.* (1992) and CDFG (1994) reported that Sacramento pikeminnow have been found in the Eel River basin and are considered a major threat to native salmonids. Furthermore, California sea lions and Pacific harbor seals, which occur in most estuaries and rivers where salmonid runs occur on the West Coast, are known predators of salmonids. However, salmonids appear to be a minor component of the diet of marine mammals (Scheffer and Sperry 1931, Jameson and Kenyon 1977, Graybill 1981, Brown and Mate 1983, Roffe and Mate 1984, Hanson 1993). In the final rule listing the SONCC coho salmon ESU (May 6, 1997, 62 FR 24588), for example, NMFS indicated that it was unlikely that pinniped predation was a significant factor in the decline of SONCC coho salmon on the west coast, although it may be a threat to existing depressed local populations. Specific areas where predation may preclude recovery cannot be determined without extensive studies.

6. Disease

Infectious disease is one of many factors that can influence salmonid survival. Salmonids are exposed to numerous bacterial, protozoan, viral, and parasitic organisms in spawning and rearing areas, hatcheries, migratory routes, and the marine environment. Very little current or historical information exists to quantify changes in infection levels and mortality rates attributable to these diseases for salmonids. However, studies suggest that naturally spawned fish tend to be less susceptible to pathogens than hatchery-reared fish (Sanders *et al.* 1992).

7. Existing Regulatory Mechanisms

Existing regulatory mechanisms, including land management plans (*e.g.*, National Forest Land and Resource Management Plans), California Forest Practice Rules, Clean Water Act (CWA) section 404 activities, urban growth management, and harvest and hatchery management all contributed to varying degrees to the decline of salmonids due to lack of protective measures, the inadequacy of existing measures to protect salmonids and/or their habitat, or the failure to carry out established protective measures.

Sections 303(d)(1)(C) and (D) of the CWA require states to prepare Total Maximum Daily Loads (TMDLs) for all water bodies that do not meet State water quality standards. Development of TMDLs is a method for quantitative assessment of environmental problems in a watershed and identification of pollution reductions needed to protect drinking water, aquatic life, recreation, and other uses of rivers, lakes, and streams. Appropriately protective aquatic life criteria are critical to the TMDL process for affecting the recovery of salmonid populations, as the criteria's exceedence will determine which water bodies will engage in the TMDL process and criteria compliance goals are the impetus for developing mass loading strategies. The ability of these TMDLs to protect salmonids should be significant in the long term. However, developing them quickly in the short term will be difficult, and their efficacy in protecting salmonid habitat will be unknown for years to come.

CDFG completed a status review of coho salmon populations in northern California (CDFG 2002) and recommended to the California Fish and Game Commission (CFGC) that coho salmon occupying streams from Punta Gorda, Humboldt County, to the Oregon border be state listed as a threatened species. In August 2002, the CFGC issued a finding that the SONCC coho salmon ESU warranted listing as a threatened species under the California Endangered Species Act (CESA). The CFGC directed CDFG to develop a recovery strategy. Subsequently, the Director of CDFG initiated a multi-stakeholder statewide Coho Salmon Recovery Team to make recommendations on components of a plan to recover the species. As requested by CDFG, on February 4, 2005, the CFGC officially listed coho salmon populations from San Francisco to the Oregon border under the CESA (CFGC 2005). Implementation of the recovery plan and protective regulations will potentially have significant long-term benefits to SONCC coho salmon. However, we do not know the manner in which additional regulations and recovery actions will be implemented. Therefore, at this time, we cannot estimate how SONCC coho salmon will benefit from the state listing.

8. Sport and Commercial Harvest

Sport and commercial harvest is thought to have been a significant factor (June 28, 2005, 70 FR 37160) in the decline of salmonids. NMFS also notes that under some circumstances, the impacts of recreational freshwater fishing are of concern, particularly during years (*e.g.*, drought) of decreased availability of refugia.

9. Watershed Restoration

Since implementation of the NWFP began in 1994, there have been at least 450 miles of roads decommissioned on the Klamath, Six Rivers, Mendocino, and Shasta-Trinity National Forests. Road decommissioning results in immediate reductions of chronic erosion to salmonid-bearing streams and also decreases the potential for catastrophic delivery of road-related sediment, especially associated with stream crossings. Road decommissioning also helps to reestablish natural drainage patterns, which can moderate peak flows. Also, over the last few years there has been a concerted effort to improve fish passage at road-stream crossings. These activities have resulted in both increased access for SONCC coho salmon to previously inaccessible habitat, and also reduces the probability of stream crossing failure during flood flows. Road rehabilitation and culvert upgrades are expected to promote the recovery of SONCC coho salmon.

D. Current Condition of Critical Habitat at the ESU Scale

As identified in the *Status of Critical Habitat* section, the essential habitat types of SONCC coho salmon CH are areas for juvenile summer and winter rearing and out-migration, and adult spawning and migrating. As described in the previous sections, timber harvest and associated activities, road construction, and water diversions throughout a large portion of the freshwater range of the SONCC coho salmon ESU continue to result in increased sedimentation, reduction in pool-forming structures, blockages to spawning and rearing habitat, reduced water quality and reduced stream flows. Although watershed restoration activities have improved freshwater CH conditions in isolated areas, reduced habitat complexity, poor water quality, and reduced habitat availability as a result of continuing land management practices continue to persist in many locations and are likely limiting the conservation value (*i.e.*, limiting the numbers of salmonids that can be supported) of CH within these freshwater habitats at the ESU scale.

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).

Analysis of the environmental baseline is guided by the specific habitat components necessary to support SONCC coho salmon within the action area. When the environmental baseline departs from conditions that support those biological requirements, it becomes more likely that additional risks to the ESU resulting from the effects of the proposed action on the ESU or its habitat may result in jeopardy (NMFS 1999). This is particularly true when the effects of the proposed action significantly contribute to a limiting factor of the species. The biological requirements of SONCC coho salmon in the action area vary depending on the life history stage present and the natural range of variation present within that system (Natural Resource Council 1996, Spence *et al.* 1996, Sandercock 1998). Limiting factors, where determined (*e.g.*, Technical Review Team, Biological Review Team, Watershed Analysis), may identify those biological requirements most responsible for threatening the survival and recovery of the species.

Generally, during spawning migrations, adult salmon require clean water with cool temperatures or thermal refugia, dissolved oxygen near 100 percent, low turbidity, adequate flows and depths to allow passage over barriers to reach spawning sites, and sufficient holding and resting sites. Spawning areas are selected based on species-specific requirements of flow, water quality, substrate size, and groundwater upwelling. Embryo survival and fry emergence depend on substrate conditions (*e.g.*, gravel size, porosity, permeability, oxygen levels), substrate stability during high flows, and, for most species, water temperatures of 13°C (55°F) or less. Habitat requirements for juvenile rearing include seasonally suitable microhabitats for holding, feeding, and resting. Migration of juveniles to rearing areas, whether the oceans, lakes, or other stream reaches, requires unobstructed access to these habitats. Physical, chemical, and thermal conditions may also impede migrations of adult or juvenile fish.

SONCC coho salmon reside in the action area. Thus, for this action area, the biological requirements for SONCC coho salmon are the habitat characteristics that would support successful adult and juvenile migration, adult holding, spawning, egg incubation, and rearing.

The environmental baseline provides a platform to assess the effects of the action, and therefore, focuses on the baseline conditions of *Turbidity*, *Substrate*, and *Pool Frequency and Quality* that are more than insignificantly affected are discussed in this section. Analysis of PEs that would result in insignificant or discountable effects to SONCC coho salmon or their CH can be found in appendix B of this Opinion. Factor analysis performed on each PE/Indicator combination has identified those combinations that would result in insignificant or neutral effects to SONCC coho salmon or their CH after considering only the first three factors, due to the geographic relationship between the PE and SONCC coho salmon or their CH (proximity), the likelihood that SONCC coho salmon or their CH would be exposed to the biotic or abiotic effects of the PE to the Indicator (probability), and the severity and intensity of the effect (magnitude). Factor analysis was continued using the remaining five factors (nature, distribution, frequency, duration, and timing) for those PE/Indicator combinations that would result in more than insignificant negative effects to SONCC coho salmon or their CH, as described in the *Effects of the Action* section below.

The discussion below first discusses the factors that affect SONCC coho salmon and their CH in the action area. Next, the status of SONCC coho salmon and their CH in the action area are discussed, including how those factors affect SONCC coho salmon and the conservation value of their CH.

A. Factors Affecting SONCC Coho Salmon and their Critical Habitat in the Action Area

The following factors affect the quality or quantity of SONCC coho salmon and their CH in the action area.

1. Migration Barriers

CR 232 crossing over Little Browns Creek presents a total barrier to upstream migrating SONCC coho salmon due to undersized, perched culverts. This barrier prevents SONCC coho salmon access to approximately 1.5 miles of CH located upstream of the barrier, and currently limits the quantity of migrating, spawning, and rearing habitat available to SONCC coho salmon in Little Browns Creek. See item number nine, below, for a description of anticipated barrier removal.

In addition, a diversion dam for the WCSD blocks SONCC coho salmon migration 0.25 miles above the East Weaver Campground.

2. Hydraulic Mining

Much of the area in and around Weaverville was hydraulically mined in the late 1800s and early 1900s. This activity involved washing hillslopes with large volumes of water, often shot at high velocities from water cannons. Immense quantities of soil and woody debris were washed from action area tributary stream channels and ultimately into Weaver Creek and the Trinity River. However, while the practice has not occurred in the area around Weaverville for over 60 years, recovery of the Weaver Creek watershed and its tributaries has been slow (USDA-FS 2002). This disturbance altered the dynamic equilibrium of the mainstem Trinity River and most of its tributaries, many of which are still responding to that disturbance. A vast network of ditches and holding ponds were created on the slopes for water delivery to the mining areas. Many water release clean outs (dammed ponds upslope on hillsides) were created to flush the ditches. The ditches, although no longer in use, have breached in several locations, adding to the potential movement of sediment through the system. Since the 1970s there has been a rise in the level of small-scale mining by suction dredging and panning.

Mining throughout the lower elevations of the watershed (below Weaverville) has denuded and destabilized some reaches of the creeks. Removal of cobbles in tributaries during hydraulic mining has decreased the inherent stability of the channels. There is a lack of shrubs and other vegetation adjacent to the channels, leaving the streambanks susceptible to lateral scouring.

3. Timber Management

Timber harvest and associated road management activities have occurred in the action area for over 100 years. These activities result in changes to natural functions of watersheds, including altering the hydrological cycle by changes in peak flows (maximum volume of water in the stream) and base flows (the volume of water in the stream representing the groundwater contribution), sediment transport, and stream channel morphology. While recent timber harvest and road building practices are less disruptive to watershed functions, the effects of past practices remain, including a scarcity of large trees. For more information, refer to *Status of the Species and Critical Habitat* section of the Opinion. NMFS is not aware of any current timber harvest activities in the action area.

4. Roads

Road density is high in both the Little Browns Creek subwatershed [6.2 miles/square mile (Mi/Mi^2)] and the Weaver Creek watershed (over 3 Mi/Mi^2). These roads, most of which lack aggregate surfaces, have exposed clay subsoils that dominate the lower watersheds and contribute to increased soil erosion over un-roaded areas. Due to the high road density and close proximity to Weaverville, these areas are popular for recreational four-wheel vehicle use, at times off-road and/or in RR where vehicles are driven into areas adjacent to or directly in stream channels. Highway and urban road runoff drain directly into Weaver Creek, and could carry chemical contaminants (such as oil and antifreeze) associated with vehicles. Highway 299 is a major transportation corridor between Interstate 5 and the northern California coast. Hazardous materials are trucked on this portion of the highway, creating the potential for hazardous materials spilling into Weaver Creek.

5. Water Diversions

A diversion dam for the WCSD blocks SONCC coho salmon migration 0.25 miles above the East Weaver Campground. For further information, refer to "Water Diversions" in the *Status of the Species and Critical Habitat* section of the Opinion. Some water diversions perviously discussed occur within the action area.

6. Wildland Fire Suppression

Wildland fire suppression has long- and short-term effects to aquatic habitats and species. A natural fire regime like that within the action area has reduced the occurrence of catastrophic fires because fuels did not accumulate on the ground, and fire-tolerant conifers dominated the overstory (Agee 1993). Transformation of forest type from mixed-conifer to true fir is largely due to wildland fire suppression and could result in microclimate alteration in riparian areas. Wildland fire suppression, commencing in earnest around 1910, has altered the plant and animal species composition and stand densities of forests in the action area. Historically, there was a short "return interval" fire regime from 5-35 years in the territory surrounding the action area (USDA-FS 2004). Fire scar analyses in mixed conifer stands on the Klamath National Forest, which are similar to mid-elevation stands in the action area, indicate an average fire return interval of approximately 8 years (Skinner and Chang 1996). Fires were caused by lightning, and Native Americans burned to improve hunting and gathering opportunities. As a result of wildland fire suppression, many forest stands which naturally grew approximately 50 large fire-tolerant trees per acre are now over-stocked with hundreds of small, mostly fire intolerant trees per acre. Stands which historically experienced low intensity understory burns now are prone to high intensity crown fires with a corresponding high percent mortality in large, normally fire-tolerant trees. The threat from catastrophic high intensity wildland fire in the action area is increasing and would likely lead to a reduction in SONCC coho salmon numbers and degradation of their CH.

7. Livestock Grazing

Livestock grazing occurred on much of the present STNF lands from the mid-1800s until World War II. Grazing reached its peak in the Trinity River Basin during and just after World War I, declining over the next 20 to 30 years, and has remained steady during the last four decades. Along with the decline in livestock numbers, came a decline in the total number of active grazing allotments. Livestock affect fish directly by entering streams and trampling fish or damaging their redds. Grazing animals degrade riparian areas by denuding streamside vegetation, leading to decreased streambank integrity and loss of channel stability (Kinch 1997).

8. Condition of Riparian Reserves

Riparian Reserves in the action area have been adversely impacted by hydraulic mining, timber harvest, and roads. These areas surrounding steam channels serve essential functions to maintaining the health of aquatic ecosystems. Currently, most of the RRs in the action area are degraded due to a lack of streambank vegetation, adequate soil cover, LWD, and canopy shade cover. These degraded conditions have limited the capacity of the RRs to function properly as buffer corridors which protect aquatic habitats, particularly the ability to prevent sediment from entering stream channels.

9. Restoration

From 1986 to 1992, most streams in the action area had habitat improvement structures installed. Six habitat improvement structures were installed in Little Browns Creek in 1992. In confined channels such as Little Browns Creek, some well-constructed structures still persist and provide

SONCC coho salmon juvenile rearing and adult migrating habitats. In streams with less confinement and high bedload transport, the structures were less successful.

Trinity County eliminated about 5,000 feet of a 4-foot-wide by 4-foot-deep ditch that diverted six ephemeral streams and caused bank sloughing and landslides which delivered sediment to action area streams. As a result, Trinity County estimated that approximately 10,000 yd^3 of potential sediment was stabilized on CR 230 (adjacent to Little Browns Creek) between 2000-2003 (Lancaster 2005).

The Trinity County Culvert Inventory and Fish Passage Evaluation Final Report (Taylor *et al.* 2002) ranked the CR 232 crossing on Little Browns Creek as the second highest priority for treatment in Trinity County and is currently considered the second highest priority out of a five-county area. Trinity County has submitted a proposal to CDFG for funding to fix this barrier in 2006 or 2007 (Lancaster 2005). Notification of funding is expected to be made in early 2006, and if project funding is received, work is expected to occur in August and September 2006 at the earliest. If work is not completed during this timeframe due to high flow conditions or other delays, work would then occur August and September 2007. After consideration of the high ranking of this barrier for removal, in combination with the track record for completion of similar high-ranking migration barrier treatment projects, NMFS believes there is a high likelihood that Trinity County will receive the funding and the barrier will be removed prior to the completion of Project work scheduled f 2010. NMFS also believes that if the barrier is removed during the timeframes stated above, SONCC coho salmon will access an additional 1.5 miles of habitat upstream of the current CR 232 barrier during the life of the Project.

10. Aggregated Federal Effects

NMFS determined whether any Federal actions that are undergoing consultation concurrently by reviewing the *Aggregated Federal Effects* section of the BA and by searching NMFS records. For the Browns Project consultation, the BA indicates no Federal actions that are undergoing consultation concurrently in the action area or the Weaver Creek watershed. However, NMFS records indicate that the Federal Highways Administrations' East Connector Project (ECP) is currently undergoing formal ESA section 7 consultation (consultation # 151422SWR2002AR6405). Because the ECP is still undergoing consultation and will not likely be completed prior to the issuance of this Opinion, the effects of the ECP are not included in the description of the environmental baseline for this consultation. Rather, upon issuance of this Opinion, the environmental baseline for the action area would be updated to include the effects of the Project and included in the ECP analysis. Therefore, the effects of ECP are not considered in this Opinion.

B. Status of SONCC Coho Salmon Critical Habitat and SONCC Coho Salmon in the Action Area

1. Extent of SONCC Coho Salmon Critical Habitat in the Action Area

Unnatural structures that are complete barriers to migrating SONCC coho salmon occur within the action area. These barriers were not identified in the SONCC coho salmon CH designation

FR notice, and therefore, habitat upstream of these barriers is considered CH. Based on Everest (2005), NMFS concluded that SONCC coho salmon CH in Little Browns Creek extends approximately 1.5 miles beyond the CR 232 barrier (7.5 total miles); and in East Weaver Creek extends approximately 0.6 miles upstream of the WCSD diversion dam (5.1 total miles). SONCC coho salmon CH also occurs within the East Branch of East Weaver Creek to approximately 0.9 miles upstream of the CR 228 barrier near the confluence with East Weaver Creek. Rush Creek contains about 9.5 miles of SONCC coho salmon CH. Maps in appendix A show the extent of SONCC coho salmon CH in the action area.

Everest's (2005) premise is that the extent of SONCC coho salmon CH both above and below the existing barriers can be described in terms of the distribution of steelhead. Steelhead have been observed more frequently than SONCC coho salmon in action area streams, and is used as an indicator of the range of SONCC coho salmon CH, thus, Everest (2005) conservatively equated the extent of SONCC coho salmon CH with the distribution of steelhead because steelhead are known to be able to access streams with higher stream gradient due to their superior swimming abilities.

2. Status of Critical Habitat in the Action Area

The final rule designating SONCC coho salmon critical habitat indicates that the essential habitat types for juvenile summer and winter rearing areas and adult spawning areas are often located in small headwater streams and side channels. In addition, juvenile migration corridors and adult migration corridors include the small headwater streams and side channels as well as mainstem reaches. Thus, SONCC coho salmon CH within the action area provides spawning, rearing, and migratory habitat for juveniles and adults. Appendix A of the BA (included herein by reference) includes the STNF Tributaries Matrix of Factors and Indicators (Matrix) to provide information on baseline habitat conditions for streams within the action area. The Matrix suggests values to determine categories of function (*i.e.*, not properly functioning, at risk, properly functioning) for anadromous fish-bearing streams. The condition of spawning, rearing, and migrating habitats are described in the BA in terms of these various Indicators. The following subsections describe the condition of CH for action area streams.

a. Little Browns Creek

Turbidity is not properly functioning (slow to clear after precipitation events). *Substrate* is properly functioning (less than 15 percent fines in pool tail-outs). Pool tail-out fines are 6 percent. *Pool Frequency and Quality* is not properly functioning; there is one pool every 4.8 channel widths, but pools are very shallow. The conditions of other Indicators are presented in appendix B.

b. Weaver Creek

Turbidity is not properly functioning; the creek becomes turbid quickly and remains turbid through precipitation events. Substrate is at risk; fine sediment levels are somewhat elevated in pool tails and spawning areas. Pool Frequency and Quality is not properly functioning; pools are infrequent and generally shallow.

c. East Weaver Creek

Turbidity is properly functioning (turbidity is low). Turbidity clears quickly after precipitation events. Substrate is properly functioning. Fine sediment at pool tail-outs is 10 percent. *Pool Frequency and Quality* is at risk because pools are frequent but average only 18 inches deep.

d. Rush Creek

Turbidity is at risk; Rush Creek becomes turbid quickly after precipitation events, but usually clears within 2 days. *Substrate* is properly functioning; fine sediment in pool-tails is 9 percent. *Pool Frequency and Quality* is at risk; Rush Creek has 1 pool every 5.4 channel widths and over half of the pools are greater than 36 inches deep.

e. Conservation Value of Critical Habitat

Adequate spawning, rearing, and migration habitat is necessary in order to support recovery of SONCC coho salmon in the action area. However, the Weaver Creek watershed, which contains a large portion of the action area (except for Rush Creek), has experienced a great deal of historical habitat degradation. Although much of the habitat degrading land use practices have subsided, recovery of the habitat has been slow. For example, historical hydraulic mining, timber harvest, residential activity, *etc.*, coupled with unstable soils, have loaded local creeks with much more sediment than could be transported, and has resulted in braided channels with cobble and gravel substrate (spawning habitat), few pools, little shade, and little LWD (rearing habitat). Although the historic disturbances are subsiding and habitat conditions are improving within the action area (both naturally and through restoration projects), migration barriers, poor water quality, reduced flow due to domestic and industrial withdrawal, and lack of deep pool habitat limit the conservation value of CH within the action area.

<u>3. Status of SONCC Coho Salmon in the Action Area</u>

SONCC coho salmon are known to inhabit streams within the Weaver Creek watershed, including Weaver Creek, East Weaver Creek, Little Browns Creek, and Rush Creek. There are about 20 miles of habitat currently accessible to anadromous fishes in the Weaver Creek watershed, and another approximately 1.5 miles upstream of the CR 232 barrier in Little Browns Creek. These populations are found sporadically in response to favorable tributary migration conditions.

Fish habitat surveys have been conducted periodically since the early 1980s for most streams in the action area, and as early as 1963 for Rush Creek. Many surveys note poor habitat conditions. Overall, information regarding the population size of naturally spawning SONCC coho salmon in the action area is incomplete. Historical accounts are difficult to interpret because early settlers did not distinguish between SONCC coho salmon, Chinook salmon, or steelhead. Complicating any attempt to estimate the number of wild SONCC coho salmon in the Trinity River and its tributaries is the large number of hatchery fish from Iron Gate Hatchery that spawn naturally, and the lack of consistent, long-term data on escapement and recruitment. What little information is available indicates that SONCC coho salmon were extirpated from Weaver Creek and its tributaries by barriers and poor habitat from the early 1900s until 1987. Since 1987, the number of SONCC coho salmon spawning in Little Browns Creek and East Weaver Creek has been sporadic and the number of spawners variable. SONCC coho salmon spawn naturally in the mainstem Trinity River and its tributaries within 20 miles up and downstream of Weaver Creek, including Reading Creek, Little Browns Creek, Dutch Creek, Soldier Creek, Canyon Creek, North Fork Trinity River, Indian Creek, Grass Valley Creek, Rush Creek, and Deadwood Creek.

a. Little Browns Creek

Little Browns Creek has over 6 miles of habitat currently accessible to SONCC coho salmon within the action area, with approximately 0.9 miles of that habitat on STNF lands. An additional approximately 1.5 miles of habitat occurs upstream of the migration barrier created by culverts on CR 232 (discussed above). Juvenile and adult SONCC coho salmon have been observed within the action area, with limited spawning observed. NMFS believes SONCC coho salmon numbers in Little Browns Creek are extremely low due to their recent re-occupation of Weaver Creek and its tributaries following several decades of extirpation from the area. Little Browns Creek flows intermittently during the dry season in the lower portions of the creek (from the Project area downstream to the confluence with Weaver Creek) and is often completely dry during the summer months upstream of the Highway 3 crossing (approximately 5.5 miles upstream of the confluence with Weaver Creek). Highway 3, CRs 230, 232 and 807, and Forest Road U34N77A closely parallel Little Browns Creek within the action area. Little Browns Creek has been channelized and its habitat greatly simplified. LWD is infrequent, pools are shallow, and the streambanks are vulnerable to erosion.

b. Weaver Creek

Weaver Creek has approximately 5.7 miles of habitat available to SONCC coho salmon below the confluence of East and West Weaver Creeks, none of which is on the STNF. The town of Weaverville is located entirely within the watershed and heavily impacts the watershed through domestic water use and disruption of peak and base flows. The riparian areas of Weaver Creek have shown some recovery from those pictured in early photos when both bucket dredge and hydraulic mining occurred in and near the community. Culverts and concrete-lined ditches did not provide for fish passage. Migration barriers are slowly being modified and upgraded to allow fish to reach areas that have been blocked for many years. SONCC coho salmon are now commonly seen in town during November and December when flows are suitable for migration.

c. East Weaver Creek

East Weaver Creek has approximately 4.5 miles of habitat accessible to SONCC coho salmon, with approximately 0.5 miles of that habitat on STNF lands. Juvenile SONCC coho salmon have been observed near East Weaver Campground but adult spawning has not been observed.

d. Rush Creek

SONCC coho salmon have access to about 9.5 miles of stream habitat before steep bedrock falls block passage. Low fall flows generally prevent SONCC coho salmon from using Rush Creek until late November. Spawning surveys have been conducted on sections of Rush Creek intermittently since 1964. Counts have varied widely according to year and survey effort, but have ranged from 0 to 32 SONCC coho salmon.

The very first fish habitat surveys in Rush Creek noted excessive bedload and recommended that measures be taken to improve habitat. During the 1980s, a Coordinated Resource Management Planning group was formed, composed of state and Federal agencies to address habitat needs in Rush Creek. The group recommended placing instream structures, 32 of which were built in 1988 and 1989. Surveys in 2002 and 2004 showed that only 40 percent of the structures remain and less than 20 percent are still functioning. A 2002 Stream Condition Inventory (SCI) found that most of the LWD was less than 1 foot in diameter, pools averaged 2.4 feet deep and 68 percent of the streambanks were unstable.

e. Summary of Status of SONCC Coho Salmon in the Action Area

The Weaver Creek watershed, which contains a large portion of the action area (except for Rush Creek), has experienced a great deal of historical habitat degradation which, in conjunction with fish passage barriers, resulted in the extirpation of SONCC coho salmon until 1987. Although much of the habitat degrading land use practices have subsided, recovery of the habitat, and in turn the SONCC coho salmon population, has been slow. For example, historical hydraulic mining, timber harvest, residential activity, *etc.*, coupled with unstable soils, have loaded local creeks with much more sediment than could be transported, and has resulted in braided channels with cobble and gravel substrate (spawning habitat), few pools, little shade, and little LWD (rearing habitat). While the area is recovering from these disturbances (both naturally and through restoration projects), migration barriers, poor water quality, reduced flow due to domestic and industrial withdrawal, and lack of deep pool habitat limit the numbers, reproduction, and distribution of SONCC coho salmon within the action area.

V. EFFECTS OF THE ACTION

The effects analysis examines those effects that may occur from implementation of the proposed action, NMFS must consider the estimated level of mortality attributable to:
(1) collective effects of the proposed or continuing action in consideration of the existing environmental baseline, (2) any aggregated Federal action effects not previously captured in the environmental baseline, and (3) any cumulative effects as described under the ESA.

NMFS provided an overview of the Project in the *Description of the Proposed Action* section of this Opinion. In the *Status of the Species* and *Critical Habitat* sections of this Opinion, NMFS provided an overview, at the ESU scale, of the status and trends of SONCC salmon and their CH. In the *Environmental Baseline* section of this Opinion, NMFS summarized the impacts of past and present Federal, State, local and private activities on SONCC coho salmon and their CH within the action area. In this section of the Opinion, as required by the ESA and its implementing regulations (50 CFR Part 402), NMFS assesses the direct and indirect effects of the proposed action, including beneficial effects of the proposed action, and the effects of any interrelated and interdependent actions on SONCC coho salmon and their CH.

"Effects of the action" means the direct and indirect effects of an action on the species or designated critical habitat, together with the effects of other activities that are interrelated or interdependent with that action that would be added to the environmental baseline. Interrelated actions are those that are part of a larger action and depend on that action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration (50 CFR § 402.02). Effects of discountable probability or insignificant magnitude to adversely affect the listed species are considered not likely to occur (USFWS and NMFS 1998).

NMFS may use one, or both, of two independent techniques in assessing the effects of a proposed action. One technique considers effects in terms of how many listed salmon will be killed or injured during a particular life stage and gauges the effects of that take on population size and viability. An alternative technique uses a habitat analysis, which considers the effects on the species' habitat requirements, such as water temperature, substrate composition, dissolved gas levels, structural elements, *etc.* To account for poorly understood exogenous effects, larger scale indicators of habitat condition must be used in conjunction with these individual indicators of habitat condition. However, in many instances, these larger scale indicators (*i.e.*, watershed condition indicators) alone may not sufficiently demonstrate a significant aquatic effect (*i.e.*, magnitude), though they may indicate a possible effect (*i.e.*, probability). That is to say, the probability to affect a watershed condition indicator may be more than discountable (*e.g.*, road density will increase), but a significant effect to the indicator may not reflect a significant effect on the aquatic resource if none of the non-watershed condition indicators were significantly affected. This is because the direct correlation between the watershed condition indicators and aquatic effect is not as strong as is the correlation for the non-watershed indicators.

A habitat-based analysis is especially useful for actions that alter the physical condition of the landscape because, while many cause and effect relationships between habitat quality and population viability are well known, they do not lend themselves to meaningful quantification of fish killed or injured. Consequently, while the habitat analysis does not directly assess the effects on population condition, the analysis indirectly considers this issue by evaluating existing conditions in light of habitat conditions known to be conducive to salmon conservation and survival. NMFS takes the results of the habitat-based analysis and evaluates the response of individuals and populations exposed to those habitat changes to then determine the risk posed to the species from the effects of the action.

The more imperiled a species' status, the less resilience is inherent in the population. For coho salmon that are likely to become endangered in the foreseeable future (*i.e.*, threatened), an environmental baseline that is impaired (*e.g.*, not properly functioning) may pose a significantly greater risk of adverse effects than one that is properly functioning (NMFS 1999). The acceptability of the risk depends not only on the status of the local population of the species, but also on the importance of the indicator to the species. The habitat indicators have been evaluated at the action area scale. In other words, the action area encompasses only a portion of the stream drainages in question. In the absence of the identification of limiting factors, all non-watershed condition indicators described as not properly functioning must be considered as potential limiting factors and analyzed as such. If an indicator associated with a potential limiting factor is not properly functioning in the action area it displays a contributory relationship to that limiting factor.

Therefore, where a non-watershed condition habitat indicator is not properly functioning, dismissal of a potential adverse effect on the basis of an insignificant magnitude may not be valid when the species is threatened and the population (or recovery unit) is declining. In such instances, any effects of a proposed action that contribute to the impaired condition of a habitat indicator that corresponds with a potential limiting factor must be acknowledged as more than insignificant because it hinders the attainment of a properly functioning condition necessary for the recovery of the species. These effects will then be considered in the jeopardy analysis. For the subject consultation, NMFS used a habitat-based analysis when evaluating potential habitat-altering activities.

As described in the *Background* section, the STNF utilized the AP to facilitate and standardize its analysis of the Project by dividing the Project into separate PEs that were analyzed for their effects on SONCC coho salmon and their CH by assessing impacts to the Indicators. The analysis in the BA considered eight factors in order to evaluate the effects of the PEs on Indicators, and subsequently, the effects on SONCC coho salmon and their CH. These eight factors are proximity, probability, magnitude (severity and intensity), nature, distribution, frequency, duration, and timing. Similarly, NMFS analyzed each of the PEs for its effect on the Indicators. Changes to an Indicator were evaluated to determine if there would be an effect to SONCC coho salmon or their CH. NMFS considers effects to the Indicators only as they relate to effects to SONCC coho salmon or their CH. NMFS does not consider effects from changes to an Indicator to result in more than insignificant negative effects unless SONCC coho salmon or their CH would be adversely affected. This analysis also considers effects to both SONCC coho salmon and their CH simultaneously because the mechanisms that result in adverse effects are the same for both.

NMFS has determined that road rehabilitation would result in adverse effects to SONCC coho salmon through impacts to the Indicators *Turbidity*, *Substrate*, and *Pool Frequency and Quality*. Therefore, the following discussion focuses on these three Indicators. NMFS concluded that all other PEs, individually and collectively, would result in insignificant or neutral effects to the Indicators, and would have insignificant or discountable effects to SONCC coho salmon and their CH (see appendix B for more information).

A. Turbidity and Substrate

The BA grouped *Turbidity* and *Substrate* since they are affected similarly by PEs. Turbidity is used as an indicator of fine sediment suspended in the water, and substrate is an indicator of fine sediment that settles onto the streambed. NMFS agrees that grouping these Indicators is an appropriate AP streamlining measure, and has therefore analyzed the effects of the action on these Indicators simultaneously. The BA determined the Project would likely have a short-term effect that would be more than insignificant negative, and a long-term effect that would be insignificant positive, on each of these two Indicators due to anticipated effects from the road rehabilitation PE. Based on the best available information (*e.g.*, BA, EIS, watershed analysis, scientific literature, personal communications), NMFS agrees with these determinations, as discussed below.

There is a high probability that road rehabilitation would have more than insignificant negative effects on *Turbidity* and *Substrate* in CH in the Little Browns Creek subwatershed. Those effects are expected to occur due to road rehabilitation within or adjacent to the floodplain.

Approximately 27 miles of roads would be rehabilitated as part of the Project, ranging from 25 feet to over 2 miles away from CH. Of the 27 miles, NMFS has determined that approximately 0.6 miles of rehabilitation work would result in more than insignificant negative effects to these Indicators, and result in adverse effects to SONCC coho salmon and their CH, based on the considerations below. The approximately 0.6 miles include Forest Road U34N77A located on the floodplain of Little Browns Creek (occupied CH) for over 0.25 miles of its length, and Forest Roads U34N77A-1, U34N77AA, U3TRI02, U3TRI01, and U3TRI01A, located within 150 feet of occupied CH in Little Browns Creek. The remaining approximately 26.4 miles of road rehabilitation are expected to result in insignificant or discountable effects to SONCC coho salmon and their CH.

Road rehabilitation work would occur within or adjacent to the floodplain on both banks of Little Browns Creek from approximately 500 feet downstream of the Hwy 3 crossing, and extend almost continuously downstream for approximately 0.4 miles.

NMFS anticipates that sediment would likely be delivered to Little Browns Creek through surface erosion (overland flow), rilling, and sloughing, resulting from rehabilitation work on the 0.6 miles of roads identified above. Although information on anticipated volume of sediment delivered to action area streams from road rehabilitation was not provided in the BA, Madej (2001) evaluated erosion and sediment delivery to streams from rehabilitated roads in the Northern California Coast Range using treatment methods similar to those proposed for the Project. Madej (2001) found that sediment delivery to streams from treatment of lower hillslope roads (similar to the position of the 0.6 miles of roads specified above) averaged approximately 1,160 yd^3 per mile of rehabilitated roads. Data were collected one time per road segment in the study, and the time between the road rehabilitation activity and the time of the data collection ranged from 1-17 years after the rehabilitation activity. NMFS suspects that data collected 1 year after the road rehabilitation activity did not capture the entire amount of sediment delivered from the given road segment, and data collected 17 years after the road rehabilitation captured the majority of the entire amount of sediment delivered from the given road segment. Due to real or potential differences in road rehabilitation and erosion control methods, magnitude and timing of storm events following road rehabilitation work, topography, soils, and other factors, the degree to which conclusions drawn by Madej (2001) regarding sediment delivery to streams can be applied to the action area is limited. The amount of sediment delivered may be higher or lower. However, NMFS believes the study provides a strong indication that the potential magnitude of sediment delivery to Little Browns Creek is not insignificant.

Negative effects to *Turbidity* and *Substrate* from road rehabilitation work within the floodplain of Little Browns Creek would occur during precipitation events when sediment is mobilized and transported to the creek. Although the exact duration of the adverse effects is not known, the BA states that these effects would occur over a period of 1 to 3 years. The greatest negative effects would occur with the first precipitation event and diminish in following events. Subsequent events would likely re-suspend sediment deposited in the affected reaches from previous precipitation events. Erosion is usually reduced through time by natural revegetation and stabilization of disturbed areas (Beschta 1978).

Adverse effects through changes to *Turbidity* and *Substrate* in Little Browns Creek would be coincidental with the SONCC coho salmon life stages of adult fish migration, spawning, egg incubation, emergence, and rearing. Subsoiling rehabilitated road surfaces and the presence of limited vegetated buffers are expected to minimize sediment delivery. However, based on the BA, NMFS expects the magnitude of disturbance would result in adverse effects up to approximately 0.25 miles below the downstream end of the road rehabilitation, after which effects would attenuate to undetectable levels. That attenuation is dependent upon factors, including short-term and long-term rainfall patterns, stream gradient, stream flows, grain size of mobilized sediment, and the quantity of sediment delivered.

NMFS anticipates that spawning would likely occur within the action area where the adverse effects are expected to occur within the duration of the Project. Increased fine sediment levels may cause a reduction in emergence of salmonid fry due to fine sediment infiltrating redds, resulting in salmonid mortality (Bjornn *et al.* 1977). NMFS expects the increase in fine sediment levels would likely result in mortality of SONCC coho salmon eggs and alevins similar to that demonstrated by Bjornn *et al.* (1977) due to similarities between conditions described in the study and those that currently exist or are anticipated to occur within the Project area, including substrate, water volume, presence of salmonid redds, and the timing and volume of sediment anticipated to be contributed to streams and subsequently fall out of suspension.

Increased sedimentation of substrate may decrease the habitat quantity and quality of spawning and rearing areas (Bjornn *et al.* 1977, Chapman 1988, Lisle 1989) and reduce the total volume of pools (Bjornn *et al.* 1977, Lisle and Hilton 1991; discussed below). NMFS expects these effects to occur within Little Browns Creek due to similarities between conditions described in the studies and those that currently exist or are anticipated to occur within Little Browns Creek, including substrate, water volume, use by salmonids for spawning and rearing, and the anticipated volume of sediment delivery into streams. NMFS anticipates these effects would likely result in reduced SONCC coho salmon spawning and rearing success.

Suspended sediments may cause clogging and abrasion of gills and other respiratory surfaces, providing conditions conducive to entry and persistence of disease-related organisms, which, in turn, may provoke behavioral modifications and reduce respiratory efficiency (Bash *et al.* 2001). NMFS expects these effects to occur within Little Browns Creek due to similarities between Bash *et al.* (2001) and existing or anticipated conditions in Little Browns Creek, including the volume of sediment anticipated to be delivered and the anticipated presence of all life stages of SONCC coho salmon within Little Browns Creek coincident with delivery of the sediment.

Reduced juvenile salmonid feeding efficiency may occur due to reduced visibility (Sigler *et al.* 1984) and reduced macroinvertebrate production (Bjornn *et al.* 1977, Kaczynski 1994, Newcombe and Jensen 1996), which can compromise salmonid health and reduce fish growth (Argent and Flebbe 1999). Suspended material reduces the amount of light available to illuminate submerged objects and provide energy for plant photosynthesis (Bash *et al.* 2001), which subsequently affects the aquatic food chain on which juvenile SONCC coho salmon depend. Substantial sedimentation rates affect macroinvertebrates primarily by burying less mobile organisms that serve as food sources for many fish species (Bjornn *et al.* 1977). NMFS anticipates these effects would likely occur within Little Browns Creek due to similarities between the above-referenced studies and existing or anticipated conditions in Little Browns Creek, including the anticipated volume of sediment delivered, the volume of affected waters, and the coincidence of that delivery with the presence of juvenile SONCC coho salmon.

Increased turbidity areas may result in forced dispersal of SONCC coho salmon (denial of refuge), which can increase the risk of predation (Hillman *et al.* 1987). Migrating salmonids avoid waters with high turbidity, or cease migration when such conditions are unavoidable (Cordone and Kelley 1961). Upstream migration of adult salmonids may be retarded during periods of high turbidity (Cederholm and Salo 1979), and the associated energy expenditure can reduce spawning success (Berman and Quinn 1991). Coho salmon frequently wait near stream mouths until a freshet occurs before moving upstream (Sandercock 1991). NMFS anticipates that there is a high likelihood that the first freshet SONCC coho salmon would normally utilize for migration into Little Browns Creek would be the first substantial precipitation event following road rehabilitation activities, which would deliver substantial amounts of sediment into Little Browns Creek. NMFS anticipates these effects would likely occur within Little Browns Creek, and that the disturbance would likely be of sufficient magnitude downstream of the Hwy 3 crossing (approximate upstream boundary of road rehabilitation work identified as resulting in more than insignificant negative effects to *Turbidity* and *Substrate*) to impede adult SONCC coho salmon migration upstream, thus rendering approximately 2.8 miles of CH upstream of the Hwy 3 crossing temporarily inaccessible. NMFS anticipates these effects due to similarities between the above-referenced studies and existing or anticipated conditions in Little Browns Creek, including the anticipated volume and distribution of sediment delivered, the volume of water which the sediment would be delivered to, the morphology of the creek which the sediment would be delivered to, and the timing of that delivery coincident with migrating adult SONCC coho salmon and rearing juvenile SONCC coho salmon, resulting in reduced spawning and rearing success.

NMFS determined in appendix B that the harvest, yarding, fuels treatment, hauling, road construction, road reconstruction, and drafting PEs would result in insignificant negative effects on *Turbidity* and *Substrate*. In addition, road rehabilitation activities, with the exception of work on the 0.6 miles of Forest Roads, discussed above, would likely result in insignificant negative effects to SONCC coho salmon from changes to *Turbidity* and *Substrate*. NMFS determined that those effects would likewise result in insignificant (low magnitude) or discountable (not probable) effects when considered collectively because the PEs would occur over different temporal and spatial (proximity) scales (appendix A). As described in the BA, the Project will be implemented during calendar years 2006-2010. In general, implementation of the Project begins with accessing each unit either via existing roads, or road construction or reconstruction. Next, timber harvest will occur, in conjunction with yarding, hauling, and water drafting, followed by fuels treatments and planting. Based on NMFS' observations of past timber harvest on Federal lands, NMFS expects that the majority of the road construction/reconstruction and timber harvest would likely take place during the earlier portion of the 5-year Project term, and road rehabilitation implemented relatively evenly throughout the 5-year Project term. The harvest unit area encompasses 3.6 percent of the action area, including 14 percent within the Little Browns Creek watershed, 0.6 percent within the Rush Creek watershed, and 0.1 percent within the East Weaver Creek watershed.

B. Pool Frequency and Quality

The BA concluded that road rehabilitation would likely have a more than insignificant short-term negative effect and an insignificant long-term positive effect on *Pool Frequency and Quality*. Based on the best available information, NMFS agrees with these conclusions, as discussed below.

The mechanism for road rehabilitation activities to affect *Pool Frequency and Quality* is through effects to the Indicators *Turbidity* and *Substrate*. The probability and effects of sediment being generated and/or deposited by the Project were analyzed previously under the Indicators *Turbidity* and *Substrate* above, included herein by reference. That analysis found the only substantial contribution of sediment to streams containing SONCC coho salmon and their CH was from road rehabilitation activities in the Little Browns Creek subwatershed. Negative effects are expected to occur due to road rehabilitation within or adjacent to the floodplain. The remainder of this analysis considers the impact of those effects to the Indicators *Turbidity* and *Substrate* on the Indicator *Pool Frequency and Quality*.

The BA concluded that road rehabilitation activities would result in more than insignificant negative effects to *Pool Frequency and Quality*, but did not specifically identify any pools within the affected reach. This analysis, therefore, assumes that pools currently occur within the affected reach at a frequency of one pool every 4.8 channel widths and an average depth of 1.3 feet, as indicated in the BA.

While an unknown amount of sediment would likely be mobilized into CH and deposited into these pools, the analysis of *Turbidity* and *Substrate* above provided a strong indication that the potential magnitude of sediment delivery to Little Browns Creek is not insignificant. NMFS anticipates that sediment would likely be deposited in Little Browns Creek in sufficient volume to result in more than insignificant negative effects to *Pool Frequency and Quality* within the action area. Those effects would occur during and after precipitation events when sediment is mobilized, transported, and deposited in pools as high flows recede. The greatest negative effects would occur with the first sediment-mobilizing precipitation event and diminish in subsequent events. These subsequent events would likely re-suspend sediment deposited in the affected reaches from previous precipitation events. More than insignificant negative effects are expected to occur for a period of 1 to 3 years (as described in the Indicators *Turbidity and Substrate* section above), after which time disturbed areas would stabilize, sediment contributions would decrease, and high flows would re-suspend sediment deposited in pools and transport it further downstream to a point at which effects would be indistinguishable from

background levels. Insignificant negative effects to *Pool Frequency and Quality* would likely continue for several more years.
The negative effects to this Indicator, and to SONCC coho salmon and their CH in Little Browns Creek, would be coincidental with coho salmon life stages of adult migration and juvenile rearing. Increased sediment levels in pools can reduce the depth of pools or fill pools completely (Lisle and Hilton 1991), resulting in a reduction in habitat that newly emerged salmonids could use for rearing (Bjornn *et al.* 1977). Pools are also used by adults for holding (resting) or leaping during migration. The reduction in depth or frequency of pools can prevent SONCC coho salmon from accessing potential spawning habitat upstream of the affected reach until high flows scour out deposited sediment if pools are filled to such a degree that adults can no longer leap from a pool due to a reduction in pool depth (Stuart 1962, Bjornn and Reiser 1991). Other effects to SONCC coho salmon from reduced pool frequency and quality include avoidance of the affected area (denial of refuge) that can increase competition for space, risk of predation, and stress, discussed in the Indicators *Turbidity* and *Substrate* section above. NMFS anticipates these effects would likely occur within Little Browns Creek due to similarities between the above-referenced studies and existing or anticipated conditions in Little Browns Creek, including the anticipated volume of sediment delivered, the volume of water which the sediment would be delivered to, and the timing of that delivery coincident with the presence of migrating adult SONCC coho salmon and rearing juvenile SONCC coho salmon.

As discussed in the *Environmental Baseline* and *Effects of the Action* sections, and supported by the assessment in Appendix B, NMFS determined that the harvest, yarding, fuels treatment, hauling, road construction, and road reconstruction PEs would result in insignificant negative effects to *Pool Frequency and Quality*. Further, road rehabilitation activities (with the exception of work on the 0.6 miles of Forest Roads discussed above) would result in insignificant negative effects to *Pool Frequency and Quality*. NMFS determined that those effects would likewise result in insignificant (low magnitude) or discountable (not probable) effects when considered collectively because most of the activities would occur over different temporal and spatial (proximity) scales. Refer to the previous section for the description of temporal and spatial scales.

C. Summary of Project Effects

As shown in the previous two subsections, road rehabilitation would result in adverse effects to SONCC coho salmon through negative impacts to *Turbidity*, *Substrate*, and *Pool Frequency and Quality*. As presented in appendix B, NMFS concluded that all other PEs, individually and collectively, would have negative, positive, or neutral impacts to the Indicators, resulting in insignificant or discountable effects to SONCC coho salmon and their CH. In addition, the analysis in appendix B concluded that the Project would not likely directly adversely affect SONCC coho salmon. Table 3 summarizes the results of the previous two subsections and appendix B.

Table 3. Summary of the effects of the Browns Project for project element/Indicator combinations.

Indicators	Project Elements							
	Harvest	Yarding	Fuels Trtmnt	Hauling	Road Const.	Road Reconst.	Road Rehab.	Water Drafting
Temp.	-	-	-	-	-	-	-/+	-
Turbidity	-	-	-	-	-	-/+	-*/+	-
Chemical Contamination	0	0	0	0	0	0	0	0
Nutrients	-/+	-/+	-/+	-/+	-/+	-/+	-/+	-/+
Physical Barriers	0	0	0	0	0	0	0	0
Substrate	-	-	-	-	-	-/+	-*/+	-
Large Woody Debris	-/+	0	-	0	-	-	+	0
Pool Frequency and Quality	-	-	-	-	-	-/+	-*/+	-
Off-Channel Habitat	0	0	0	0	0	0	0	0
Refugia	0	0	0	0	0	0	0	0
Width/Depth Ratio	0	0	0	0	0	0	-	0
Streambank Condition	-	0	0	0	-	-	+	-
Floodplain Connectivity	0	0	0	0	0	0	+	0
Change in Peak/Base Flows	-	-	-	0	-	-	-/+	-
Increase in Drainage Network	-	-	-	0	-	-	+	0
Road Density and Location	0	0	0	0	-	0	+	0
Disturbance History	-/+	-/+	-/+	-/+	-/+	-/+	-/+	-/+
Riparian Reserves	-/+	-	-	-	-	0	-/+	0

- = Insignificant negative effects
0 = Neutral effects
+ = Insignificant positive effects
-* = More than insignificant negative effects
-/+ = Insignificant negative effects and insignificant positive effects
-*/+ = More than insignificant negative effects, and insignificant positive effects

a. Summary of Neutral Effects

For those PE/Indicator combinations that would likely result in neutral effects, there are no causal mechanisms for the PEs to result in any effects to the Indicators. The neutral effects to the Indicators will likewise result in neutral effects to SONCC coho salmon and their CH.

b. Summary of Positive Effects

The Project (all PEs) would not likely result in any positive effects to *Chemical Contamination, Physical Barriers, Off-Channel Habitat, Refugia*, and *Width/Depth Ratio*. For those

PE/Indicator combinations that would likely result in positive effects, those positive effects would likely be insignificant because of the dilution of the positive effect prior to reaching SONCC coho salmon or their CH (proximity), the low likelihood that implementation of any of the PEs would likely result in positive effects to individual coho or their CH (probability), or the inconsequential intensity of the positive effects that may occur (magnitude).

Various PEs (*e.g.*, road rehabilitation) would likely improve habitat conditions within the action area over time. For example, road rehabilitation would likely result in positive effects because it would promote shade and LWD, stabilize streambanks and sediment, reducing road-related turbidity, and decreasing fine sediment in the substrate, increasing floodplain connectivity, restoring hydrologic connectivity, decreasing compacted surfaces, increasing infiltration reduce drainage network and road density, re-vegetating bare surfaces that are prone to erosion, and improving the quality of riparian reserves. Effects from road rehabilitation on SONCC coho salmon and their CH are expected to be insignificant on the majority of the road rehabilitation due to the location (proximity) and the baseline condition of the relevant Indicators. In addition, based on the results of cumulative watershed effect modeling provided in the BA, *Disturbance History* is expected to improve within the Little Browns Creek subwatershed and would likely experience an incremental long-term improvement in *Disturbance History* and corresponding habitat conditions.

c. Summary of Negative Effects

The Project (all PEs) would not likely result in any negative effects to *Chemical Contamination*, *Physical Barriers*, *Off-Channel Habitat*, *Refugia*, and *Floodplain Connectivity*. For those PE/Indicator combinations that would likely result in negative effects, those negative effects, except for the 0.6 miles of road rehabilitation within 150 feet from Little Browns Creek, would likely be insignificant or discountable because of: (1) the substantial dilution of impacts prior to reaching SONCC coho salmon or their CH (proximity), (2) the low likelihood that implementation of any of the PEs would affect individual SONCC coho salmon or their CH (probability), or (3) the inconsequential severity and intensity of effects that may occur (magnitude).

Except for the 0.6 miles of road rehabilitation within 150 feet from Little Browns Creek, NMFS concluded the Project would likely result in insignificant or discountable effects on SONCC coho salmon and their CH due to: (1) limited timber harvest within the 150-foot intermittent stream or 300-foot fish-bearing stream RRs, and maintaining about a 100-foot no-harvest buffer for those units where RRs would be thinned; (2) not hauling or implementing any ground disturbing activities during wet weather conditions, (3) road rehabilitation, which would likely reduce sediment delivery to action area streams, in addition to reducing road density, and (3) many project design criteria that minimize the potential for negative effects. NMFS expects that ground cover attributes such as forest litter and vegetation within the RRs would likely substantially filter and arrest the majority of Project-related sediment. NMFS also expects that any Project-related sediment that enters streams will substantially dilute and result in insignificant or discountable impacts to SONCC coho salmon and their CH downstream. Because of the streamside protection buffers, NMFS also anticipates that the thermal buffering capacity provided by the remaining streamside vegetation would likely maintain water temperature.

Negative effects that are more than insignificant would likely occur as a result of the 0.6 miles of road rehabilitation within 150 feet of Little Browns Creek. Negative effects to *Turbidity, Substrate,* and *Pool Frequency and Quality* would likely result from sediment delivered to Little Browns Creek through surface erosion (overland flow), rilling, and sloughing. Adverse effects in Little Browns Creek would be coincidental with the SONCC coho salmon life stages of adult fish migration, spawning, egg incubation, emergence, and rearing. NMFS expects the magnitude of disturbance would result in adverse effects up to approximately 0.25 miles below the downstream end of the road rehabilitation, after which effects would attenuate to undetectable levels. NMFS expects the increase in fine sediment levels would likely result in mortality of SONCC coho salmon eggs and alevins. NMFS also expects the increased sedimentation of substrate to decrease the habitat quantity and quality of spawning and rearing areas and reduce the total volume of pools within Little Browns Creek resulting in a reduction in habitat that newly emerged salmonids could use for rearing. Pools are also used by adults for holding (resting) or leaping during migration. NMFS expects suspended sediments to cause clogging and abrasion of gills and other respiratory surfaces, provoke behavioral modifications, and reduce respiratory efficiency. NMFS anticipates reduced juvenile salmonid feeding efficiency and reduced macroinvertebrate production. NMFS anticipates that increased turbidity areas may result in forced dispersal of SONCC coho salmon (denial of refuge), and adult SONCC coho salmon migration upstream would likely be impeded coincident with migrating adult SONCC coho salmon and rearing juvenile SONCC coho salmon, resulting in reduced spawning and rearing success.

VI. EFFECTS OF INTERRELATED AND INTERDEPENDENT ACTIONS

In considering the effects of the Project, NMFS analyzes the effects of any interrelated or interdependent actions that are likely to occur. No interrelated or interdependent actions have been identified for analysis in this Opinion.

VII. CUMULATIVE EFFECTS

NMFS must consider both the "effects of the action" and the cumulative effects of other activities in determining whether the action is likely to jeopardize the continued existence of SONCC coho salmon or result in the destruction or adverse modification of SONCC coho salmon CH. Under the ESA, cumulative effects include the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the action area. Future Federal actions that are unrelated to the Project are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

A. Residential Development

Private lands in the action area (appendix A) include small parcels of private property, primarily in residential use. Based on anticipated population growth, road building and residential construction are reasonably certain to occur on these lands. Water is withdrawn from East Weaver and Rush Creeks within the action area for domestic and irrigation purposes. These activities manifest effects downstream or downslope as net increases in sediment delivery to channels, higher turbidities, alterations to riparian habitat including riparian canopy removal, increased water temperatures, and decreases in available fish habitat.

B. Timber Harvest on Private Lands

Private lands within the action area (appendix A) are also in timber production. Future timber harvest levels in the action area cannot be precisely predicted, however, harvest in the foreseeable future is reasonably certain to occur, and is expected to be within the approximate range of harvest levels that have occurred in the past. The effects of timber harvest on private lands are similar to those described in the *Status of the Species*, *Environmental Baseline*, and *Effects of the Action* sections of this Opinion.

C. Restoration

Trinity County is proposing additional sediment reduction work on Browns Mountain Road in the Little Browns Creek subwatershed to improve water quality (Lancaster 2005). This work is expected to reduce delivery of sediment to Little Browns Creek resulting in improved SONCC coho salmon habitat conditions. NMFS believes that this and other SONCC coho salmon habitat restoration activities are reasonably certain to occur, and would likely continue at the approximate rate that they have occurred since SONCC coho salmon listing under the ESA in 1997.

VIII. INTEGRATION AND SYNTHESIS OF EFFECTS

A. Effects on SONCC Coho Salmon

As described in the *Effects of the Action* section, NMFS expects that there would likely be increased turbidity, increased embeddedness of substrate, and decreased pool frequency and quality as a result of the Project. The road rehabilitation that results in adverse effects would occur over a period of 1 year, but the effects are expected to occur with decreasing frequency and intensity with subsequent storm events and last up to 3 years. NMFS concluded that during this time, the Project would likely lead to a reduction in SONCC coho salmon adult spawning success due to a short-term delay in access to spawning areas and dispersal of potential spawners due to elevated turbidity. Consequently, NMFS concluded that the Project would likely reduce emergence of SONCC coho salmon fry due to changes to substrate embeddedness. NMFS also concluded that the Project would likely result in reduced survival of rearing juveniles due to: (1) a short-term loss of rearing habitat from substrate embeddedness and increased turbidity, (2) reduced feeding efficiency of juveniles due to poor visibility from elevated turbidity, (3) dispersal from rearing habitat and the associated increase in risk of predation, and (4) injury to juveniles through elevated turbidity. These adverse effects are expected to occur within approximately four percent (0.85 of 20 miles) of the habitat within the action area. As discussed in the *Environmental Baseline* section, SONCC coho salmon were extirpated (or nearly so) in Weaver Creek and its tributaries as a result of barriers poor habitat, and began to return noticeably in 1987 with sporadic occurrences of spawning. Although SONCC coho salmon are known to spawn, rear, and migrate within the action area, the degraded condition limits the amount of spawning, rearing, and migrating opportunity. Therefore, NMFS expects that very few SONCC coho salmonwould use the action area. As described in the *Effects of the Action* section, very few of the SONCC coho salmon juveniles, fry, and eggs that that use the action area would likely be killed or injured.

Although the positive effects of the Project were found to be insignificant, various PEs (*e.g.*, road rehabilitation) would likely improve upon the quality of SONCC coho salmon habitat within the action area over the 7-year duration in which adverse impacts are foreseen. For example, *Disturbance History* is expected to improve over time within the Upper East Weaver Creek and Upper Little Browns Creek watersheds, likely resulting in corresponding improvement in spawning, rearing, and migrating conditions.

After consideration of the above information, and how the effects described in the *Effects of the Action* and *Cumulative Effects* sections, when added to the *Environmental Baseline*, affect SONCC coho salmon, NMFS expects a slight reduction in SONCC coho salmon reproduction, numbers, and distribution in a small portion of the action area. However, because the action area only contributes marginally to the overall reproduction, numbers, and distribution in the Trinity River Basin, NMFS does not anticipate that the Project would appreciably diminish the likelihood of survival and recovery of the SONCC coho salmon ESU.

B. Effects on SONCC Coho Salmon CH

Four of the five PCEs, as described in the SONCC coho salmon CH designation (May 5, 1999, 64 FR 24049), occur within the action area: (1) juvenile summer and winter rearing areas, (2) juvenile migration corridors, (3) adult migration corridors, and (4) spawning areas. The Project is likely to adversely affect SONCC coho salmon CH because the sediment-related effects from the 0.6 miles of road rehabilitation workwould likely diminish the value of migrating, spawning, and rearing habitat. As described above in the *Effects of the Action* section, the road rehabilitationwould likely result in adverse effects in Little Browns Creek, coincidental with the SONCC coho salmon life stages of adult fish migration, spawning, egg incubation, emergence, and rearing. NMFS expects the magnitude of disturbance would result in adverse effects up to approximately 0.25 miles below the downstream end of the road rehabilitation, after which effects would attenuate to undetectable levels. NMFS expects the increased sedimentation of substrate to decrease the habitat quantity and quality of spawning and rearing areas and reduce the total volume of pools within Little Browns Creek. Pools are also used by adults for holding (resting) or leaping during migration. NMFS anticipates that increased turbidity would likely hamper adult SONCC coho salmon migration and rearing juvenile SONCC coho salmon.

As described in the *Environmental Baseline* section above, the conservation value of CH within the action area is limited. Adverse effects are expected to occur in only four percent of the CHin the action area near the upper extent of CH. In addition, the road rehabilitation that results in adverse effects would occur over a period of one year, but the effects are expected to occur with decreasing frequency and intensity with subsequent storm events and last no more than 3 years. Over time, the habitat is expected to support more fish as it recovers from those effects and trend towards improving habitat conditions as a result of the road rehabilitiation. NMFS expects the action area to recover from the effects of the Project prior to a recovering SONCC coho salmon population needing the habitat. Finally,NMFS believes the cumulative effects of future State, tribal, local, or private actions that are reasonably certain to occur within the action area would not diminish the value of SONCC coho salmonCH because of their limited impact on the action area and inconsequential impact on the overall conservation value. NMFS has considered how the effects described in the *Effects of the Action* and *Cumulative Effects* sections, when added to the *Environmental Baseline*, impacts CH. For these reasons, NMFS concluded that the Project is not likely to appreciably diminish the conservation value of SONCC coho salmonCH at the ESU scale.

IX. CONCLUSION

After reviewing the best available scientific and commercial information, the current status of SONCC coho salmon and their designated critical habitat, the environmental baseline for the action area, the effects of the Browns Project, and the cumulative effects, it is NMFS' biological opinion that the proposed Browns Project is not likely to jeopardize the continued existence of SONCC coho salmon, and is not likely to destroy or adversely modify their designated critical habitat.

X. 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 [ESA section 3(18)]. NMFS further defines harm to include significant habitat modification or degradation which actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding, or sheltering (64 FR 60727). 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 the purpose of the proposed action is not considered to be prohibited taking under the ESA, provided that such taking is in compliance with this Incidental Take Statement (ITS).

The measures described below are non-discretionary, and must be undertaken by the STNF for the exemption in section 7(o)(2) to apply. The STNF has a continuing duty to regulate the activity covered by this ITS. If the STNF (1) fails to assume and implement the terms and conditions of the ITS or (2) fails to require that any permittee or contractor adhere to the terms and conditions of the ITS through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the STNF must report the progress of the action and its impact on the species to NMFS as specified in this ITS [50 CFR § 402.14(i)(3)].

A. Amount or Extent of Take

NMFS anticipates the Project would likely result in the incidental take of SONCC coho salmon. NMFS expects this take to occur in the form of "harm" to migrating, spawning, rearing, and feeding SONCC coho salmon as a result of habitat degradation described in the *Effects of the Action* section above. NMFS cannot, with the current best available science, quantify anticipated take of individual fish associated with implementation of the Project. In instances where NMFS cannot quantify the amount of take that may occur, the extent of take can instead be described. In this instance, NMFS expects the extent of take can best be described using an estimate of habitat disturbed. As described in the *Effects of the Action* section, NMFS anticipates that harm to SONCC coho salmon resulting from sediment contributions to Little Browns Creek would occur up to approximately 0.25 miles below the downstream end of the road rehabilitation, below which effects would attenuate to insignificant levels. Anticipated incidental take will be exceeded if measurable increases in turbidity, measurable sedimentation of substrate, or measurable filling of pools, occurs downstream of the 0.25-mile stream segment between the onset of road rehabilitation work on the 0.6 miles of roads identified in the *Effects of the Action* section, and 3 years after completion of that work. In addition, anticipated incidental take may be exceeded if the Project is not implemented as described in this Opinion, if effects exceed those described in the *Effects of the Action* section, or if the Project is not in compliance with the terms and conditions of this ITS.

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.

C. Reasonable and Prudent Measures

Pursuant to section 7(b)(4) of the ESA, reasonable and prudent measures (RPMs) may be necessary and appropriate to minimize the impact of the incidental take of SONCC coho salmon. NMFS believes the following RPMs are necessary and appropriate to minimize the impact of the incidental take of SONCC coho salmon resulting from implementation of the proposed action:

1. Minimize sediment delivery to Little Browns Creek resulting from road rehabilitation work on portions of Forest Roads U34N77A, U34N77A-1, U34N77AA, U3TRI02, U3TRI01, and U3TRI01A within 150 feet of Little Browns Creek.

2. Conduct and report on implementation and effectiveness monitoring, and monitoring of incidental take.

D. Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the ESA, the STNF and its designee(s) must comply with the following non-discretionary terms and conditions, which implement the RPMs described above and outline reporting requirements.

1. To implement RPM #1 above, the STNF shall:

    a. Install sediment barriers (*e.g.*, straw wattles, silt fences) between the road rehabilitation work and the channel of Little Browns Creek. Sediment barriers shall be maintained from the onset of work in the areas specified above for a period of 3 years and shall be inspected as necessary to maintain their functionality.

    b. Provide 100 percent ground cover using straw mulch at the conclusion of earth-moving activities. In addition, use native seed when seeding the disturbed areas (or a sterile hybrid mix if native seed is unavailable).

    c. Inspect road rehabilitation work 1 year after the work is completed, and correct any sources or potential sources of substantial erosion.

2. To implement RPM #2 above, the STNF shall:

    a. Finalize and implement the draft Instream and Upland Quality Assurance and Quality Control Monitoring Plan (USDA-FS 2005b) capable of detecting a measurable increase in turbidity, measurable sedimentation of substrate, or measurable filling of pools beyond approximately 0.25 miles downstream of the 0.6 miles of road rehabilitation work on Forest Roads U34N77A, U34N77A-1, U34N77AA, U3TRI02, U3TRI01, and U3TRI01A for the purpose of determining whether the anticipated level of incidental take is exceeded. NMFS has reviewed a preliminary draft of the monitoring plan, and is working with the STNF on the content of the plan. This monitoring plan shall be reviewed and approved by NMFS within 60 days of the date of this Opinion and prior to Project implementation.

    b. Provide to all STNF personnel, or any other party or contractor, that is employed to implement the road rehabilitation portion of the Project a copy of all Terms and Conditions of this ITS. The STNF shall be responsible for implementation of the Terms and Conditions, regardless of implementation venue.

    c. Provide a copy of the Browns Project erosion control plan to the NMFS Arcata Area Office (see term and condition 3.d. below) as soon as practicable once it has been approved. NMFS assumes the Browns Project erosion control plan will not differ substantially from the example provided in the BA. If the erosion control plan differs from the example provided in the BA to the degree that effects to SONCC coho salmon or their CH may occur that were not considered in this Opinion, reinitiation of consultation may be warranted.

d. Have a biologist or hydrologist make weekly visits to the Project area during implementation of road rehabilitation activities on the 0.6 miles of roads identified in the *Effects of the Action* section in order to monitor and ensure that both the Terms and Conditions, and the measures included in the Project to minimize impacts to SONCC coho salmon.

e. Transmit annual monitoring reports following monitoring from the previous calendar year and meet with the NMFS Arcata Area Office by May 1 of each calendar year to discuss the reports. The reports shall briefly document for the previous calendar year the collected data on turbidity, substrate, and pools in Little Browns Creek and implementation of the Terms and Conditions of this Opinion and the minimization measures provided for the Project. Annual reports shall be sent to:

NMFS
Arcata Area Office
Attn: Allen Taylor
1655 Heindon Road
Arcata, CA 95521-4573

XI. 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 endangered and threatened species. Conservation recommendations are discretionary measures suggested to minimize or avoid adverse effects of a proposed action on listed species or CH, to help implement recovery plans, or to develop additional information.

NMFS believes the following conservation recommendations are consistent with these obligations, and therefore, should be implemented by the STNF:

1. Harvest in RRs using cable yarding instead of tractor yarding to further reduce the likelihood of yarding activities contributing sediment to streams within the action area.

2. Work with Trinity County, State agencies, and private landowners to remove SONCC coho salmon migration barriers within the action area.

3. During the wet season, temporarily close roads that contribute sediment to streams within the action area due to damage from high public traffic.

4. Conduct surveys to obtain more detailed information on SONCC coho salmon use of the action area, and provide reports of all SONCC coho salmon surveys conducted within the action area for the duration of the Project to the NMFS Arcata Area Office as soon as they become available.

5. Seed and mulch all skid trails, as opposed to only the main skid trails.

6. Use only native seed (or a sterile hybrid mix if native seed is unavailable).

7. For any tree inadvertently felled into the inner gorge of action area streams, retain any portion laying within that gorge.

8. Reduce road density within the action area.

9. Work with the WCSD to develop alternatives that meet their water needs while conserving SONCC coho salmon habitat within the action area. They are currently operating a diversion on East Weaver Creek that removes large quantities of water from the creek under a permit issued by the STNF.

10. Select water drafting sites away from SONCC coho salmon spawning and rearing habitat.

11. Avoid cutting large fire-resistant trees when aligning segments of new road construction within RRs.

12. Ensure that heavy equipment operators that are skilled in working adjacent to stream channels conduct slope recontouring activities on Forest Roads U34N77A, U34N77A-1, U34N77AA, U3TRI02, U3TRI01, and U3TRI01A, wherever work occurs within 150 feet of the channel of Little Browns Creek.

In order for NMFS to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, we request notification of the implementation of any conservation recommendations.

XII. REINITIATION OF CONSULTATION

This concludes formal consultation and conference on the proposed Browns Project. Reinitiation 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 may affect listed species or critical habitat in a manner or to an extent not considered in the Opinion, (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in the Opinion, or (4) a new species is listed or critical habitat designated that may be affected by the action (50 CFR § 402.16). In instances where the amount of incidental take is exceeded, consultation shall be reinitiated immediately.

During the course of consultation, NMFS made several assumptions to clarify the description of the proposed action that was provided by the STNF in the BA, or to facilitate the analysis in the *Effects of the Action* section of this Opinion. If any assumption is determined to be false, and after consideration is given to the four criteria in the paragraph above, additional consultation may be necessary.

XIII. REFERENCES AND FEDERAL REGISTER NOTICES

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

A. References

Agee, J. K. 1993. Fire ecology of Pacific Southwest forests. Island Press. Covelo, California.

Argent, D. G. and P. A. Fleebe. 1999. Fine sediment effects on brook trout eggs in laboratory streams. Fisheries Research 39:253-262.

Bash, J., C. Berman, and S. Bolton. 2001. Effects of Turbidity and Suspended Solids on Salmonids. Center for Streamside Studies, University of Washington, Seattle, Washington.

Bell, M. C. 1991. 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.

Berman, C. H. and T. P. Quinn. 1991. Behavioral thermoregulation and homing by spring Chinook salmon, *Onchorhynchus tshawytscha* (Walbaum), in the Yakima River. Journal of Fish Biology 39:301-312.

Beschta, R. L. 1978. Long-term patterns of sediment production following road construction and logging in the Oregon Coast Range. Water Resources Research 14:1011-1016.

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. 751 p.

Bjornn, T. C., M. A. Brusven, M. P. Molnau, J. H. Milligan, and R. A. Klamt. 1977. Transport of granitic sediment in streams and its effects on insects and fish. University of Idaho, Idaho Cooperative Fisheries Research Unit, Research Technical Completion Report, Project B-036-IDA Bulletin 17.

Boussu, M. F. 1954. Relationship between trout populations and cover on a small stream. Journal of Wildlife Management 18(2):229-239.

Brett, J. R. 1952. Temperature tolerance of young Pacific salmon, genus *Oncorhynchus*. Journal of the Fisheries Research Board of Canada 9:265-323.

Briggs, J. C. 1953. The behavior and reproduction of salmonid fishes in a small coastal stream. Fish Bulletin, No. 94, California Department of Fish and Game, Marine Fisheries Branch. 62 p.

Brown, L. R, and P. B. Moyle. 1991. Status of coho salmon in California. Report to the National Marine Fisheries Service. 114 pp. Available from National Marine Fisheries Service, Environmental and Technical Services Division, 525 N.E. Oregon Street, Portland, Oregon 97232.

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(2):237-261.

Brown, R. F. and B. R. Mate. 1983. Abundance, movement and feeding habits of harbor seals, *Phoca vitulina*, at Netarts and Tillamook bays, Oregon. NOAA Fishery Bulletin 81(2):291-301.

Brown, T. M. 2002. Short-term total suspended-solid concentrations resulting from stream crossing obliteration in the Clearwater National Forest, Idaho. M.S. Thesis. University of Washington, Seattle. 107 p.

Brownell, N. F., W. M. Kier, and M. L. Reber. 1999. Historical and current presence and absence of coho salmon, *Oncorhynchus kisutc*h, in the northern California portion of the southern Oregon-northern California evolutionary significant unit. Prepared by Kier and Associates, Sausalito, California for the U.S. Department of Commerce, NOAA National Marine Fisheries Service, Southwest Fisheries Science Center, Santa Cruz, California.

California Advisory Committee on Salmon and Steelhead Trout. 1988. Restoring the balance. California Department of Fish and Game. 84 p.

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. 1416 Ninth Street, Sacramento, California 95814.

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. 35 p. plus appendices. (Available from California Board of Forestry, 1416 Ninth, Sacramento, California 95814). *In:* Weitkamp *et al.* (1995).

California Department of Fish and Game. 2000. Annual Report: Trinity River Basin salmon and steelhead monitoring project 1999-2000 season. California Department of Fish and Game. Northern California-Northcoast Region.

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 Fish and Game Commission. 2005. The recovery strategy for California Coho Salmon. February.

California State Lands Commission. 1993. California's rivers, a public trust report. 304 p.

Cederholm, C.J. and E.O. Salo. 1979. The effects of logging road landslide siltation on the salmon and trout spawning gravels of Stequaleho Creek and the Clearwater River basin, Jefferson County, Washington, 1972-1978. FRI-UW-7915. Fisheries Research Institute, University of Washington, Seattle. 99 p.

Chapman, D.W. 1988. Critical review of variables use to define effects of fines in redds of large salmonids. Transactions of the American Fisheries Society 117:1-21.

Cordone, A.J. and D.W. Kelley. 1961. The influences of inorganic sediment on the aquatic life of streams. California Department of Fish and Game 47(2):189-228.

Everest, L. 2005. Personal Communication. Fisheries Biologist, USDA-Forest Service. Weaverville, California

Fisher, J.P., W.G. Pearcy, and A.W. Chung. 1984. Studies of juvenile salmonids off the Oregon and Washington coast, 1983. Oregon State Univerisity. Oceanography Cruise Report 84-2; Oregon State Univerisity Sea Grant College Program. ORESU-T-85-004. 29 p. *In* Sandercock (1991).

Forest Ecosystem Management Assessment Team. 1993. Forest ecosystem management: an ecological, economic, and social assessment. U.S. Forest Service, National Marine Fisheries Service, Bureau of Land Management, U.S. Fish and Wildlife Service, National Park Service, U.S. Environmental Protection Agency. Portland, Oregon, and Washington D.C. 843 p. plus appendices.

Furniss, M.J., T.D. Roelofs, and C.S. Yee. 1991. Road construction and maintenance. *In*: W. R Meehan (Editor), Influences of forest and rangeland management on salmonid fishes and their habitats, p. 297-323. American Fisheries Society Special Publication 19. Bethesda, Maryland. 751 p.

Gilbert, C.H. 1912. Age at maturity of the Pacific coast salmon of the genus *Oncorhynchus*. Fisheries Bulletin 32:3-22

Godfrey, H. 1965. Coho salmon in offshore waters. *In* Salmon of the North Pacific Ocean. Part IX, p.1-39. International North Pacific Fisheries Commission Bulletin 16. *In* Sandercock (1991).

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, 597 p.

Graybill, M.R. 1981. Haul out patterns and diet of harbor seals, *Phoca vitulina*, in Coos County, Oregon. Master's Thesis. University of Oregon, Eugene, Oregon. 55 p.

Gribanov, V.I. 1948. Coho (Oncorhynchus kisutch Walb.) (General Biology) Izvestiia TINRO, Vol 28. (Translated from Russian by W.E. Ricker) Fisheries Research Board of Canada Translation Series No. 370.

Hanson, L.C. 1993. The foraging ecology of harbor seals, *Phoca vitulina*, and California sea lions, *Zalophus californianus*, at the mouth of the Russian River, California. Master's Thesis. Sonoma State University, Rohner Park, California. 70 p.

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.

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.

Hillman, T.W., J.S. Griffith, and W.S. Platts. 1987. Summer and winter habitat selection by juvenile Chinook salmon in a highly sedimented Idaho stream. Transactions of the American Fisheries Society 116: 185-195.

Jameson, R.J. and K.W. Kenyon. 1977. Prey of sea lions in the Rogue River. Oregon Journal of Mammalogy 58(4):672

Kaczynski, V. 1994. Wildfire impacts on stream habitats. *in:* Prescribed Burning Issues and Notes, Oregon Department of Forestry, Vol. 4: No. 1.

Kinch, G, V. Elsbernd, M. Borman, and S. Swanson. 1997. Riparian Area Management: Grazing Management for Riparian-Wetland Areas. USDA-Forest Service and Bureau of Land Management Technical Report TR 1737-14.

Lancaster, M. 2005. Personal communication. Trinity County Natural Resources Planner. Weaverville, California.

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. 21 p.

Lisle, T.E. 1989. Sediment transport and resulting deposition in spawning gravels, north coastal California. Water Resources Research. 25:6: 1303-1319.

Lisle, T.E. and S. Hilton. 1991. Fine sediment in pools: an index of how sediment is affecting a stream channel. R-5 Habitat Relationship Technical Bulletin No. 6. USDA- Forest Service, Redwood Sciences Laboratory, Arcata, California.

Loeffel, R.E. and H.O. Wendler. 1968. Review of the Pacific coast Chinook and coho salmon resources with special emphasis on the troll fishery. Prepared by the U.S. working group of the Informal Committee on Chinook and Coho (Available from Oregon Department of Fish and Wildlife, P.O. Box 59, Portland, Oregon 97207).

Madej, M.A. 2001. Erosion and sediment delivery following removal of forest roads. Earth Surface Processes and Landforms. 26:175-190.

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.

Mundie, J.H. 1969. Ecological implications of the diet of juvenile coho in streams. In T.G. Nothcote (Editor), Symposium on salmon and trout in streams, p. 135-152. H.R. MacMillan Lectures in Fisheries, University of British Columbia, Institute of Fisheries, Vancouver, British Columbia, Canada. 388 p.

Natural Resource Council. 1996. Upstream-Salmon and Society in the Pacific Northwest. National Academy Press, Washington, D.C. 452 p.

National Marine Fisheries Service. 1996. Making ESA Determinations of Effect for Individual or Grouped Actions at the Watershed Scale. NMFS, Environmental and Technical Services Division, Habitat Conservation Branch, 525 NE Oregon Street, Portland, Oregon. August. 28 pages.

National Marine Fisheries Service. 1999. The habitat approach – Implementation of section 7 of the Endangered Species Act for actions at the watershed scale. Environmental and Technical Services Division, Habitat Conservation Branch. August. 28 p.

National Marine Fisheries Service. 2001a. Water Drafting Specifications. 3 p.

National Marine Fisheries Service. 2001b. Status review update for coho salmon (*Oncorhynchus kisutch*) from the Central California Coast and the California Portion of the Southern Oregon/Northern California Coast Evolutionarily Significant Units. Southwest Fisheries Science Center, Santa Cruz Laboratory. April 12. 43 p.

National Marine Fisheries Service. 2004. Endangered Species Act – Section 7 Consultation Biological and Conference Opinion, USDA-Forest Service and USDI-Bureau of Land Management Land and/or Resource Management Plans in the Northwest Forest Plan Area. NMFS, Northwest Region. March 19. 119 p.

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

Newcombe, C.P. and J.O.T. Jensen. 1996. Channel suspended sediment and Fisheries: A synthesis for quantitative assessment of risk and impact. North American Journal of Fisheries Management. 16:693-727.

Nickelson, T.E., J.W. Nicholas, A.M. McGie, R.B. Lindsay, D.L. Bottom, R.J. Kaiser, and S.E. Jacobs. 1992. Status of anadromous salmonids in Oregon coastal basins. Unpublished manuscript. Oregon Department of Fish and Wildlife, Research and Development Section, Corvallis, and Ocean Salmon Management, Newport. 83 p.

Norse, E.A. 1990. Ancient forests of the Pacific Northwest. Isaland Press, Washington, DC.

Pacific Watershed Associates. 1994. Action Plan for Restoration of the South Fork Trinity River Watershed and its Fisheries. Prepared for the U.S. Bureau of Reclamation and The Trinity River Task Force. Contract No. 2-CS-20-01100.

Pritchard, A.L. 1940. Studies on the age of the coho salmon (*Oncorhynchus kisutch*) and the spring salmon (*Oncorhynchus tshawytscha)* in British Columbia. Transactions of the Royal Society of Canada, Series 3, 34(V):99-120

Roffe, T.J. and B.R. Mate. 1984. Abundance and feeding behavior of pinnipeds in the Rogue River, Oregon. Journal of Wildlife Management 48(4):1262-1274

Rosgen, D. 1996. Applied river morphology, wildland hydrology, Pagosa Springs, Colorado. 352 pp.

Sandercock, F.K. 1991. Life history of coho salmon. *In* C. Groot and L. Margolis (Editors), Pacific salmon life histories, p. 397-445. UBC Press, Vancouver, British Columbia, Canada.

Sanders, J.E., J.J. Long, C.K. Arakawa, J.L. Bartholomew, and J.S. Rohovec. 1992. Prevalence of *Renibacterium salmoninarum* among downstream-migrating salmonids in the Columbia River. *Journal Aquatic Animal Health* 4:72-75.

Scheffer, T.H. and C.C. Sperry. 1931. Food habits of the Pacific harbor seal, *Phoca vitulina richardsi*. Journal of Mammalogy 12(3):214-226

Schiewe, M.H. 1997. Memorandum to W. Stelle and W. Hogarth. Conclusions regarding the Updated Status of Coho Salmon from Northern California and Oregon Coasts. National Marine Fisheries Service, Northwest Fisheries Science Center, 2725 Montlake Boulevard East, Seattle, Washington 98112-2097. 70 p. plus appendices.

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 (editor). Pacific Biological Station, Nanaimo, B.C.

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 98:375

Sigler, J.W., T.C. Bjornn, R.H. Everest. 1984. Effects of chronic turbidity on density and growth of steelhead and coho salmon. Transactions of the American Fisheries Society 115:142-150.

Skinner, C. N., and C. Chang. 1996. Fire regimes, past and present. In: Sierra Nevada Ecosystem Project: Final report to Congress. Vol. II: Assessments and scientific basis for management options. Wildland Resources Center Publication No. 37. Centers for Water and Wildland Resources, University of California, Davis, 1041-1070.

Spence, B. C., G. A. Lomnicky, R.M. Hughes, and R. P. Novitzki. 1996. An ecosystem approach to salmonid conservation. TR-4501-96-6057. Management Technology Environmental Research Services Corp., Corvallis, OR.

Stuart, T.A. 1962. The leaping behaviour of salmon and trout at falls and obstructions. Freshwater and Salmon Fisheries Report 28. Department of Agriculture and Fisheries for Scotland, Edinburgh.

Taylor, R.N., M. Love, T.D. Grey, and A.L. Knoche. 2002. Trinity County culvert inventory and fish passage evaluation. Final Report. 59 p. plus appendices.

USDA-Forest Service. 1995. Shasta-Trinity National Forest Land and Resource Management Plan. Shasta-Trinity National Forests, Redding California.

USDA-Forest Service. 2000. Water quality management for National Forest System lands in California – Best Management Practices. Pacific Southwest Region, Vallejo, California.

USDA-Forest Service. 2002. Hydrologist Report for Oregon Fire Community Protection Project. Trinity River Management Unit, Shasta-Trinity National Forest, Trinity County, California.

USDA-Forest Service. 2004. Weaverville Watershed Analysis. Shasta Trinity National Forest, Weaverville Ranger District, Weaverville, California.

USDA-Forest Service. 2005a. Browns Project Biological Assessment. Trinity River Management Unit, Shasta-Trinity National Forest, Trinity County, California.

USDA-Forest Service. 2005b. Browns Project Draft Instream and Upland Quality Assurance and Quality Control Monitoring Plan. Shasta Trinity National Forest, Trinity County, California.

USDA-Forest Service and USDI-Bureau of Land Management. 1994a. Final Supplemental Environmental Impact Statement for amendments to Forest Service and Bureau of Land Management planning documents within the range of the northern spotted owl Portland, Oregon: U.S. Department of Agriculture (Forest Service), U.S. Department of Interior (Bureau of Land Management).

USDA-Forest Service and USDI-Bureau of Land Management. 1994b. Record of Decision for amendments to Forest Service and Bureau of Land Management planning documents within the range of the northern spotted owl; standards and guidelines for management of habitat for late-successional and old-growth forest related species within the range of the northern spotted owl. Portland, Oregon: U.S. Department of Agriculture (Forest Service), U.S. Department of Interior (Bureau of Land Management).

USDA-Forest Service and USDI-Bureau of Land Management. 2003. Supplemental Environmental Impact Statement. Clarification of language in the 1994 Record of Decision for the Northwest Forest Plan; National Forests and Bureau of Land Management Districts within the range of the northern spotted owl. U.S. Department of Agriculture – Forest Service Region 6 and U.S. Department of the Interior – Bureau of Land Management. Oregon/Washington. Portland, Oregon.

USDA-Forest Service, National Marine Fisheries Service, USDI-Bureau of Land Management, and U.S. Fish and Wildlife Service. 1999. Streamlined Consultation Procedures for Section 7 of the Endangered Species Act. July.

USDA-Forest Service, National Marine Fisheries Service, USDI-Bureau of Land Management, and U.S. Fish and Wildlife Service. 2004. Analytical Process for Developing Biological Assessments for Federal Actions Affecting Fish Within the Northwest Forest Plan Area. November.

U.S. Fish and Wildlife Service and National Marine Fisheries Service. 1998. Endangered species consultation handbook, procedures for conducting consultation and conference activities under section 7 of the Endangered Species Act. March.

Waples, R. S. 1991. Definition of "species" under the Endangered Species Act: Application to Pacific salmon. U.S. Department of Commerce. NOAA Technical Memorandum. NMFS, F/NWC-194. 29 p.

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. Department of Commerce. NOAA Technical Memorandum NMFS-NWFSC-24, Northwest Fisheries Science Center, Seattle, Washington. 258 p.

B. Federal Register Notices

62 FR 24588. National Marine Fisheries Service. Endangered and Threatened Species; Threatened Status for Southern Oregon/Northern California Coast Evolutionarily Significant Unit (ESU) of Coho Salmon. May 6, 1997.

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

70 FR 37160. National Marine Fisheries Service. 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.