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

JUN 2 1 2006

In response reply to:
151422SWR2006SR00190:JMA

Lieutenant Colonel Feir, District Engineer
United States Department of the Army
Corps of Engineers, San Francisco District
333 Market St. 8th Floor
San Francisco, California 94105-2197

Dear Colonel Feir:

This document transmits NOAA's National Marine Fisheries Service's (NMFS) biological opinion (BO) (Enclosure 1) and Essential Fish Habitat (EFH) consultation (Enclosure 2), based on our review of the U.S. Army Corps of Engineers (Corps) proposal to permit fisheries restoration projects pursuant to section 404 of the Clean Water Act (33 U.S.C. 1344) and section 10 of the Rivers and Harbors Act of 1899. The biological opinion analyzes the effects of the proposed action on threatened Southern Oregon/Northern California Coast (SONCC) coho salmon (*Oncorhynchus kisutch*), endangered Central California Coast (CCC) coho salmon, threatened Northern California (NC) steelhead (*O. mykiss*), threatened CCC steelhead, threatened South-Central California Coast (S-CCC) steelhead, and on their designated critical habitats and the critical habitat of California Coast (CC) Chinook salmon *(O. tshawytscha*) in accordance with section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 *et seq.*). Based on their life history, CC Chinook salmon are not likely to be adversely affected by the proposed action and were not considered in this BO.

NMFS concludes the Corps' proposed action is not likely to jeopardize the continued existence of threatened CCC steelhead, S-CCC steelhead, NC steelhead, SONCC coho salmon, and endangered CCC coho salmon, or adversely modify or destroy designated critical habitats for listed salmonids. Incidental take is anticipated to occur as a result of the proposed action and, therefore, an incidental take statement is included with this BO. The incidental take statement includes reasonable and prudent measures necessary and appropriate to minimize incidental take of these species.

NMFS also concludes the proposed actions will have minimal adverse effects to Chinook salmon and coho salmon EFH. Section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), authorizes NMFS to provide EFH Conservation Recommendations to minimize adverse effects of an activity to EFH. Adverse effects are anticipated to occur as a result of the proposed action and, therefore, EFH Conservation Recommendations are included with this consultation.

Mr. Jonathan Ambrose is the lead biologist for this project. He can be contacted at (707) 575-6091 or via email at jonathan.ambrose@noaa.gov if you would like additional information regarding the enclosed biological opinion.

Sincerely,

for Rodney R. McInnis
Regional Administrator

Enclosures (2)
1. Biological Opinion and Appendices
2. Essential Fish Habitat Consultation

cc: Patrick Rutten, NOAA Restoration Center, Santa Rosa
Kate Goodnight, Coastal Conservancy, Oakland
Nicole Martin, Sustainable Conservation, San Francisco
Gail Newton, California Dept. Fish & Game, Sacramento
Scott Wilson, California Dept. Fish & Game, Yountville
Mendocino Redwood Company, Mike Jani, Ukiah
Jackson Demonstration State Forest, Marc Jamison, Fort Bragg
Campbell Timberland Management, David Wright, Fort Bragg
Karen Christensen, Santa Cruz RCD, Capitola
Kristen Kittleson, Santa Cruz County Public Works, Santa Cruz

**Enclosure 1**

## BIOLOGICAL OPINION

| | |
|---|---|
| **ACTION AGENCY:** | U.S. Army Corps of Engineers |
| **ACTION:** | Permitting of Fisheries Restoration Projects within the Geographic Boundaries of NMFS' Santa Rosa, California, Field Office. |
| **CONSULTATION CONDUCTED BY:** | National Marine Fisheries Service |
| **FILE NUMBER:** | 151422SWR2006SR00190:JMA |
| **DATE ISSUED:** | JUN 21 2006 |

## I. CONSULTATION HISTORY

On March 10, 2006, the U.S. Army Corps of Engineers (Corps) requested formal consultation with NOAA's National Marine Fisheries Service (NMFS) pursuant to section 7(a)(2) of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 *et seq.*). The consultation request applies to the Corps' permitting of qualifying fisheries restoration projects within the regulatory jurisdiction of NMFS' Santa Rosa office under section 10 (§10) of the Rivers and Harbors Act of 1899 and section 404 (§404) of the Federal Water Pollution Control Act, as amended (Clean Water Act). Consultation was requested due to the Corps' determination that permitting of qualifying fisheries restoration projects may affect, and is likely to adversely affect, endangered Central California Coast (CCC) Evolutionary Significant Unit (ESU) coho salmon (*Oncorhynchus kisutch*), threatened Southern Oregon/Northern California (SONCC) coho salmon (Eel River portion of Mendocino County, California), Northern California (NC) Distinct Population Segment (DPS) steelhead (*O. mykiss*), CCC DPS steelhead, and South-Central California Coast (S-CCC) DPS steelhead, and designated critical habitat for CCC ESU coho salmon, SONCC ESU coho salmon, NC DPS steelhead, CCC DPS steelhead, S-CCC DPS steelhead, and California Coast (CC) Chinook salmon.

The genesis of this consultation request was based on conversations, in January and February 2005, between NMFS staff and Corps staff who were concerned over the expiration of the Corps' Regional General Permit 1 (RGP1) in March 2005. RGP1 facilitated the section 7 consultation process by streamlining the permitting of "fish-friendly crossings", which included coverage for modification or removal of instream culverts to improve salmonid passage, placement of bridges, *etc.* However, the Corps was unwilling to initiate consultation on a new RGP due to staffing constraints and the "time intensive" reporting requirements associated with RGP1. NMFS and Corps staff were concerned that without RGP1, standard Corps and NMFS permitting requirements would significantly delay and potentially discourage implementation of many future fisheries restoration projects and/or increase agency workloads. NMFS solicited the assistance of Sustainable Conservation[1] (Suscon) to help draft a biological assessment (BA) for the Corps in order to initiate a section 7 consultation on restoration projects. The BA would include the following types of fisheries restoration projects: (1) those that would have qualified for coverage under RGP1, (2) privately and publicly funded fisheries restoration projects similar to those covered under RGP12[2], (3) restoration projects funded by NOAA's Restoration Center (NOAA RC) that would require a Corps permit under section 10 (§10) of the Rivers and Harbors Act of 1899 and/or section 404 (§404) of the Federal Water Pollution Control Act, (4) permanent summer dam removal, and (5) maintenance of existing fish ladders. Suscon's efforts were funded, in large part, by the California Coastal Conservancy through the Integrated Watershed Restoration Program for Santa Cruz County (IWRP) and to a smaller degree, by NMFS.

NMFS has participated in numerous meetings with the Corps, Suscon, the California Department of Fish and Game (CDFG – Region 3), *Alnus* Ecological, Santa Cruz County Resource Conservation District, and NOAA RC in the development of this programmatic fisheries restoration project (Program). Communications, including telephone calls and electronic mail, between NMFS, CDFG, *Alnus* Ecological, and NOAA RC resulted in identification of potential adverse and beneficial impacts to listed salmonids and their designated critical habitats, and the clear designation of agency roles to ensure successful implementation of this Program. Impact minimization and conservation measures were developed to ensure specific actions in the Program will be conducted in a manner least damaging to the environment. The measures were deemed necessary to minimize adverse effects to listed salmonids and critical habitat resulting from implementation of the various actions. The majority of these measures were incorporated into the BA and are specified in Appendix 1 to this BO.

The goal of this consultation is to facilitate authorization for projects explicitly intended to benefit protected salmonids and their habitats within the jurisdictional boundaries of NMFS' Santa Rosa office. In addition to a biological opinion from NMFS, the Corps will also seek a Consistency Determination, pursuant to Fish and Game Code Section 2080.1, from CDFG for incidental take of coho salmon. Staff from CDFG has been involved in the development of the Corps' BA to ensure necessary minimization and avoidance measures and required funding assurances are built in to the project description in order to facilitate a Consistency Determination once the BO is complete.

This BO analyzes the effects of 500 fisheries restoration projects on the aforementioned listed salmonids and their critical habitats. This BO is based on the best scientific and commercial data available including information contained in the BA and other sources of information. A complete administrative record of this consultation is on file in the NMFS Santa Rosa office.

---

[1] Sustainable Conservation is a non profit organization that seeks to solve environmental problems by involving business, regulatory agencies, and private landowners in the development of new ways to protect land and water in California.

[2] RGP12 encompasses fisheries restoration projects funded by the California Department of Fish and Game (CDFG). Fisheries restoration projects that do not receive CDFG funding cannot be covered under RGP12 and must go through the standard section 7 consultation process. This action proposes to include these non-CDFG funded projects that meet the CDFG Restoration Manual (Flosi *et al.* 1998) standards and other NMFS/CDFG criteria described above.

## II. DESCRIPTION OF THE PROPOSED ACTION

The Corps proposes to authorize the placement of fill material into the waters of the United States to annually implement multiple salmonid habitat restoration projects that are part of the Program. Up to 500 salmonid restoration projects over a ten year period will be authorized in streams and adjacent riparian areas within the jurisdiction of NMFS' Santa Rosa office (Figure 1). The purpose of this action is to provide a streamlined regulatory permitting opportunity through the Corps for landowners, governmental agencies, and non-governmental agencies interested in conserving, restoring, and enhancing salmonid habitats. The Program creates a process for the Corps to streamline permitting requirements for landowners and agencies to implement specific conservation practices on private and public lands within the regulatory jurisdiction of NMFS' Santa Rosa Office. Activities included under this Program may be permitted under, but not limited to, the Corps' Nationwide 27 for Wetland and Riparian Restoration and Creation Activities or Nationwide 13 for Bank Stabilization projects. The Corps will provide this streamlined permitting process to landowners and agencies who agree to carry out their projects in conformance to the practices specified in the description below and associated appendices.

This biological opinion (BO) will address routine restoration practices determined by the Corps, in prior collaboration[3] with NMFS, Suscon, NOAA RC, the Santa Cruz Resource Conservation District, *Alnus* Ecological, and CDFG, as having potential to adversely affect listed salmonids and/or adversely modify their designated critical habitats. Restoration activities typically occur in watersheds subjected to significant levels of logging, road building, urbanization, mining, grazing, and other activities that have reduced the quality and quantity of instream habitat available for native anadromous salmonids. Types of authorized projects include: instream habitat improvement, fish passage improvement (including construction of new fish ladders/fishways and maintenance of existing ladders), bank stabilization, riparian restoration, upslope restoration, and fish screens. Project types are described in greater detail in Sections A and C below.

The majority of the actions considered in this BO closely follow those described in: (1) the CDFG Manual (Flosi *et al.* 1998), (2) NMFS' *Guidelines for Salmonid Passage at Stream Crossings* (NMFS 2000 hereafter referred to as NMFS' Crossing Guidelines), and (3) NMFS' *Fish Screening Criteria for Anadromous Salmonids* (NMFS 1997a hereafter referred to as NMFS' Screening Guidelines). These documents guide many of the restoration projects implemented within the jurisdictional boundaries of NMFS' Santa Rosa office, including those covered under the expired RGP1 and, projects funded by NOAA's RC. Other actions include fish ladder maintenance and permanent removal of summer dams.

Prohibited activities are described in Section B below. Minimization and Avoidance measures and Monitoring Requirements are described in Appendix 1 and 2, respectively. Oversight and administration of this program is described in Section D. As described in greater detail below in Section D, NOAA RC, based out of NMFS' Santa Rosa office, will provide the lead role in the administration and oversight of this Program. They will participate in the screening of individual

[3] These agencies worked together to define restoration project types that were likely to result in short-term adverse effects to listed species. The result of this collaboration is the Program being analyzed in this biological opinion.

projects under consideration for inclusion in the Program, and will track implementation of individual projects. Such tracking will include documentation and reporting back to the Protected Resource Division (PRD) of NMFS of any incidental take that results from individual projects authorized under this BO.

## A. Enhancement and Restoration Projects

1. Instream Enhancement and Restoration Projects

Habitat enhancement and restoration projects authorized through the proposed Program will be designed and implemented consistent with techniques and minimization measures presented in the CDFG Manual, NMFS Crossing Guidelines, and NMFS Screening Guidelines in order to maximize the benefits of each project while minimizing potential short term, adverse impacts to salmonids. Additional avoidance and minimization practices will likely be necessary for all projects in order to reduce the potential for ancillary impacts to both salmonids and other riparian and aquatic species on a site specific basis. These measures, which are mandatory for projects included in the Program, are described in Appendix 1. All of the restoration projects included in this Program are intended to restore degraded salmonid habitat; improve instream cover, pool habitat, and spawning gravel; remove and/or modify barriers to fish passage; and reduce or eliminate ongoing erosion and sedimentation impacts.

Instream habitat structures and improvements are intended to provide predator escape and resting cover, increase spawning habitat, improve upstream and downstream migration corridors, improve pool to riffle ratios, and add habitat complexity and diversity. Specific techniques for instream habitat improvements may include: placement of cover structures (divide logs, digger logs, spider logs, and log, root wad, and boulder combinations), boulder structures (boulder weirs, vortex boulder weirs, boulder clusters, and single and opposing log wing-deflectors), log structures (log weirs, upsurge weirs, single and opposing log wing-deflectors, and Hewitt ramps), and placement of imported spawning gravel. Implementation of these types of projects may require the use of heavy equipment (*i.e.*, self-propelled logging yarders, helicopters, mechanical excavators, backhoes, *etc.*); however, hand labor is the preferred method and will be used when possible. Large woody debris (LWD) may also be used to enhance pool formation and improve stream reaches. For placement of unanchored LWD, logs selected for placement will have a minimum diameter of 12 inches and a minimum length 1. 5 times the mean bankfull width of the stream channel at the deployment site. Root wads will be selected with care and have a minimum root bole diameter of five feet and a minimum length of 15 feet.

2. Instream Barrier Modification for Fish Passage Improvement

Instream barrier modification projects are intended to improve salmonid fish passage and increase access to currently inaccessible or difficult to access salmonid habitat. Projects may include those which improve fish passage through existing culverts, bridges, and paved and unpaved fords through replacement, removal, or retrofitting of these existing structures. In particular, these practices may include the use of gradient control weirs upstream or downstream of the barriers to control water velocity, water surface elevation, and/or provide sufficient pool habitat to facilitate jumps, or interior baffles or weirs to mediate velocity and the affects of shallow sheet flow. Weirs may also be used to improve passage in flood control channels (particularly in concrete lined channels). Implementing these types of projects may require the use of heavy equipment (*i.e.*, mechanical excavators, backhoes, *etc.*); however, hand labor will be used when possible.

Activities associated with the maintenance of existing fish ladders/fishways are also included in this category of restoration projects. Maintenance activities covered by this program include complete removal of garbage, construction waste and debris, sediment, wood, industrial debris, and anything else that prevents the proper functioning of existing fish ladders/fishways.

Due to the complex and site specific nature of stream crossing remediation projects, neither the CDFG Manual nor the NMFS Crossing Guidelines provide design protocols for constructing individual replacement structures. However, these documents do provide consistent methods for evaluating fish passage through culverts at stream crossings, and will aid in assessing fish passage through other types of stream crossings, such as bridges and paved or hardened fords. The objectives of these documents are to provide the user with: consistent methods for evaluating salmonid passage though stream crossings; ranking criteria for prioritizing stream crossing sites for treatment; treatment options to provide unimpeded fish passage; a stream crossing remediation project checklist; guidance measures to minimize impacts during stream crossing remediation construction; and five methods for monitoring the effectiveness of corrective treatments. Projects authorized under the proposed Program must be designed and implemented consistent with the CDFG *Culvert Criteria for Fish Passage* (Appendix IX-A, CDFG Manual) and NMFS' Crossing Guidelines.

In addition, all fish passage improvement projects will require design review and design approval from a NMFS and/or CDFG fish passage specialist prior to project authorization. Similarly, summer dam removal projects will require design review and design approval from a NMFS and/or CDFG fish passage specialist prior to project authorization and design review from a qualified geomorphologist.

3. Stream Bank Stabilization and Riparian Habitat Restoration

These projects are intended improve salmonid habitat through increased stream shading that will ultimately lower stream temperatures, increased future recruitment of LWD to streams, and increased bank stability and invertebrate production. Riparian habitat restoration projects will aid in the restoration of riparian habitat by increasing the number of plants and plant groupings, and will include the following types of projects: natural regeneration, livestock exclusionary fencing, bioengineering, and revegetation projects. Part XI of the CDFG Manual, titled *Riparian Habitat Restoration*, contains some examples of these techniques.

Stream bank stabilization will result in the reduction of sediment input and will improve fish habitat and fish survival by increasing fish embryo and alevin survival in spawning gravels, reducing injury to juvenile salmonids from high concentrations of suspended sediment, increasing macroinvertebrate food production, and minimizing the loss of, or reduction in size, of pools from excess sediment deposition. The proposed activities will reduce sediment from bank erosion by stabilizing stream banks with appropriate site specific techniques including: boulder stream bank stabilization structures, log stream bank stabilization structures, tree revetment, native plant material revetment, willow wall revetment, willow siltation baffles, brush mattresses, checkdams, brush checkdams, water bars, and exclusionary fencing. Some guidelines for stream bank stabilization techniques are described in Part VII of the CDFG Manual, entitled *Project Implementation*. Implementation of these types of projects may require the use of heavy equipment (*i.e.*, self-propelled logging yarders, mechanical excavators, backhoes, *etc.*); however, hand labor will be used when possible.

4. Project Types Requiring Additional Oversight and Engineering Review by NMFS

More complex project types covered by the Program will require a higher level of oversight (engineering review, *etc.*) and review by NMFS regulatory agency staff and agency engineers. These project types will include:

- culvert retrofit and replacement projects;
- construction of new fish ladders/fishways;
- retrofitting of older fish ladders/fishways;
- permanent removal of flashboard dam abutments and sills;
- installation of fish screens; and
- placement of weirs in concrete lined channels.

Specific requirements associated with these more complex project types include the following:

- For stream crossing projects, if the stream at the project location was passable to, or was not utilized by all life stages of covered salmonids prior to the existence of the crossing, the project shall pass the life stages and covered salmonid species historically passing there. Retrofit culverts shall meet the fish passage criteria for the passage needs of the listed species and life stages historically passing through the site prior to the existence of the road crossing according to NMFS Crossing Guidelines and CDFG stream crossing criteria (Appendix X of the CDFG Manual).
- All designs for fish ladders/fishways and culvert replacement or modification projects must be reviewed and authorized by a NMFS (or CDFG) fish passage specialist prior to commencement of work.
- All designs for fish ladders/fishways and culvert replacement or modification designs must be designed and stamped by an Engineer registered in the State of California.
- Fish ladders/fishways larger than 30 feet in height are not covered by this Program.

- New ladders/fishways shall be constructed to provide passage conditions suitable for year round bidirectional, adult and juvenile salmonid movement.

- New ladders will have a maximum vertical jump of six inches.

- Flow patterns in new ladders must be stable, with no water surges.

- Energy dissipation in new ladders should be complete in a step-and-pool fishway, with no carryover from pool to pool.

- Sediment composition and quantity, and effects of sediment transport must be evaluated by a qualified geomorphologist for all summer dam removal projects.

**B. Prohibited Activities**

Projects that include any of the following elements will not be authorized under this Program and would require separate consultation with NMFS:

- use of gabion baskets;

- use of cylindrical riprap (*e.g.*, Aqualogs);

- use of undersized riprap (rock that will not remain in place during a 100 year flow event);

- permanent dams or construction of concrete lined channels of any sort;

- use of chemically-treated timbers used for grade or channel stabilization structures, bulkheads or other instream structures;

- activities substantially disrupting the movement of those species of aquatic life indigenous to the waterbody, including those species that normally migrate through the project areas;

- projects that would completely eliminate a riffle, pool, or riffle/pool complex (*Note: There may be some instances where a riffle/pool complex is affected/modified by a restoration project [i.e., a culvert removal that affects an existing pool]. These types of projects would be allowed under the Program.*); and

- water diversions (except to dewater a restoration project construction site).

## C. Limitations on Size and Number of Projects Authorized for Implementation Each Year Under the Proposed Program

In order to minimize the potential for short term adverse impacts associated with implementation of the projects authorized under the Program, the following limitations were placed on individual projects and on the total number of projects authorized each year:

1. Limits on Area of Disturbance for Individual Projects

*a. Maximum Length of Stream Dewatered Per Project*:

- Three hundred feet (ft). Impact analyses will also assume potential effects of increased turbidity of 100 ft downstream for each project involving dewatering making a total maximum length of impact per project 400 ft.

*b. Maximum Upslope Disturbance (raw dirt, tree removal, canopy cover reduction)*:

- The disturbance footprint for the project's staging areas may not exceed 0.25 acres.
- Overstory canopy cover may not be reduced by more 20 percent (per linear 100 ft) within 75 ft of a watercourse or lake transition line as measured by a spherical densitometer (using a minimum of four measurements from each cardinal direction).
- Native trees with defects, cavities, leaning toward the stream channel, nests, late seral characteristics, or > 36 inches (in) diameter at breast height (dbh), and large snags > 16 in dbh and 20 ft high will be retained. In limited cases, removal will be permitted if trees/snags occur over culvert fill that requires removal for retrofit projects. No removal will occur without a site visit and written approval from NOAA RC.
- Downed trees (logs) > 24 in dbh and 10 ft long will be retained on upslope sites.

2. Buffer Between Projects Implemented in the Same Year

A 1200 ft linear buffer will be placed between projects implemented within the same year within the same watershed under the Program. This is intended to minimize the potential for short term accumulation of adverse impacts within a stream.

3. Limit on Total Number of Projects

Approximately 35-40 projects are expected to be authorized each year under this Program. It is possible once this Program is in place, there will be increased interest among the restoration community to authorize their actions through this Program. Therefore, the Corps proposed a maximum of 50 projects per year to be authorized under the Program to accommodate a potential for increased project activity as a result of this effort.

4. Limit on Number of Projects Per Watershed

Under this Program, there will also be an annual per-watershed limitation of three projects occurring in any one watershed per year (using California Interagency Watershed Map of 1999, CalWater 2.2.1).

5. Limits on Removal of Vegetation

While encouraged, removal of exotic invasives in a stream with high temperatures must be done in a manner to avoid creation of additional temperature loading to fish bearing streams. If a stream has a seven day moving average daily maximum (7DMADM) temperature greater than 17.8 degree Celsius ($^{o}$C) in a coho salmon and steelhead stream or greater than 18.5$^{o}$C in a stream with only steelhead, and vegetation management would reduce overstory shade canopy to the wetted channel, then the practice will not be allowed.

## D. Oversight and Administration

The following section outlines the process for administration of the Program. NOAA RC will bear primary Program administration responsibilities. The Corps staff will communicate directly with staff from NOAA RC regarding all proposed actions falling within the authority of the Program. Project applications for fisheries restoration projects, consistent with those actions covered by the Program, will require a Corps permit[4]. To assist NOAA RC staff with the tracking and oversight of projects, a "TEAM" has been designated and is comprised of staff from NOAA RC, NMFS PRD, CDFG staff (when available), and *Alnus* Ecological. This TEAM will assist NOAA RC in tracking the overall number and locations of projects that are authorized under the Program each year to ensure the limits outlined above are adhered to. The following summarizes the anticipated process for reviewing individual projects for consideration and authorization under the Program and the annual administration process.

1. Timeline for Submittals/Review

Project applications will likely be submitted to the Corps throughout the year and distributed to Corps staff for review. As described in Step 3 below, the Corps staff may request concurrence from NOAA RC on an ongoing basis for projects to be included under this Program. NOAA RC will "bundle" those projects to be covered under the Program for review and processing approximately twice a year (possibly more frequently depending on demand), likely in the early winter (December/January) and spring (May/June) of each year. NOAA RC with assistance from the TEAM will review projects for consistency with the project conditions (protection, avoidance, and minimization measures) of the Program.

[4] NOAA RC website will also include contact information so that project applications could be submitted directly to NOAA RC staff in Santa Rosa. NOAA RC website will include a link to the Corps' website which provides instructions for the Corps' application requirements. (Note: Since applicable NOAA RC-funded projects will also require a Corps permit, NOAA RC would coordinate closely with the Corps to ensure that they have received the project application for the appropriate Corps permit as well.)

2. Submittal Requirements

Project applicants seeking coverage under the Program's regulatory approvals must submit sufficient information about their project to allow the Corps and NOAA RC to determine whether or not the project qualifies for coverage under the Program. Project proposals without sufficient information will not be processed and will not be covered under the Program until all relevant information necessary to initiate section 7 consultation is provided. Necessary information includes, but is not limited to: (1) a description of the project location, (2) proposed timing of construction activities, (3) a description of construction methods, (4) relevant engineering and design criteria and reports, (5) presence of listed salmonids, (6) proposed methods of fish capture and relocation, and (7) proposed erosion control measures.

3. Corps Staff Requests Concurrence from NOAA RC

If the Corps determines during their initial screening of a project that it comports to the conditions of the BO, the Corps will contact either Leah Mahan ((707) 575-6077) or Kit Crump ((707) 575-6080) or another designated NOAA RC staff and request preliminary concurrence with their determination of the project's coverage under the BO. The Corps will not authorize the project until Steps 4 – 5 are complete.

4. Batched Submittal to NOAA RC and Field Checks if Deemed Necessary

Once NOAA RC receives a preliminary concurrence request from Corps staff, NOAA RC will complete a "paper check" to confirm whether or not a project fits under the Program using a pre-established checklist (Checklist for Consistency – Appendix B of the BA). Once projects have passed through the initial project screen, NOAA RC will compile a single report that will include information about each project (size, description, practice type, ESUs and/or DPSs present, *etc.*) proposed for authorization for the upcoming construction season.

NOAA RC staff and CDFG staff will provide additional screening by taking into consideration any potential resource vulnerability associated with a particular activity or project location (*i.e.,* projects in sensitive streams or watersheds). NOAA RC staff (and CDFG staff when available) would review the project list and identify projects requiring a field check prior to determining whether or not they may be authorized under the Program. In this case, NOAA RC would coordinate with a predetermined network of regional experts in the field (which will include, but is not necessarily limited to) NOAA RC, NMFS PRD, CDFG staff if available, and *Alnus* Ecological (who will be funded by either Sustainable Conservation or the Coastal Conservancy) to conduct a field check to confirm whether or not a project may proceed under the Program. In addition, if the project requires engineering review by a CDFG or NMFS engineer (described above under Section C. 2) or geomorphologist, NOAA RC will coordinate with these engineers/fish passage specialist and/or geomorphologist to get their input on the project design at this stage.

5. Written Authorization by NOAA RC and NMFS PRD

Following any necessary site visits to confirm whether or not the project may proceed under the Program, and to ensure that the specific requirements of the Program are part of the individual project plans, the California NOAA RC Supervisor will provide a summary of these projects, at least once a year, to the NMFS PRD Santa Rosa Area Office Supervisor who will sign-off that the proposed project(s) comport to the conditions authorized under this BO. Next, NOAA RC will provide written documentation to the Corps that the project is included in the Program. For projects to be considered part of the Program, project applicants must accept any additional minimization and avoidance measures NOAA RC determines to be necessary to protect listed salmonids or their habitat. A copy of the written documentation will be forwarded to the NMFS PRD Santa Rosa Area Office Supervisor.

6. Corps Authorization and Project Construction

With the Corps' approval (and all other necessary approvals and permits in hand), authorized projects will be implemented by the applicants, incorporating applicable guidelines and required protection measures.

7. Post Construction Implementation Monitoring and Reporting on 100% of Projects

Qualifying applicants will be required to carry out all post-construction implementation monitoring (Appendix B of the BA) for projects authorized under the Program. This will include photo-documentation (using standardized guidelines for photo-documentation consistent with the pre-construction monitoring requirements), as-builts, evidence of implementation of required avoidance, minimization, and mitigation measures, information about number (and species) of fish relocated and any fish mortality that resulted from the project. This information will be submitted by the applicants to the Corps and NOAA RC for data assembly described in Step 8.

8. Project Tracking and the Annual Report

NOAA RC, with assistance from the TEAM, will maintain a database of information about all of the projects implemented under the Program. In order to monitor the impacts to the protected ESUs, DPSs, and critical habitats over the life of the Program, and to track incidental take of listed salmonids, NOAA RC (with assistance from the TEAM) will annually prepare a report of the previous year's restoration activities (Appendix B of the BA) and submit the report to the NMFS PRD Santa Rosa Area Office Supervisor. The annual report will contain information about projects implemented during the previous construction season, including the number of projects that required fish relocation.

## E. Monitoring and Reporting Requirements

The Program will utilize the monitoring protocols developed by CDFG in their partnership with the Center for Forestry, University of California, Berkeley (R. Harris, Principal Investigator). These are the same monitoring protocols CDFG follows in implementing their Fisheries Restoration Grant Program (Appendix B of CDFG Manual). The most current version of these guidelines was released in March 2005 and can be found at:

http://nature.berkeley.edu/forestry/comp_proj/dfg.html. These guidelines will be utilized for the pre- and post- construction monitoring for this Program (Appendix B of the BA) along with additional measures outlined in Appendix 2 of this BO.

For projects that may result in incidental take of coho salmon; (*i.e.*, that will require dewatering and fish relocations activities in a stream historically known to support coho salmon – see Appendix C of the BA), the applicant will also need to comply with the requirements of the California Endangered Species Act (CESA). CESA requires that impacts be minimized and fully mitigated and that funding for implementation is assured. Therefore, for projects with grant funding for implementation, the funding assurance shall be the grant/agreement itself, showing monies earmarked for implementation of necessary protection measures during implementation and follow-up monitoring, or another mechanism approved by CDFG in writing. For projects that have no grant funding, the applicant shall be required to provide security in the form of a cash deposit in an amount approved in writing by CDFG and held by CDFG or another pre-approved entity. The funding security will be held until the required measures have been successfully implemented.

**F. Action Area**

This BO applies to restoration activities that take place within portions of the following counties that encompass the 16,126 square miles of NMFS' Santa Rosa office's regulatory jurisdictional boundaries: Marin, Mendocino, Monterey, Napa, San Benito, San Francisco, San Luis Obispo, San Mateo, Santa Clara, Santa Cruz, Solano, and Sonoma (Figure 1). Restoration projects will occur within stream channels, riparian areas and hydrologically-linked upslope areas within these counties. These counties include, either in whole or in part, the following $4^{th}$ field hydrologic unit code (HUC), as defined by United States Geological Survey (USGS): South Fork Eel, Middle Fork Eel, Upper Eel, Mattole, Big-Navarro-Garcia, Gualala-Salmon, Russian, Bodega Bay (tributaries), Tomales-Drakes Bay (tributaries), San Francisco Bay (tributaries), Suisun Bay (tributaries), San Pablo Bay (tributaries), Coyote, San Francisco Coastal South, San Lorenzo-Soquel, Pajaro, Estrella, Salinas, Alisal-Elkhorn Sloughs, Carmel, and Central Coastal.

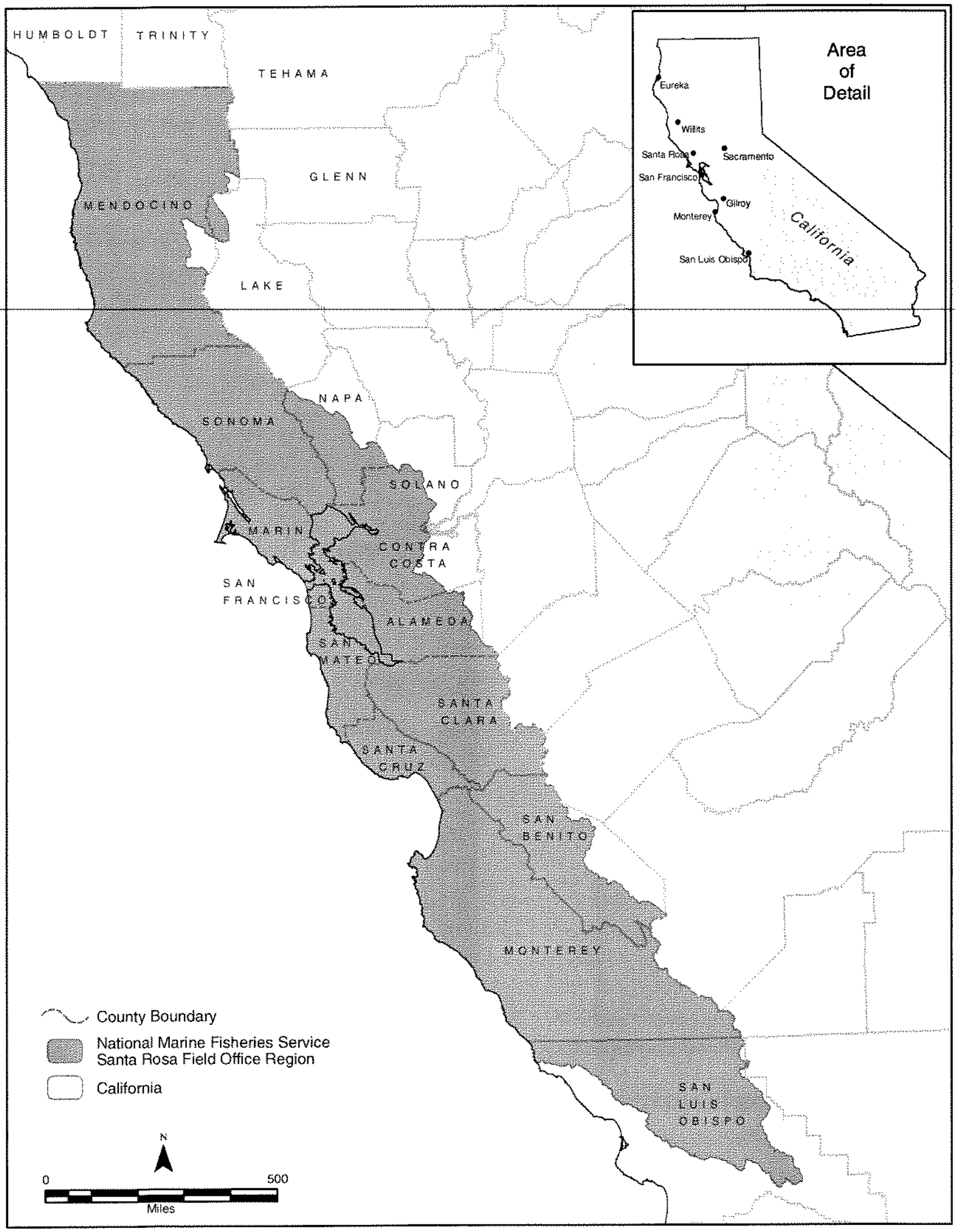


Figure 1. Geographic scope of Program to facilitate implementation of fisheries restoration projects in the region of NMFS' Santa Rosa office.

The action area is defined as all areas affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR §402.02). NMFS anticipates the effects resulting from most restoration activities will be restricted to the immediate restoration project site. However, minor sediment releases from some restoration projects such as culvert replacements, or road decommissioning, may increase turbidity for a short distance (100 ft) downstream. Rearing juvenile salmonids may either move upstream or downstream in response to increased turbidity, fish relocation activities, and/or dewatering. This could result in displacement and/or increased competition among listed salmonids and increased predation on listed salmonids. The specific extent of impact from each individual habitat restoration project will vary depending on project type, specific project methods, and site conditions.

## III. STATUS OF THE SPECIES AND CRITICAL HABITAT

This BO analyzes the effect of the proposed action on the following ESUs, DPSs, and critical habitat:

- threatened SONCC coho salmon (62 FR 24588),
- endangered CCC coho salmon (70 FR 37160),
- threatened NC steelhead (65 FR 36074),
- threatened CCC steelhead (62 FR 43937),
- threatened S-CCC steelhead (62 FR 43937), and
- designated critical habitat for SONCC and CCC coho salmon (64 FR 24049), NC, CCC and S-CCC steelhead (70 FR 52487), and CC Chinook salmon (70 FR 54287).

Based on their life history, CC Chinook salmon *(O. tshawytscha)* are not likely to be present in the action area during the implementation of habitat restoration projects (the summer low-flow period), nor when any adverse effects are expected to occur. Therefore, CC Chinook salmon are not likely to be adversely affected by the proposed action and will not be further considered in this BO. However, the designated critical habitat of CC Chinook salmon habitat will be modified as a result of the various habitat restoration projects considered in this BO.

In addition, based on the location and timing of projects authorized, NMFS has determined that the Program will not affect threatened Central Valley spring-run Chinook salmon (*O. tshawytscha*), endangered Sacramento River winter-run Chinook salmon, and threatened Central Valley steelhead (*O. mykiss*).

### A. Species Description and Life History

Most salmonids are anadromous fish, living in both fresh and salt water. The older juvenile and adult life stages occur in the ocean, until the adults ascend freshwater streams to spawn. Eggs (laid in gravel nests called redds), alevins (gravel dwelling hatchlings), fry (juveniles newly emerged from stream gravels), and younger juveniles all rear in freshwater until they become large enough to migrate to the ocean to finish rearing and become adults. Juveniles migrating to the ocean are called smolts. Both smolts and adults go through physiological changes as they emigrate from fresh to salt water (smolts) and from salt to freshwater (adults). The timing of migrations, freshwater habitat preferences for spawning and rearing, the duration of freshwater and ocean rearing, distribution in the ocean, age at maturity, and several other traits can all vary by species. Salmon adults die after spawning; steelhead can sometimes survive to spawn again (Bjornn and Reiser 1991, Groot and Margolis 1991, Busby *et al.* 1996).

1. <u>Coho Salmon</u>

The life history of the coho salmon in California has been well documented by Shapovalov and Taft (1954) and Hassler (1987). In contrast to the life history patterns of other anadromous salmonids, coho salmon in California generally exhibit a relatively simple 3-year life cycle (Shapovalov and Taft 1954, Hassler 1987). Adult salmon typically begin the freshwater migration from the ocean to their natal streams after heavy late-fall or winter rains breach the sand bars at the mouths of coastal streams (Sandercock 1991). Delays in river entry of over a month are not unusual (Salo and Bayliff 1958, Eames *et al.* 1981). Migration continues into March, generally peaking in December and January, with spawning occurring shortly after arrival at the spawning ground (Shapovalov and Taft 1954).

Coho salmon are typically associated with small to moderately-sized coastal streams characterized by heavily forested watersheds; perennially-flowing reaches of cool, high-quality water; dense riparian canopy; deep pools with abundant overhead cover; instream cover consisting of large, stable woody debris and undercut banks; and gravel or cobble substrates.

Female coho salmon choose spawning sites usually near the head of a riffle, just below a pool, where water changes from a laminar to a turbulent flow and small to medium gravel substrate is present. The flow characteristics of the location of the redd usually ensure good aeration of eggs and embryos, and flushing of waste products. The water circulation in these areas also facilitates fry emergence from the gravel. Preferred spawning grounds have nearby overhead and submerged cover for holding adults; water depth of 10-54 centimeters (cm); water velocities of 20-80 centimeters per second (cm/sec); clean, loosely compacted gravel (1.3-12.7 cm diameter) with less than 20 percent fine silt or sand content; cool water ranging from 4-10$^{o}$C with high dissolved oxygen of eight milligrams per liter (mg/l); and intergravel flow sufficient to aerate the eggs. Lack of suitable gravel often limits successful spawning in many streams.

Each female builds a series of redds, moving upstream as she does so, and deposits a few hundred eggs in each. Fecundity of coho salmon is directly proportional to female size; coho salmon may deposit from 1,000-7,600 eggs (reviewed in Sandercock 1991). Briggs (1953) noted a dominant male accompanies a female during spawning, but one or more subordinate males also may engage in spawning. Coho salmon may spawn in more than one redd and with more than one partner (Sandercock 1991). Coho salmon are semelparous, *i.e.*, they die after spawning. The female may guard a nest for up to two weeks (Briggs 1953).

The eggs generally hatch after four to eight weeks, depending on water temperature. Survival and development rates depend on temperature and dissolved oxygen levels within the redd. According to Baker and Reynolds (1986), under optimum conditions, mortality during this period can be as low as 10 percent; under adverse conditions of high scouring flows or heavy siltation, mortality may be close to 100 percent. McMahon (1983) found egg and fry survival drops sharply when fines make up 15 percent or more of the substrate. The newly-hatched fry remain in the redd from two to seven weeks before emerging from the gravel (Shapovalov and Taft 1954). Upon emergence, fry seek out shallow water, usually along stream margins. As they grow, juvenile coho salmon often occupy habitat at the heads of pools, which generally provide an optimum mix of high food availability and good cover with low swimming cost (Nielsen 1992). Chapman and Bjornn (1969) determined that larger parr tend to occupy the head of pools, with smaller parr found further down the pools. As the fish continue to grow, they move into deeper water and expand their territories until, by July and August, they reside exclusively in deep pool habitat. Juvenile coho salmon prefer well shaded pools at least 1 meter (m) deep with dense overhead cover; abundant submerged cover composed of undercut banks, logs, roots, and other woody debris; preferred water temperatures of 12-15° C (Brett 1952, Reiser and Bjornn 1979), but not exceeding 22-25°C (Brungs and Jones 1977) for extended time periods; dissolved oxygen levels of 4-9 mg/l, and water velocities of 9-24 cm/sec in pools and 31-46 cm/sec in riffles. Water temperatures for good survival and growth of juvenile coho salmon range from 10-15°C (Bell 1973, McMahon 1983). Growth is slowed considerably at 18° C and ceases at 20°C (Stein *et al.* 1972, Bell 1973).

Preferred rearing habitat has little or no turbidity and high sustained invertebrate forage production. Juvenile coho salmon feed primarily on drifting terrestrial insects, much of which are produced in the riparian canopy, and on aquatic invertebrates growing within the interstices of the substrate and in leaf litter in pools. As water temperatures decrease in the fall and winter months, fish stop or reduce feeding due to lack of food or in response to the colder water, and growth rates slow down. During December-February, winter rains result in increased stream flows and by March, following peak flows, fish again feed heavily on insects and crustaceans, and grow rapidly.

In the spring, as yearlings, juvenile coho salmon undergo a physiological process, or smoltification, which prepares them for living in the marine environment. They begin to migrate downstream to the ocean during late March and early April, and out migration usually peaks in mid-May, if conditions are favorable. Emigration timing is correlated with peak upwelling currents along the coast. Entry into the ocean at this time facilitates more growth and, therefore, greater marine survival (Holtby *et al.* 1990). At this point, the smolts are about 10-13 cm in length. After entering the ocean, the immature salmon initially remain in nearshore waters close to their parent stream. They gradually move northward, staying over the continental shelf (Brown *et al.* 1994). Although they can range widely in the north Pacific, movements of adult coho salmon from California are poorly known.

2. <u>Steelhead</u>

Steelhead young usually rear in freshwater for one to three years before migrating to the ocean as smolts, but rearing periods of up to seven years have been reported. Migration to the ocean usually occurs in the spring, where they may remain for one to five years (two to three years is most common) before returning to their natal streams to spawn (Busby *et al.* 1996). The distribution of steelhead in the ocean is not well known. Coded wire tag recoveries indicate that most steelhead tend to migrate north and south along the continental shelf (Barnhart 1986).

Steelhead can be divided into two reproductive ecotypes, based upon their state of sexual maturity at the time of river entry and the duration of their spawning migration: stream maturing and ocean maturing. Stream maturing steelhead enter freshwater in a sexually immature condition and require several months to mature and spawn; whereas ocean maturing steelhead enter freshwater with well developed gonads and spawn shortly after river entry. These two reproductive ecotypes are more commonly referred to by their season of freshwater entry (*i.e.,* summer (stream maturing) and winter steelhead (ocean maturing)). The timing of upstream migration of winter steelhead is correlated with higher flow events, such as freshets or sand bar breaches, while adult summer steelhead immigrate from March through September. In contrast to other species of *Oncorhynchus,* steelhead may spawn more than one season before dying (iteroparity); although one-time spawners represent the majority.

Because rearing juvenile steelhead reside in freshwater all year, adequate flow and temperature are important to the population at all times (CDFG 1997). Emigration appears to be more closely associated with size than age. In Waddell Creek, Shapovalov and Taft (1954) found steelhead juveniles migrating downstream at all times of the year, with the largest numbers of age 0+ (young of the year) and yearling steelhead moving downstream during spring and summer. Smolts can range from 14-21 cm in length. Steelhead emigration timing is similar to coho salmon (CDFG 2001).

Survival to emergence of steelhead embryos is inversely related to the proportion of fine sediment in the spawning gravels. However, steelhead are slightly more tolerant than other salmonids, with significant reductions in survival when fines of less than 6.4 millimeters (mm) comprise 20-25 percent of the substrate. Fry typically emerge from the gravel two to three weeks after hatching (Barnhart 1986).

Upon emerging from the gravel, fry rear in edgewater habitats and move gradually into pools and riffles as they grow larger. Older fry establish territories which they defend. Cover is an important habitat component for juvenile steelhead, both as a velocity refuge and as a means of avoiding predation (Shirvell 1990, Meehan and Bjornn 1991). Steelhead, however, tend to use riffles and other habitats not strongly associated with cover during summer rearing more than other salmonids. Young steelhead feed on a wide variety of aquatic and terrestrial insects, and emerging fry are sometimes preyed upon by older juveniles. In winter, juvenile steelhead become inactive and hide in available cover, including gravel or woody debris.

Water temperature influences the growth rate, population density, and swimming ability of rearing juvenile steelhead, as well as the ability to capture and metabolize food and withstand disease (Barnhart 1986, Bjornn and Reiser 1991). Rearing steelhead juveniles prefer water temperatures of 7.2-14.4°C and have an upper lethal limit of 23.9°C. They can survive in water up to 27°C with saturated dissolved oxygen conditions and a plentiful food supply. Fluctuating diurnal water temperatures also aid in survivability of salmonids (Busby *et al.* 1996). Werner *et* *al.* (2001) documented correlations between stream temperature, size of juveniles, and heat shock protein expression. Heat shock proteins are involved in cellular protein homeostasis and repair, and provide a mechanism for organisms to reduce the deleterious effects of heat stress. This physiological coping mechanism not only helps to define a range of deleterious temperatures, but demonstrates the metabolic (and, by inference, survival) costs of exposure to those temperatures.

During rearing, suspended and deposited fine sediments can directly affect salmonids by abrading and clogging gills, and indirectly cause reduced feeding, avoidance reactions, destruction of food supplies, reduced egg and alevin survival, and degraded rearing habitat (Reiser and Bjornn 1979). Bell (1973) found that silt loads of less than 25 mg/l permit good rearing conditions for juvenile salmonids.

**B. Status of the Species**

In this BO, NMFS assesses the status of each species by examining four types of information, all which help to understand a population's ability to survive. These population viability parameters are: abundance, population growth rate, spatial structure, and diversity (McElhaney *et al.* 2000). While there is insufficient information to evaluate these population viability parameters in a quantitative sense, NMFS has used existing information to determine the general condition of each population. Factors responsible for the current status of the ESU/DPS are also described.

1. <u>SONCC Coho Salmon</u>

Recent estimates for abundance of coho salmon runs in the SONCC coho salmon ESU, give a minimum total abundance of about 10,000 natural fish and 20,000 hatchery fish. California streams are estimated to contain average runs of 7,080 natural spawners and 17,156 hatchery fish. Abundance has declined since the 1940s and through the 1960s. For example, the Rogue River in Oregon had passage counts that averaged 2,000 adults per year in the 1940s. In the late 1960s and early 1970s, these numbers had dropped to an average of 200 fish prior to the introduction of hatchery fish. In California, current SONCC coho salmon numbers are at a small percentage of their estimated abundance in the first half of the 20$^{th}$ century (Weitkamp *et al.* 1995).

SONCC coho salmon do not occupy many of the streams where they were found historically. Of streams in the ESU where current surveys were available and known to have coho salmon historically, 36 percent no longer contained coho salmon. In some streams, entire year classes are lacking (Weitkamp *et al.* 1995). More recent data indicates that SONCC coho salmon may be absent from 48 percent of streams where they were once present, although differences in distribution may be due, in part, to sampling error. The species still remains present in all the major river basins of the ESU, which is a positive indicator of species status (NMFS 2003a).

Widespread hatchery production has introduced non-native stocks. Coho salmon have been introduced from as far away as Puget Sound in Washington State. Reductions in hatchery production in the last decade and an end to out-of-state transfers have occurred. Nevertheless, the SONCC coho salmon ESU still faces genetic risk from domestication selection due to hatchery populations in the Trinity River and from straying within the ESU by large numbers of hatchery coho salmon (NMFS 2003a).

The following is a summary of the 2001 status review update for the CCC coho salmon ESU and the California portion of the SONCC coho salmon ESU (NMFS 2001):

> "In the California portion of the SONCC coho salmon ESU, there appears to be a general decline in abundance, but trend data are more limited in this area and there is variability among streams and years. In the California portion of the SONCC coho salmon ESU, Trinity River Hatchery maintains large production and is thought to create significant straying to natural populations. In the California portion of the SONCC coho salmon ESU, the percent of streams with coho present in at least one brood year has shown a decline from 1989-1991 to the present. In 1989-1991 and 1992-1995, coho were found in over 80 percent of the streams surveyed. Since then, the percentage has declined to 69 percent in the most recent three-year interval.
>
> Both the presence-absence and trend data presented in this report suggest that many coho salmon populations in this ESU continue to decline. Presence-absence information from the past 12 years indicates fish have been extirpated or at least reduced in numbers sufficiently to reduce the probability of detection in conventional surveys. Unlike the CCC ESU, the percentage of streams in which coho were documented did not experience a strong increase in the 1995-1997 period. Population trend data were less available in this ESU, nevertheless, for those sites that did have trend information, evidence suggests declines in abundance."

Both the presence-absence and trend data available suggest many coho salmon populations in this ESU continue to decline. The ESU is also at risk from genetic introgression. The widespread distribution suggests some continued resiliency for this population. Based on this information, status reviews of the species have concluded that SONCC coho salmon are "likely to become endangered" (NMFS 2005).

2. CCC Coho Salmon

A comprehensive review of estimates of historic abundance, decline and present status of coho salmon in California, is provided by Brown *et al.* (1994). They estimated the coho salmon annual spawning population in California ranged between 200,000 and 500,000 fish in the 1940s, which declined to about 100,000 fish by the 1960s, followed by a further decline to about 31,000 fish by 1991. Brown *et al.* (1994) concluded that the California coho salmon population had declined more than 94 percent since the 1940s, with the greatest decline occurring since the 1960s. More recent population estimates vary from approximately 600 to 5,500 adults (Brown *et al.* 1994). The Southwest Fisheries Science Center's recent reviews (NMFS 2001, NMFS 2003a) indicate that the CCC coho salmon ESU is likely continuing to decline in number.

CCC coho salmon have also experienced acute range restriction and fragmentation. Adams *et al.* (1999) found that in the mid 1990s coho salmon were present in 51 percent (98 of 191) of the streams where they were historically present, and documented an additional 23 streams, within the CCC coho salmon ESU, in which coho salmon were found for which there were no historical records. Recent genetic research in progress by both the NMFS Southwest Fisheries Science Center and the Bodega Marine Laboratory, has documented a reduction in genetic diversity within subpopulations of the ESU (Dan Logan, NMFS, personal communication, 2003). The influence of hatchery fish on wild stocks has also contributed to the lack of diversity throughout breeding depression[5] and disease. There are apparently few native coho salmon left (Weitkamp *et al.* 1995).

Available information suggests CCC coho salmon abundance is very low, and the ESU is not able to produce enough offspring to maintain itself (population growth rates are negative). CCC coho salmon have experienced range constriction, fragmentation, and a loss genetic diversity. Many subpopulations that may have acted to support the species' overall numbers and geographic distribution, have likely been lost. The extant subpopulations of CCC coho salmon may not have enough fish to survive additional natural and human caused environmental change. While the amount of data supporting these conclusions is not extensive, NMFS is unaware of information that suggests a more positive assessment of the condition of the ESU and its critical habitat. Recent status reviews for CCC coho salmon conclude that this ESU is presently in danger of extinction (NMFS 2001, NMFS 2005).

3. <u>NC Steelhead</u>

Both summer and winter run steelhead occur in the NC steelhead DPS. The information available indicates within a geographic area, summer and winter steelhead are more genetically similar to each other than to other summer or winter populations in other areas (65 FR 36074). The Eel River has the southern-most summer steelhead population in North America (Roelofs 1983). Current abundance information is inadequate and total escapement for individual river basins cannot be reliably estimated.

Based on the limited data available (dam counts of portions of stocks in several rivers), NMFS' initial status review of NC steelhead (Busby *et al.* 1996) determined population abundance was very low relative to historical estimates (1930s and 1960s dam counts), and recent trends were downward in most stocks. Overall, population numbers are severely reduced from pre-1960s levels, when approximately 198,000 adult steelhead migrated upstream to spawn in the major rivers of this DPS (65 FR 36074, Busby *et al.* 1996). Updated status reviews reach the same conclusion, and noted the poor amount of data available, especially for winter run steelhead (NMFS 1997b, NMFS 2003a). The information available suggests that the population growth rate is negative.

[5]Outbreeding depression is the loss of genetic and behavioral diversity in a population through the introduction of parental genomes that are not well adapted to local environments. Less native genetic material is passed to subsequent generations when native fish hybridize with hatchery fish instead of propagating with other purely native salmon.

Comprehensive geographic distribution information is not available for this DPS, but steelhead are considered to remain widely distributed (NMFS 1997b). It is known that dams on the Mad River and Eel River block large amounts of habitat historically used by NC steelhead (Busby *et al.* 1996). Hatchery practices in this DPS have exposed the wild population to genetic introgression and the potential for deleterious interactions between native stock and introduce steelhead. Historical hatchery practices at the Mad River hatchery are of particular concern, and included out-planting of non-native Mad River hatchery fish to other streams in the DPS and the production of non-native summer steelhead (65 FR 36074).

The conclusion of the most recent status reviews (NMFS 2003, 2005) echoes that of previous reviews. Abundance and productivity in this DPS are of most concern, relative to NC steelhead spatial structure (distribution on the landscape) and diversity (level of genetic introgression). The lack of data available also remains a risk because of uncertainty regarding the condition of some stream populations. As with previous reviews, the biological review team concluded that the NC steelhead ESU[6] is "likely to become endangered" (NMFS 2003, 2005).

4. CCC Steelhead

While there are no specific estimates of abundance at the population scale, CCC steelhead numbers are substantially reduced from historical levels. A total of 94,000 adult steelhead were estimated to spawn in the rivers of this DPS in the mid-1960s, including 50,000 fish in the Russian River[7] and 19,000 fish in the San Lorenzo River (Busby *et al.* 1996). Recent estimates for the Russian River are on the order of 4,000 fish (NMFS 1997b). Abundance estimates for smaller coastal streams in the DPS indicate low but stable levels (NMFS 1997b); with recent estimates for several streams (Lagunitas Creek, Waddell Creek, Scott Creek, San Vincente Creek, Soquel Creek, and Aptos Creek) of individual run sizes of 500 fish or less (62 FR 43937).

Overall, the abundance of the CCC steelhead DPS has declined precipitously, from an estimated 94,000 returning adults in the 1960s to estimates less than 5,350 in recent times (Busby *et al.* 1996, NMFS 1997b). These numbers indicate over a 94 percent decline in the population of steelhead spawning in the DPS. Absent information indicating a recent upward trend in numbers DPS wide, NMFS assumes that the overall population growth rate may continue to be negative. For more detailed information on the population trend of CCC steelhead, see Busby *et al.* 1996, NMFS 1997b, NMFS 2003a, and NMFS 2005.

CCC steelhead have maintained a wide distribution throughout the DPS. Presence/absence data show that in a subset of streams sampled in the CCC region, most contain steelhead (NMFS 1997b). Of streams in the DPS with current presence/absence data on steelhead, 218 of 264 streams currently support some juveniles (including the Russian River). Species with broad distributions are more likely to survive environmental fluctuations and stochastic events, even if

[6] The ESU designation for steelhead was recently modified and is now referred to as a DPS (distinct population segment).

[7] The Russian River, which is the largest watershed in the ESU, once boasted steelhead runs ranked as the third largest in California behind only the Klamath and Sacramento rivers.

they suffer local extirpation (Pimm *et al.* 1988). Many streams in and around the San Francisco Bay region, however, no longer support steelhead.

The interbasin transfer of hatchery steelhead has persisted in various locations and at various times within the CCC DPS (NMFS 1997b). This has likely affected the genetic composition of existing stocks. Although some genetic research is being done on CCC steelhead, little information is available to assess the diversity of the species.

While CCC steelhead have experienced significant declines in abundance, and long-term population trends suggest a negative growth rate, they have maintained a wide distribution throughout the DPS. This suggests that, while there are significant threats to the population, they possess a resilience that is likely to slow their decline. In the recent document titled *Updated Status of Federally Listed ESUs of West Coast Salmon and Steelhead,* the biological review team concluded that steelhead in the CCC steelhead DPS remain "likely to become endangered in the foreseeable future" (NMFS 2005).

5. S-CCC Steelhead

No recent estimates for total run size exist for this DPS. However, early 1990s run-size estimates are available for five streams (Pajaro River, Salinas River, Carmel River, Little Sur River, and Big Sur River). The total of these estimates was less than 500 fish, compared with a total of 4,750 fish for the same streams in 1965 (Busby *et al.* 1996). Based on these numbers, the species was considered at high risk (Nehlsen *et al.* 1991). The current number of adult steelhead in the DPS may be about 1,500 due to recent increases in number of steelhead recorded on the Carmel River. Estimates based on San Clemente Dam ladder counts in the last six years have averaged 1,254 fish (Jones and Stokes Associates, Incorporated 1998, Entrix Incorporated 2000, John McKeon, NMFS, personal communication, 2003).

Available information shows the population declined from the 1970s to the 1990s (Busby *et al.* 1996) and more recent data (NMFS 2003) indicates this trend continues. In the mid-1960s, total spawning populations of steelhead in this DPS were estimated as 17,750 (CDFG 1965). Current runs in five of the larger rivers (Pajaro, Salinas, Carmel, Little Sur, and Big Sur) appear to be limited to about 1,000 adults; where previously these runs had been on the order of 4,750 adults in the mid 1960s (CDFG 1965). Thus, recent total abundance in five of the larger rivers in the DPS is about 22 percent of their abundance in the mid 1960s. Although numbers in the Carmel River appear to be increasing, this general decline in the population of steelhead indicates an overall negative trend in growth rate for the DPS.

Distribution within the DPS is widespread; however, the patchiness of distribution is of concern. A recent assessment by NMFS indicates that only 36 percent of the historic steelhead habitat of the DPS remains suitable for steelhead rearing (Jonathan Ambrose, NMFS, personal communication, 2003). Species range constriction and fragmentation are likely to interfere with the population structure and are indications of reduced viability. Also, the poor condition of the habitat in many areas, and the changed flow regimes of the major rivers in the DPS due to urban and agricultural water use, remain as serious risks to survival and recovery of the S-CCC steelhead DPS. Habitat loss has been acute in the DPS's two inland basins (Salinas and Pajaro systems), where conditions are more arid and instream conditions are less resilient to adverse perturbation than the wetter coastal basins (Carmel, Big Sur, and Little Sur systems). Habitat loss has been less dramatic in the coastal basins and a status review update (Schiewe 1997) listed numerous reports of juvenile *O. mykiss* present in many coastal streams.

The interbasin transfer of hatchery steelhead has persisted in various locations and at various times within the S-CCC DPS (Sundermeyer 1999, Titus *et al.* 2002). This has adversely affected the genetic composition of existing stocks in at least one major watershed in the S-CCC steelhead DPS. Sundermeyer (1999) found steelhead in many of the tributaries of the Pajaro River indistinguishable from steelhead in the San Lorenzo River (CCC steelhead DPS) due to the long history of hatchery supplementation. Other basins in the DPS have also had interbasin transfers but little genetic information is available to assess the effects of these practices.

Total steelhead abundance is extremely low and most stocks in the S-CCC steelhead DPS, for which there are data, show a substantial decline during the past 40 years (Busby *et al.* 1996). This species is generally more resilient to perturbation than other salmonids due to their ability to tolerate a wider range of habitat conditions. However, the poor condition of their habitat (particularly in the Pajaro and Salinas Rivers) in many areas remains, and compromised genetic integrity of some stocks poses a serious risk to their survival and recovery (NMFS 2005). Furthermore, steelhead are not evenly distributed throughout the DPS. Distribution of steelhead within many watersheds across the DPS is very patchy, with better distribution in the coastal basins and poor distribution in the interior basins.

## C. Critical Habitat

In designating critical habitat, NMFS considers the following requirements of the species: (1) space for individual and population growth, and for normal behavior; (2) food, water, air, light, minerals, or other nutritional or physiological requirements; (3) cover or shelter; (4) sites for breeding, reproduction, or rearing offspring; and, generally, (5) habitats that are protected from disturbance or are representative of the historic geographical and ecological distributions of this species (50 CFR §424.12(b)). In addition to these factors, NMFS also focuses on known physical and biological features (primary constituent elements) within the designated area that are essential to the conservation of the species and that may require special management considerations or protection. These essential features may include, but are not limited to, spawning sites, food resources, water quality and quantity, and riparian vegetation.

Critical habitat for coho salmon is defined as: "all waterways, substrate, and adjacent riparian zones (in an ESU) below longstanding, naturally impassable barriers (*i.e.*, natural waterfalls in existence for at least several hundred years) (64 FR 24049)." NMFS has excluded from critical habitat designation all tribal lands in northern California and areas above certain dams blocking access to historical habitats of listed salmonids. Waterways include estuarine areas and tributaries. Riparian areas are defined as "the area adjacent to a stream that provides the following functions: shade, sediment, nutrient, or chemical regulation, stream bank stability, and input of large woody debris or organic matter" (64 FR 24049). In other words, riparian areas are those areas that produce physical, biological, and chemical features that help to create stream habitat for salmonids.

Critical habitat for steelhead and Chinook salmon is defined for each DPS or ESU as described below. The lateral extent of critical habitat for steelhead and Chinook is "the width of the stream channel defined by the ordinary high-water line as defined by the Corps in 33 CFR 329.11" (FR 69 71880). Riparian areas were excluded because their inclusion without a specific lateral extent in coho salmon critical habitat (see above) has resulted in difficulty for Federal agencies in determining the specific acreage of critical habitat across landscapes.[8] Activities in riparian areas may impact Chinook salmon or steelhead critical habitat, because the "quality of aquatic habitat within stream channels is intrinsically related to the adjacent riparian zones..." (FR 69 71880).

1. <u>SONCC Coho Salmon</u>

SONCC coho salmon critical habitat includes all accessible reaches of rivers between Mattole River in California and the Elk River in Oregon. Logging, agricultural and mining activities, urbanization, stream channelization, dams, wetland loss, and water withdrawals and unscreened diversions for irrigation have been identified as causes contributing to the modification and curtailment of coho salmon critical habitat within the SONCC coho salmon ESU (64 FR 24049).

Timber harvest is one of the major land uses affecting SONCC coho salmon critical habitat. Private lands, much of which are forest lands, make up approximately 56 percent of the SONCC coho salmon ESU. One Habitat Conservation Plan (HCP), the Pacific Lumber Company (Palco) HCP, is expected to result in improving habitat conditions for SONCC coho salmon on a small percentage of the private lands in this ESU. Another HCP, the Simpson Resource Company[9] (Simpson) HCP (2002), is in the process of permit review. Other private timber lands currently operate under state rules which do not achieve the level of protection provided on Federal forests. For example, California Forest Practice Rules have been judged by NMFS as inadequate to conserve salmonids (65 FR 36074).

Federal lands make up approximately 36 percent of the lands in the ESU. Since the adoption of the Northwest Forest Plan (USDA and USDOI 1994), there has been a significant decrease in the miles of new road constructed on public lands in the range of the northern spotted owl, which includes the SONCC coho salmon ESU. The Northwest Forest Plan (NWFP) is also working to improve current road conditions, but due to the large number of roads (thousands of miles) and culverts, the forest road system in this ESU will not be brought up to the new standards in the near future. These roads are not only chronic sources of fine sediment, but during floods, they can deliver immense quantities of fine and coarse sediments to SONCC coho salmon spawning and rearing areas. Many of the culverts remain impassable to fish. Unfortunately, stream channels may take decades or centuries to recover (Chamberlin *et al.* 1991, Furniss *et al.* 1991). Riparian conditions will also improve under the NWFP, but similar to sediment impacts, it will take decades (centuries in some areas) for the habitat complexity provided by properly functioning riparian areas to recover.

[8] NMFS chose not to provide a lateral extent in riparian areas to avoid under or over estimating the actual extent of riparian habitat essential to aquatic habitat (FR 69 71880).
[9] Now doing business as Green Diamond.

Other activities, such as grazing and mining activities, water use, and urban development, are likely to continue to degrade SONCC coho salmon critical habitat for the foreseeable future. In some areas, improvements are occurring, but similar to forest management, it is likely to take decades to return large areas of critical habitat to conditions suitable for the conservation of SONCC coho salmon. Restoration efforts are underway on both Federal and private lands, but at the current level of effort, it will take decades to affect a significant portion of SONCC coho salmon critical habitat. Based on the above information, NMFS expects SONCC coho salmon critical habitat conditions are likely to improve in some areas, while continued degradation is likely in others. Improvements may take decades or centuries to return habitat to conditions that conserve SONCC coho salmon populations.

2. CCC Coho Salmon

On May 5, 1999, NMFS designated critical habitat for the CCC coho salmon ESU (64 FR 24049). The designations include all accessible reaches of rivers between Punta Gorda and the San Lorenzo River in Santa Cruz County, California; this designation also includes two rivers entering the San Francisco Bay: Arroyo Corte Madera Del Presidio and Corte Madera Creek.

The condition of CCC coho salmon critical habitat, specifically its ability to provide for their conservation, has been degraded from conditions known to support viable salmonid populations. NMFS has determined that present depressed population conditions are, in part, the result of the following human induced factors affecting critical habitat[10]: logging, agricultural and mining activities, urbanization, stream channelization, dams, wetland loss, and water withdrawals and unscreened diversions for irrigation.

Numerous studies have demonstrated that land use activities associated with logging, road construction, urban development, mining, agriculture, and recreation, have significantly degraded coho salmon critical habitat quantity and quality in the CCC coho salmon ESU. Impacts of concern include alteration of stream bank and channel morphology, alteration of water temperatures, loss of spawning and rearing habitat, fragmentation of habitat, loss of downstream recruitment of spawning gravels and LWD, degradation of water quality, removal of riparian vegetation resulting in increased stream bank erosion, increases in erosion entry to streams from upland areas, loss of shade (higher water temperatures), and loss of nutrient inputs (61 FR 56138).

Depletion and storage of natural river and stream flows have drastically altered natural hydrologic cycles in many of the streams in the ESU. Alteration of flows results in migration delays, loss of suitable habitat due to dewatering and blockage, stranding of fish from rapid flow fluctuations, entrainment of juveniles into poorly screened or unscreened diversions, and increased water temperatures harmful to salmonids (61 FR 56138).

[10]Other factors, such as over-fishing and artificial propagation, have also contributed to the current population status of these species. All these human induced factors have exacerbated the adverse effects of natural environmental variability from such factors as drought and poor ocean conditions.

3. NC Steelhead

On September 2, 2005, NMFS designated critical habitat for the NC steelhead DPS. The designations include nearly all steelhead inhabited reaches of rivers between Redwood Creek (Humboldt County, California) southward to the Gualala River (Mendocino County) with the exception of those areas excluded from the Critical Habitat designation described in the table below.

Table 1. CALWATER Hydrologic Subarea (HAS) watersheds within the geographical range of the NC steelhead DPS and excluded from critical habitat

| **Watershed Code/Name** | | **Area Excluded** |
|---|---|---|
| 110940 | Ruth | Entire watershed |
| 111142 | Spy Rock | Tribal land |
| 111150 | North Fork Eel | Entire watershed, Indian lands |
| 111163 | Lake Pilsbury | Entire watershed |
| 111171 | Eden Valley | Indian lands |
| 111172 | Round Valley | Indian lands |

Specific factors affecting habitat quality for the NC steelhead DPS, as identified by the NMFS Biological Review Team (BRT) include dams on the upper Eel and Mad Rivers, the likely existence of minor blockages throughout the DPS, continuing impacts of catastrophic flooding of the 1960s, and reductions in riparian and instream habitat and increased sedimentation from timber harvest activities. NMFS has identified water diversion and extraction, agriculture, and mining as factors affecting habitat conditions for steelhead in this DPS. The BRT has also cited poaching of summer steelhead and predation by pikeminnow in the Eel River as factors for concern (65 FR 36074).

4. CCC Steelhead

On September 2, 2005, NMFS designated critical habitat for the CCC steelhead DPS. The designation includes nearly all steelhead inhabited reaches of rivers between Russian River southward to and including Aptos Creek, as well as drainages of San Francisco and San Pablo Bay eastward to but excluding the Sacramento-San Joaquin Delta. Major coastal watersheds occupied by this DPS include the Russian River, Lagunitas Creek, and San Lorenzo River. The following areas were excluded from the Critical Habitat designation for this DPS:

Table 2. HSA Watersheds within the geographical range of the CCC steelhead DPS and excluded from critical habitat

| **Watershed Code/Name** | | **Area Excluded** |
|---|---|---|
| 111421 | Laguna de Santa Rosa | Entire watershed |
| 111422 | Santa Rosa | Entire watershed |
| 111431 | Ukiah | Tributaries |
| 111433 | Forsythe Creek | Indian lands |
| 220330 | Berkeley | Entire watershed |

| | |
|---|---|
| 220440 San Mateo Bayside | Entire watershed |
| 220420 Eastbay Cities | Entire watershed |
| 220540 Guadelupe River | Entire watershed |
| 220620 Novato | Entire watershed |
| 220660 Pinole | Entire watershed |
| 220710 Suisun Bay | Entire unit |
| 220722 Suisun Creek | Entire watershed |
| 220721 Benicia | Entire watershed |
| 220731 Pittsburg | Entire watershed |
| 220733 Martinez | Entire watershed |

In designating critical habitat, NMFS identified several factors potentially responsible for adversely affecting habitat for this DPS, including urbanization, agriculture, grazing, flood control channelization, road building and maintenance, agricultural and non-agricultural water withdrawals, and non-hydro dams (70 FR 52487).

5. S-CCC Steelhead

On September 2, 2005, NMFS designated critical habitat for the S-CCC steelhead DPS. The designation includes nearly all steelhead inhabited reaches of coastal river basins from the Pajaro River southward to, but not including, the Santa Maria River. The major watersheds occupied by this DPS include the Pajaro River, Salinas River, Carmel River, and numerous smaller rivers and streams along the Big Sur coast and southward. The following areas were excluded from the Critical Habitat designation for this DPS:

Table 3. HSA watersheds within the geographical range of the S-CCC steelhead DPS and excluded from critical habitat

| Watershed Code/Name | Area Excluded |
|---|---|
| 330911 Neponset | Tributaries |
| 330930 Soledad | Tributaries |
| 330940 Upper Salinas Valley | Tributaries |
| 330981 Paso Robles | Dept. of Defense lands |
| 331022 Chorro | Dept. of Defense lands |

In designating critical habitat, NMFS identified several factors potentially responsible for adversely affecting habitat for this DPS, including flood control channelization, agricultural and non-agricultural water withdrawals, road building and maintenance, and non-hydro dams (70 FR 52487).

6. CC Chinook salmon

On September 2, 2005, NMFS designated critical habitat for the CC Chinook salmon ESU. The designation includes nearly all Chinook salmon inhabited reaches of coastal river basins from the Russian River northward to Prairie Creek. The major watersheds occupied by this ESU include the Russian River, Eel River, Mad River, Mattole River, and numerous smaller rivers and streams along the northern California coast and southward. The following areas were excluded from the Critical Habitat designation for this ESU:

Table 4. HSA watersheds within the geographical range of the CC Chinook ESU and excluded from critical habitat

| Watershed Code/Name | | Area Excluded |
|---|---|---|
| 110810 | Big Lagoon | 0.7 mi of occupied habitat area |
| 110920 | NF Mad River | 0.8 mi of occupied habitat area |
| 111171 | Eden Valley | Tributaries |
| 111350 | Navarro River | All occupied habitat |
| 111423 | Mark West | All occupied habitat |

In designating critical habitat, NMFS identified several factors potentially responsible for adversely affecting habitat for this ESU, including flood control channelization, agricultural and non-agricultural water withdrawals, road building and maintenance, and non-hydro dams (70 FR 52487).

7. Critical Habitat Summary

With the listing of these salmonid species and the designation of critical habitat, the provisions of the Federal ESA took effect to prevent Federal actions from authorizing, funding, or carrying out actions that would jeopardize the long-term survival and recovery of the species and/or taking actions that would adversely modify critical habitat. In addition, both the State and Federal government are providing funding for habitat restoration projects in these ESUs/DPSs. However, Federal agency actions affect only a subset of many of the critical habitat areas and/or elements. Funding for restoration has been increased since the late 1990s, but it may not affect a significant portion of degraded critical habitat for several decades. Thus, it is unknown whether State management of land use, Federal agency responsibilities under the ESA, and State/Federal restoration efforts are likely to reverse the overall trend of continued habitat degradation in the near future.

## D. Factors Responsible for Stock Declines: Changes to Habitat (Including Critical Habitat) and Other Impacts

Many of the biological requirements for anadromous salmonids can best be expressed in terms of the essential features of their habitat. That is, anadromous salmonids typically require adequate (1) substrate (especially spawning gravel), (2) water quality, (3) water quantity, (4) water temperature, (5) water velocity, (6) cover/shelter, (7) food, (8) riparian vegetation, (9) space, and (10) migration conditions. The best scientific information presently available demonstrates that a multitude of factors, past and present, have contributed to the decline of west coast salmonids by adversely affecting these essential habitat features.

NMFS cites many reasons (primarily anthropogenic) for the decline of CCC and SONCC coho salmon (Weitkamp *et al.* 1995), and NC, CCC, and S-CCC steelhead (Busby *et al.* 1996). The foremost reason for the decline in these anadromous salmonid populations is the degradation and/or destruction of freshwater habitat. Additional factors contributing to the decline of these populations include: commercial and recreational harvest, ocean conditions, predation, natural stochastic events, and water quality.

The following section details the general factors affecting SONCC coho salmon, CCC coho salmon ESUs, NC steelhead, CCC steelhead, and S-CCC steelhead DPSs. The extent to which there are species specific differences in population limiting factors is not clear; however, the freshwater ecosystem characteristics necessary for the maintenance of self-sustaining populations of anadromous salmonids are similar.

1. <u>Habitat Degradation and Destruction</u>

A major cause of the decline of salmon and steelhead is the loss or severe decrease in quality and function of essential freshwater habitat, including critical habitat. Most of this habitat loss and degradation have resulted from anthropogenic watershed disturbances caused by agriculture, logging, urban development, water diversion, road construction, erosion and flood control, dam building, and grazing. Most of this habitat degradation is associated with the loss of essential habitat components necessary for salmon and steelhead survival. For example, the loss of deep pool habitat as a result of sedimentation and stream flow reductions has reduced rearing and holding habitat for juvenile and adult salmonids.

*a. Urban Development*

Urbanization has degraded anadromous salmonid habitat through stream channelization, flood plain drainage, and riparian damage (reviewed in 61 FR 56138). When watersheds are urbanized, problems may result simply because structures are placed in the path of natural runoff processes, or because of changes in the hydrologic regime. In almost every circumstance where urbanization activity touches the watershed, point source and nonpoint pollution occur. Sources of nonpoint pollution, such as sediments washed from the urban areas, contain trace metals such as copper, cadmium, zinc, and lead (California State Lands Commission 1993). These, together with pesticides, herbicides, fertilizers, gasoline, and other petroleum products, contaminate drainage waters and harm aquatic life necessary for anadromous salmonid survival. Water infiltration is reduced due to extensive ground covering. As a result, runoff from the watershed is flashier, with increased flood hazard (Leopold 1968). Flood control and land drainage schemes may concentrate runoff, resulting in increased bank erosion which causes a loss of riparian vegetation and undercut banks and eventually causes widening and down-cutting of the stream channel.

For example, urbanization has been a major influence on the land and tributaries surrounding the San Francisco Bay. Today, nearly 30 percent of the land in the nine counties surrounding San Francisco Bay is urbanized. The increase in urban land reflects the growth of the human population. There are now more than 7.5 million individuals living in the 12 Bay Area counties, making the region the fourth most populous metropolitan area in the United States. These changes have reduced the acreage of valuable farm land, wetlands, and riparian areas, and have increased pollutant discharge and loadings to the tributaries and the bay. Stream channel manipulations for flood control, bank stabilization, and gravel extraction have reduced the amount of valuable riffle habitat for rearing juvenile salmonids.

*b. Water Quality*

Many waterways fail to meet the Federal Clean Water Act and Federal Safe Drinking Water Act water quality standards due to the presence of pesticides, heavy metals, dioxins, and other pollutants. These pollutants originate from both point (industrial and municipal waste) and nonpoint (agriculture, forestry, urban activities, *etc.*) sources. The types and amounts of compounds found in runoff are often correlated with land use patterns: fertilizers and pesticides are found frequently in agricultural and urban settings, and nutrients are found in areas with human and animal waste. People contribute to chemical pollution in the area, but natural and seasonal factors also influence pollution levels in various ways. Nutrient and pesticide concentrations vary considerably from season to season, as well as among regions with different geographic and hydrological conditions. Natural features (such as geology and soils) and land-management practices (such as storm water drains, tile drainage, and irrigation) can influence the movement of chemicals over both land and water. Salmon require clean water and gravel for successful spawning, egg incubation, and fry emergence. Fine sediments clog the spaces between gravel and restrict the flow of oxygen-rich water to the incubating eggs. Pollutants, excess nutrients, low levels of dissolved oxygen, heavy metals, and changes in pH also decrease the water quality for salmon and steelhead.

*c. Water Development*

Water is diverted for urban, commercial, agricultural, and residential use. In addition to a number of large reservoirs, there are an unknown number of permanent and temporary water withdrawal facilities diverting water for similar purposes. Impacts from water withdrawals include localized dewatering of stream reaches, entrapment of younger salmonids, and depletion of flows necessary for migration, spawning, rearing, and flushing of sediment from spawning gravels, gravel recruitment, and transport of LWD. Unprotected or poorly screened water diversions can also impact young salmonids; young fry are easily drawn into water pumps or become stuck against the pump's screened intakes. Unscreened or inadequately screened diversions are common throughout central and northern California.

Water withdrawals (primarily for irrigation) have reduced summer flows in many streams and thereby profoundly decreased the amount and quality of salmonid rearing habitat. Water quantity problems are a significant cause of habitat degradation and reduced fish production. Although some of the water withdrawn from streams eventually returns as agricultural runoff or groundwater recharge, crops consume a large proportion of it. Withdrawals affect seasonal flow patterns by removing water from streams in the summer (mostly May through September) and restoring it to surface streams and groundwater in ways that are difficult to measure. Withdrawing water for irrigation, urban consumption, and other uses increases temperatures, smolt travel time, and sedimentation that adversely affects rearing habitat quality and quantity.

*d. Dams*

Dams have a wide variety of functions including hydropower production, residential, commercial and agricultural water supply, and flood and/or debris control. The construction of dams in the rivers in California has dramatically affected anadromous salmonids utilizing these streams. Dams have eliminated spawning and rearing habitat and altered the natural hydrograph of most major river systems, decreasing spring and summer flows and increasing fall and winter flows. Depletion and storage of natural flows have drastically altered natural hydrological cycles in many California Rivers and streams. Alteration of stream flows has increased juvenile salmonid mortality for a variety of reasons: migration delay resulting from insufficient flows or habitat blockages; loss of usable habitat due to dewatering and blockage; stranding of fish resulting from rapid flow fluctuations; entrainment of juveniles into unscreened or poorly screened diversions; and increased juvenile mortality resulting from increased water temperatures (Berggren and Filardo 1993, Chapman and Bjornn 1969, 61 FR 56138).

*e. Gravel Mining*

Gravel mining is a major cause of sediment deficits in many watersheds. In-channel mining removes gravel by either skimming it from bars or excavating it directly from the channel. Over-harvesting of gravel can lead to river incision, bank erosion, habitat simplification, and tributary downcutting (SEC 1996).

Gravel mining has resulted in morphological changes to many river systems in California. Decreased sediment load has caused many rivers to increase in depth, resulting in extensive bank erosion (Florsheim and Goodwin 1993). Degradation or downcutting of the channel due to past mining in the middle reaches of some rivers has also lead to adverse impacts on adjacent ground water tables.

Loss of spawning gravels has a direct impact on salmonids. Female salmon and steelhead preferentially chose spawning sites where there is clean, loosely compacted gravel or cobble substrates with less than 20 percent fine silt or sand content, and an intergravel flow sufficient to aerate the eggs. The lack of suitable gravel often limits spawning success in many streams.

Turbidity as a result of increased erosion and sedimentation caused by gravel mining, can also be a limiting factor for anadromous salmonid populations. Salmonids are particularly sensitive to turbidity (Bjornn and Reiser 1991); it may lead to failed spawning, reduced respiratory efficiency, interruption of migration, altered prey base, reduced visibility, and reduction in plant production. Reduced plant production may, in turn, lead to lower dissolved oxygen levels and diminished food and cover for fish and aquatic insects.

*f. Agriculture*

Agricultural practices have contributed to the degradation of salmonid habitat on the West Coast through irrigation diversions, overgrazing in riparian areas, and compaction of soils in upland areas from livestock (reviewed in 61 FR 56138). These practices have also altered the natural flow patterns of streams and rivers (many of the streams and rivers within the action area are dry during the summer low flow period due to agricultural water diversions). Early agricultural practices resulted in filled sloughs and side channels and removed riparian vegetation. River valleys were leveled and water courses channelized, altering drainage and runoff patterns. Agricultural operations removed riparian vegetation, small in-channel islands, and gravel bars to increase arable acreage and achieve flood control.

Vegetation removal and channel destabilization have accelerated erosion. In response to increased erosion, bank stabilization measures began and continued as cultivated acreage increased. Stabilization measures increased channel straightening which expedited channel downcutting. In addition to changing river morphology, agricultural practices decrease water quality by releasing fertilizers and pesticides into streams and rivers (Florsheim and Goodwin 1993). Enrichment from manures is also a problem where barns and livestock are adjacent to watercourses. Osborne and Kovacic (1993) report the largest diffuse source of water quality degradation comes from agriculture-derived contaminants such as sediment, nutrients, and pesticides.

Grazing activities have resulted in loss of native perennial grasses and riparian vegetation; soil loss; hillside trailing and gullying; and the incision of swales and meadows. Soils compacted by overgrazing on land with minimal vegetative cover have significantly reduced infiltration rates. Instead of the water moving into the soil, it moves rapidly over it, delivering heavy runoff to streams, which in turn can result in flashy watersheds (Kohler and Hubert 1993). This altered cycle is characterized by reduced groundwater storage capacity, and a greater propensity for intermittent stream flow during low-flow periods. The response within the stream corridor is one of bank erosion, channel scour, and loss of riparian and fish habitat.

The vigor, composition, and diversity of natural vegetation can be altered by livestock grazing in and around riparian areas. This, in turn, can affect the site's ability to control erosion, provide stability to stream banks, and provide shade, cover, and nutrients to the stream. Compaction can reduce the productivity of the soils appreciably and cause bank slough and erosion. Bank damage often leads to channel widening, lateral stream migration, and excess sedimentation (61 FR 56138).

*g. Forestry*

Forestry practices have limited production of anadromous salmonids and adversely affected their habitat in numerous ways. Habitat degradation by forestry activities has mostly occurred in tributaries, which mostly affects spawning and early-rearing juvenile salmonids. Populations are limited in tributary and mainstem habitats by the loss of LWD, debris barriers, increased temperatures, massive siltation, loss of riparian cover diversity, road building and maintenance causing increased sedimentation of fines and the filling of pools. Standiford and Arcilla (2001) state LWD volume in northern California streams has generally decreased over the last century due to forestry practices. LWD loss affects fish by reducing available habitat and habitat complexity, reduced deposition of sediment, and reduced deposition of fine organic matter that feeds stream invertebrates.

Forestry practices have also affected salmonid habitat by removing streamside vegetation, accelerating erosion, introducing and removing organic debris, and altering the shape of the channel (Chamberlin 1982). Removing riparian vegetation along the channel through logging activities can result in increased stream temperatures (Beschta *et al.* 1987). These temperature changes can impact salmonids by influencing factors such as rates of egg development, rearing success, and species competition, and increase their susceptibility to diseases. Increased erosion can occur as a result of forestry activities. Site disturbance and road construction typically increase sediment delivery to streams through mass wasting and surface erosion, which can elevate levels of fine sediment in spawning gravels and fill pool habitats used by salmonids for rearing (Spence *et al.* 1996).

The effects of introducing organic debris can be positive because organic debris controls sediment transport and provides habitat for aquatic organisms (Swanson and Lienkaemper 1978, Keller and Swanson 1979, Bryant 1980); however, introduction of excessive organic loading can impede fish movement and reduce dissolved oxygen levels (Hall and Lantz 1969). Logging activities can also lead to morphological changes in the channel due to increased sediment inputs (Reid 1994). These changes include the widening and an increase in braiding of some streams and the filling in of pools. When flows on these streams spread too widely, upstream migration of adults is hindered. The loss of pools decreases available habitat for salmonids and removes cool water refuges needed for summer survival in some streams.

Past timber harvest and associated activities have had more impact across forested ecosystems than current timber practices, especially those utilizing ground-based equipment methods after World War II. The majority of private and state timber land holdings within California have been harvested, leading to decreased habitat quality for salmonids. Also, the removal of riparian trees during timber harvesting activities reduces shading and recruitment of organic debris important in maintaining salmonid habitat (Spence *et al.* 1996). Past timber harvest, and to some extent ongoing timber harvest activities, along many streams have contributed to decreases in wild populations of anadromous salmonids over time.

2. Natural Stochastic Events

Natural events such as droughts, landslides, floods, and other catastrophes have adversely affected salmon and steelhead populations throughout their evolutionary history and yet they have survived. The effects of these events are often times exacerbated by anthropogenic changes to watersheds caused by activities such as logging, road building, and water diversion. Additionally, the ability of species to rebound from natural stochastic events may be limited as a result of other existing anthropogenic factors or depressed populations.

Variability in ocean productivity has been shown to affect salmon production both positively and negatively. Beamish and Bouillion (1993) showed a strong correlation between North Pacific salmon production from 1925 to 1989 and their marine environment. Beamish *et al.* (1997) noted decadal-scale changes in the production of Fraser River sockeye salmon (*O. nerka*) that they attributed to changes in the productivity of the marine environment. They (along with many others) also reported the dramatic change in marine conditions occurring in 1976-77, whereby an oceanic warming trend began. El Niño conditions, which occur every three to five years, negatively affect ocean productivity. Johnson (1988) noted increased adult mortality and decreased average size for Oregon's Chinook and coho salmon during the strong 1982-83 El Niño. It is unclear to what extent ocean conditions have played a role in the decline of salmon and steelhead; however, ocean conditions have likely affected populations throughout their evolutionary history.

3. Commercial and Recreational Harvest

There are few good historical accounts of the abundance of coho salmon and steelhead harvested along the California coast (Jensen and Startzell 1967). Early records did not contain quantitative data by species until the early 1950s. In addition, the confounding effects of habitat deterioration, drought, and poor ocean conditions on coho salmon and steelhead survival make it difficult to assess the relative contribution recreational and commercial harvest have had on the overall decline of salmonids in West Coast rivers.

4. Artificial Propagation

Releasing large numbers of hatchery fish can pose a threat to wild salmon and steelhead stocks through genetic impacts, competition for food and other resources, predation of hatchery fish on wild fish, and increased fishing pressure on wild stocks as a result of hatchery production (Waples 1991). The genetic impacts of artificial propagation programs are primarily caused by the straying of hatchery fish and subsequent hybridization of hatchery and wild fish. Artificial propagation threatens the genetic integrity, and diversity protecting overall productivity against changes in environment (61 FR 56138). The potential adverse impacts of artificial propagation programs are well documented (reviewed in Waples 1991, National Research Council 1995, National Research Council 1996, Waples 1999).

5. Marine Mammal Predation

Marine mammal predation is not believed to be a major factor contributing to the decline of west coast salmon and steelhead populations relative to the effects of fishing, habitat degradation, and hatchery practices. However, marine mammal predation may significantly influence salmonid abundance in some local populations when other marine mammal prey are absent and physical conditions lead to the concentration of adult and juvenile salmonids (NMFS 1999a). At the mouth of the Russian River, Hanson (1993) reported that the foraging behavior of California sea lions and harbor seals with respect to anadromous salmonids was minimal. Hanson (1993) also stated that predation on salmonids appeared to be coincidental with the salmonid migrations rather than dependent upon them.

6. Reduced Marine-Derived Nutrient Transport

Reduced marine-derived nutrient (MDN) transport to watersheds is another consequence of the past century of decline in salmon abundance (Gresh *et al.* 2000). Salmon may play a critical role in the survival of their own species as MDN (from salmon carcasses) is important for the growth of juvenile salmonids (Bilby *et al.* 1996, Bilby *et al.* 1998). The return of salmon to rivers provides a significant contribution to the flora and fauna of both terrestrial and riverine ecosystems (Gresh *et al.* 2000). Evidence of the role of MDN and energy in ecosystems infers this deficit may indicate an ecosystem failure that has contributed to the downward spiral of salmonid abundance (Bilby *et al.*1996).

## IV. ENVIRONMENTAL BASELINE

The environmental baseline is an analysis of the effects of past and ongoing human and natural factors leading to the status of the species, its habitat, and the ecosystem in the action area. The environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area; the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation; and the impact of State or private actions which are contemporaneous with the consultation in process (50 CFR §402.02).

The action area includes all 20,484 miles of coastal anadromous California streams from the Humboldt/Mendocino County boarder south to headwaters of the Salinas River in San Luis Obispo County and all streams draining into San Francisco and San Pablo bays eastward to the Napa River (inclusive), excluding the Sacramento-San Joaquin River Basin (Figure 1). The action area for this project encompasses a range of environmental conditions and several listed salmonid ESUs/DPSs, and is delineated by four geographic areas described in the *Status of the Species and Critical Habitat in the Action Area* section of this BO.

The action area encompasses approximately 16,126 square miles of the central and northern California Coast Range. Native vegetation varies from redwood (*Sequoia sempervirens*) forest along the lower drainages to Douglas fir (*Pseudotsuga menziesii*) intermixed with hardwoods and chaparral, to ponderosa pine (*Pinus ponderosa*) and Jeffery pine (*Pinus jefferyi*) stands along the upper elevations. Areas of grasslands are also found along the main ridge tops and south facing slopes of the watersheds.

The action area has a Mediterranean climate characterized by cool wet winters with typically high runoff, and dry warm summers characterized by greatly reduced instream flows. Fog is a dominant climatic feature along the coast, generally occurring daily in the summer and not infrequently throughout the year. Higher elevations and inland areas tend to be relatively fog free. Most precipitation falls during the winter and early spring as rain, with occasional snow above 1,600 ft. Along the coast, average air temperatures range from 46° to 56° Fahrenheit (F). Further inland and in the southern part of the action area, annual air temperatures are much more varied, ranging from below freezing in winter to over 100°F during the summer months.

High seasonal rainfall on bedrock and other geologic units with relatively low permeability, erodible soils, and steep slopes contribute to the flashy nature (stream flows rise and fall quickly) of the watersheds within the action area. In addition, these high natural runoff rates have been increased by road systems, urbanization, and other land uses. High seasonal rainfall combined with rapid runoff rates on unstable soils delivers large amounts of sediment to river systems. As a result, many river systems within the action area contain a relatively large sediment load, typically deposited throughout the lower gradient reaches of these systems.

## A. Status of the Species and/or Critical Habitat in the Action Area

This section provides a synopsis of the four geographic areas of consideration, the ESUs/DPSs and HUCs present within each area, specific recent information on the status of coho salmon or steelhead, and a summary of the factors affecting the listed species within the action area. The best information presently available demonstrates that a multitude of factors, past and present, have contributed to the decline of west coast salmonids (Weitkamp *et al.* 1995, Busby *et al.* 1996, NMFS 1996, Myers *et al.* 1998, NMFS 1998, CDFG 2002, CRWQCB 2001). The following is a summary of the factors affecting the environment of the species or critical habitat within each HUC. Information in this section is delineated by the following geographic areas: North Coast Area, North Central Coast Area, San Francisco Bay Area, and the Central Coast Area, and subdivided by 4$^{th}$ Field HUCs.

Information for the North Coast Area only includes the Eel River which is the only North Coast stream falling within the NMFS Santa Rosa office jurisdiction. The discussion of information from the North Central Coast, San Francisco Bay, and Central Coast areas are organized by HUCs. A few HUCs in these areas contain one river system, but most contain several small systems.

1. North Coast Area

The North Coast Area (NCA) includes many 4$^{th}$ Field HUCs, however, for this analysis only the Eel River is discussed because it is the only HUC within the action area. Forestry is the dominant land use within the NCA. Species within the NCA analyzed in this BO include SONCC coho salmon and NC steelhead.

*a. Eel River*

Fishery data indicate depressed or declining abundance trends, yet observational data indicate natural populations still persist in the Eel River, albeit at lower levels than were observed historically. Historic land and water management, specifically large-scale timber extraction and water diversion projects, contributed to a loss of habitat diversity within the mainstem Eel River and many of its tributaries. The Eel River has been listed under section 303(d) of the Clean Water Act as water quality limited due to sediment and water temperature problems (CSWRCB 2003). Essential habitat feature limitations include high water temperatures, low instream cover levels, high sediment levels, and low LWD abundance.

Water diversion within the Eel River basin has occurred since the early 1900s at the Potter Valley facilities. Roughly 160,000 acre feet (219 cubic feet per second [cfs] average) are diverted at Cape Horn Dam, through a screened diversion, to the Russian River basin annually. Flow releases from the Potter Valley facilities have both reduced the quantity of water in the mainstem Eel River, particularly during summer and fall low-flow periods, as well as dampened the within-year and between-year flow variability that is representative of unimpaired watersheds. These conditions have restricted juvenile salmonid rearing habitat, impeded migration of adult fish and late emigrating smolts, and provided ideal low-flow, warm water conditions for predatory Sacramento pikeminnow (*Ptychocheilus grandis*) (NMFS 2002).

2. North Central Coast Area

The North Central Coast area includes all coastal California streams entering the Pacific Ocean in Mendocino, Sonoma, and Marin counties, excluding streams draining into San Francisco and San Pablo bays. The North Central Coast Area includes portions of three ESUs/DPSs (CCC coho salmon, NC steelhead, and CCC steelhead) and five USGS 4$^{th}$ field HUCs (Big-Navarro-Garcia, Bodega Bay, Gualala-Salmon, Russian, and Tomales-Drakes Bay). Forestry is the dominant land-use throughout the northern part of this area (north of the Russian River). Agriculture and urbanization are more predominant in the Russian River and areas south.

*a. Big, Navarro, and Garcia River*

This HUC includes all coastal watersheds from Jackass Creek south to, but not including, the Gualala River. This HUC is wholly within Mendocino County and includes most of the coastal streams in the county. There are several medium-sized watersheds present within the HUC: Garcia River, Navarro River, Albion River, Big River, Noyo River, and Ten Mile River. The HUC also includes many smaller watersheds draining directly to the Pacific Ocean. The urban development within the HUC is limited primarily to coastal towns on the estuaries of the larger streams, though there are some small towns in other areas of the HUC. In the larger basins within this HUC, private forest lands average about 75 percent of the total acreage (65 FR 36074). Forestry is the dominant land use activity and in some subwatersheds significant portions, up to 100 percent, have been harvested (CRWQCB 2001). Excessive sedimentation, low LWD abundance and recruitment, and elevated water temperature are issues throughout the HUC; these issues are likely attributable to forestry activities. Agriculture has likely contributed to depressed conditions within the Navarro River watershed, and gravel mining may affect salmonids in the Ten Mile and Garcia River watersheds. The effects of land use activities are exacerbated by natural erosive geology, poorly consolidated sediments, the mountainous and rugged terrain, and large recent storms (1964, 1982). Estuaries throughout the HUC have likely decreased in size due to sedimentation. All of the larger watersheds within this HUC are included on the 2002 Clean Water Act section 303(d) list of water quality limited segments (CSWRCB 2003); only the Albion, Big, Noyo, and Ten Mile rivers have approved Total Maximum Daily Load (TMDL) (www.epa.gov).

This HUC is within the CCC coho salmon and NC steelhead DPSs. Salmonid abundance has declined throughout the HUC. Steelhead are widespread yet reduced in abundance, and coho salmon have a patchy distribution with populations significantly reduced from historic levels (Weitkamp *et al.* 1995, Busby *et al.* 1996, CRWQCB 2001). Increased sedimentation and low LWD recruitment have affected spawning gravels and pool formation throughout the HUC, and are likely limiting production of salmonids (CRWQCB 2001).

*b. Gualala-Salmon River*

This HUC includes the entire Gualala River watershed and all coastal watersheds between the Gualala River watershed and the Russian River watershed. The Gualala River is the only large watershed within the HUC, though there are several small coastal watersheds. There is limited urban development within the HUC. Within the Gualala River watershed, private forest lands make up about 94 percent of the total acreage, and forestry is the dominant land use of the watershed (65 FR 36074). Agriculture has been a significant land use within the Gualala River watershed; historically orchards and grazing were the dominant agricultural activities, though more recently vineyard development has become more common within the basin (CRWQCB 2001). Gravel mining is a historic activity. Gravel extraction is currently limited to 40,000 tons per year, though extractions in the past 10 years have not reached that limit (CRWQCB 2001). The Gualala River is included on the 2002 Clean Water Act section 303(d) list of water quality limited segments (CSWRCB 2003). The pollution factors for the Gualala River are sedimentation and temperature; forestry, agriculture, and land development are listed as the potential sources for those factors. Recently, a TMDL for sedimentation was approved for the Gualala River (www.epa.gov).

This HUC contains CCC coho salmon and NC steelhead. Higgins *et al.* (1992) considered coho salmon from the Gualala River as being at a high risk of extinction. The CDFG (2002) has concluded that the Gualala River contains no known remaining viable coho salmon populations. Three small coastal watersheds within this HUC and outside the Gualala River watershed, historically contained coho salmon: Fort Ross Creek, Russian Gulch, and Scotty Creek (Brown and Moyle 1991, Hassler *et al.* 1991). However, coho salmon have not been observed in any of these watersheds in recent years (CDFG 2002). Steelhead, while widespread throughout the Gualala River, are at low abundance (CRWQCB 2001).

*c. Russian River*

This HUC contains the entire Russian River basin and no other watersheds. Portions of the HUC are in Sonoma and Mendocino counties. There is significant urban development within this HUC centered on the Highway 101 corridor, though there are small towns and rural residences throughout the HUC. Santa Rosa is the largest city within the HUC. Forestry and agriculture are other significant land uses within the HUC, and there are some in-channel gravel mining operations. Brown and Moyle (1991) reported that logging and mining in combination with naturally erosive geology have led to significant aggradation of up to 10 feet in some areas of Austin Creek - a lower Russian River tributary. NMFS' status reviews (Weitkamp *et al.* 1995, Busby *et al.* 1996, Myers *et al.* 1998) identified two large dams within the Russian River which block access to anadromous fish habitat: Coyote Valley Dam and Warm Springs Dam. Steiner Environmental Consulting (SEC) (1996) cite unpublished data from CSWRCB (California State Water Resources Control Board) which state that there are over 500 small dams on the Russian River and its tributaries. These dams have a variety of functions including residential, commercial, and agricultural water supply, flood and/or debris control, and recreation. These small dams interfere with fish migration, affect sediment transport, and affect water flow and temperature.

The Corps (1982) concluded that the loss of tributary habitat was the primary factor limiting the recovery of the anadromous fishery in the Russian River. The Russian River is included on the 2002 Clean Water Act section 303(d) list of water quality limited segments (CSWRCB 2003). The pollution factors for the Russian River are sedimentation, temperature, and pathogens. Forestry, agriculture, dams with flow regulation, urban and land development, and nonpoint sources are listed as the potential sources for these factors. Lake Sonoma, a reservoir impounded by Warm Springs Dam, is included on the section 303(d) list because of elevated levels of mercury associated with historic mining. Currently, there is no approved TMDL for the Russian River watershed (www.epa.gov).

Many releases of in-basin and out-of-basin coho salmon and steelhead occurred throughout the Russian River since the late 1800s (Weitkamp *et al.* 1995, Busby *et al.* 1996, Myers *et al.* 1998, NMFS 1999b). For the last 20 years, the Don Clausen Fish Hatchery operated at Warm Springs Dam and released coho salmon, Chinook salmon, and steelhead into the Russian River watershed. However, significant changes in hatchery operations began in 1998, in which the production of coho salmon and Chinook salmon was discontinued. Traditional production of steelhead continues at Don Clausen Fish Hatchery.

This HUC is within the CCC coho salmon ESU and CCC steelhead DPS. The CDFG (2002) reported that recent monitoring data indicate that widespread extirpation of coho salmon has occurred within the Russian River basin. In 2001, a conservation hatchery program was developed for coho salmon at the Don Clausen Fish Hatchery. Juvenile coho salmon from the program have been released for reintroduction into several historical coho salmon Russian River tributaries annually beginning in Fall 2004 (Jeffrey Jahn, NMFS, personal communication, 2004). The Russian River has the highest steelhead productivity within the CCC steelhead DPS (62 FR 43937), and are found throughout the Russian River basin, though at reduced abundance (Busby *et al.* 1996).

*d. Bodega Bay*

This HUC contains all of the coastal watersheds from the Estero de San Antonio north to the mouth of the Russian River. There are three moderate-sized watersheds within the HUC (Salmon Creek, Americano Creek, and Stemple Creek) and few small coastal watersheds directly tributary to the Pacific Ocean. The Salmon Creek watershed is wholly within Sonoma County, whereas the Americano Creek and Stemple Creek watersheds are in both Sonoma and Marin counties. There is limited urban development within the HUC; agriculture is the dominant land use within all of the watersheds within this HUC, with dairy farming being the chief activity. There are some forest lands in the headwaters of Salmon Creek. A large winter storm in 1982 exacerbated the impact of land use activities and natural erosive geology of Salmon Creek (Brown and Moyle 1991) and negatively affected rearing habitat quality and quantity. Americano Creek and Stemple Creek and their estuaries are included on the 2002 Clean Water Act section 303(d) list of water quality limited segments (CSWRCB 2003). The pollution factors for these streams are sedimentation, nutrients, and temperature; diazinon is listed as a pollutant in Estero de San Antonio. Agriculture and land development are listed as the potential sources for those factors. There are no approved TMDLs in this HUC (www.epa.gov). Many of the streams lack riparian cover, causing increased water temperatures.

This HUC is within the CCC coho salmon ESU and CCC steelhead DPS. The distribution and abundance of salmonids within the HUC are highly reduced. Within this HUC coho salmon have been found from two watersheds: Salmon Creek and Valley Ford Creek (Brown and Moyle 1991, Hassler *et al.* 1991, Weitkamp *et al.* 1995). NMFS found no historical coho salmon collections from watersheds of this HUC between Valley Ford Creek and Tomales Bay. Currently, coho salmon are likely extirpated from the HUC (Adams 1999, CDFG 2002). The watersheds of this HUC historically contained steelhead. Steelhead are found throughout Salmon Creek, but the status of steelhead distribution in tributary streams is unknown. Steelhead are likely extirpated from San Antonio Creek and Americano Creek (B. Cox, CDFG, personal communication, 2004).

*e. Tomales-Drakes Bay*

This HUC includes all watersheds draining into the Pacific Ocean from Rodeo Cove north to Tomales Bay. The entire HUC is in Marin County, with the exception of a small portion of the headwaters of Walker Creek, which is in Sonoma County. Most of the watersheds in this HUC are small with the exception of Walker Creek and Lagunitas Creek, both tributaries of Tomales Bay, a prominent artifact of the San Andreas Rift Zone. Urban development within the HUC ranges from single homes to small towns and municipal complexes. Although urbanization has been limited, flood control activities, contaminated runoff from paved lots and roads, and seepage from improperly designed and/or maintained septic systems, continue to impact habitat and water quality in portions of the watershed (B. Ketcham, National Park Service, personal communication, 2003). Recreation is a significant factor in land use within the HUC as there are county, state, and Federal parks within the HUC. Agriculture is a dominant land-use, particularly in the northern half of the HUC, and forestry was a historic land use activity within the HUC. Lagunitas Creek, Walker Creek, and Tomales Bay are included on the 2002 Clean Water Act section 303(d) list of water quality limited segments (CSWRCB 2003); nutrients, pathogens, and sedimentation are the factors and are attributed to agriculture and urban runoff or storm sewers. Mercury, associated with mining, is an additional factor for Walker Creek and Tomales Bay. No TMDLs have been developed for waterbodies within the HUC (www.epa.gov). The construction of Kent Reservoir and Nicasio Reservoir cut off 50 percent of the historical salmonid habitat within the Lagunitas Creek watershed; and construction of two large reservoirs within the Walker Creek watershed, Laguna Lake, and Soulejoule Reservoir, cut off access to significant amounts of habitat (Weitkamp *et al.* 1995, Busby *et al.* 1996, Myers *et al.* 1998, CDFG 2002).

Anecdotal evidence of a once thriving coho salmon and steelhead run in Walker Creek exists. Sedimentation has had a profound effect on fish habitat in Walker Creek. Many of the deep, cool pools and gravel that salmonids depend on for spawning and rearing, have been filled in with fine sediment.

This HUC is within the CCC coho salmon ESU and CCC steelhead DPS. With the exception of Lagunitas Creek, the abundance of coho salmon is very low throughout the HUC. Lagunitas Creek may have the largest populations of coho salmon remaining in the CCC coho salmon ESU. Although Lagunitas Creek is presumed to have a relatively stable and healthy population of coho salmon, at least when compared with other CCC coho salmon streams, NMFS (2001) noted that this stream has experienced a recent reduction in coho salmon population. Small persistent populations of coho salmon are in Pine Gulch Creek and Redwood Creek. Coho salmon were last observed in Walker Creek in 1981. In 2003, CDFG stocked adult coho salmon, from Olema Creek (a Lagunitas Creek tributary) stock, into Walker Creek in hopes of reestablishing a run of coho salmon.

Elevated stream temperatures are also a concern within many watersheds throughout the HUC. Summer water temperatures are usually below lethal thresholds for salmonids, but can be high enough to retard growth. It was reported that juvenile salmonids in Lagunitas Creek did not show appreciable growth during the summer of 1984, and it is believed that this lack of growth was due to the relatively high summer water temperatures that occurred during this time (Bratovich and Kelly 1988). More recently, the National Park Service has documented water temperatures well over the preferred range for salmonids in Olema Creek and one of its tributaries (B. Ketcham, National Park Service, personal communication, 2003).

3. San Francisco Bay Area

The San Francisco Bay Area encompasses the region between the Golden Gate Bridge and the confluence of the San Joaquin and Sacramento rivers. All of the watersheds in this area drain into either San Francisco Bay, San Pablo Bay, or Suisun Bay at Chipps Island. Watersheds within this area are in portions of several counties: Marin, Sonoma, Napa, Solano, Contra Costa, Alameda, San Mateo, and San Francisco. This area contains four 4$^{th}$ Field HUCs: San Pablo Bay, Suisun Bay, San Francisco Bay, and Coyote. Anthropogenic factors affecting listed salmonids in these HUCs are related primarily to urbanization, though agriculture is another prevalent land use in the San Pablo Bay and Suisun HUCs. Urban development is extensive within this area and has negatively affected the quality and quantity of salmonid habitat. Human population within the San Francisco Bay Area is approximately six million, representing the fourth most populous metropolitan area in the United States, and continued growth is expected (www.census.gov). In the past 150 years, the diking and filling of tidal marshes has decreased the surface area of the greater San Francisco Bay by 37 percent. More than 500,000 acres of the estuary's historic tidal wetlands have been converted for farm, salt pond, and urban uses (San Francisco Estuary Project 1992). These changes have diminished tidal marsh habitat, increased pollutant loadings to the estuary, and degraded shoreline habitat due to the installation of docks, shipping wharves, marinas, and miles of rock riprap for erosion protection. Most tributary streams have lost habitat through channelization, riparian vegetation removal, water development, and reduced water quality. Dams blocking anadromy are present on many streams and are used for water supply, aquifer recharge, or recreational activities. Streams have been affected by surface water diversion and groundwater withdrawal. Channelization for flood control, roadway construction, and commercial/residential development have further affected the quality and quantity of available salmonid habitat. Most watersheds within this area are listed under the 2002 Clean Water Act section 303(d) list of impaired water bodies for high levels of diazinon, reflecting the impacts of urbanization. Agricultural and industrial chemicals and by-products are other factors limiting water quality throughout the area (CSWRCB 2003). There are no approved TMDLs for this HUC (www.epa.gov). These human induced changes have substantially degraded natural productivity, biodiversity, and ecological integrity in streams throughout the area.

The area provides a critical link in the migratory pathway between the ocean and freshwater habitat in the Central Valley for three listed salmonid ESUs/DPSs;[11] Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, and Central Valley steelhead. CCC steelhead occur in tributary streams around the Bay Area. CCC steelhead also utilize the bay for migration and possibly rearing.

*a. San Pablo Bay Tributaries*

This HUC contains all of the watersheds draining into San Pablo Bay located east of the Golden Gate Bridge, north of the San Francisco-Oakland Bay Bridge, and west of the Carquinez Bridge. This HUC contains several small to medium-sized watersheds within portions of six counties: Marin, Sonoma, Napa, Solano, Contra Costa, and San Francisco. Agriculture has been a significant land use within the San Pablo Bay HUC; historically orcharding, dairy, and grazing were the dominant agricultural activities, though more recently vineyard development has become common within the HUC. Agricultural practices have resulted in numerous small dams and water diversions that alter streamflows and water temperature conditions. Also, agricultural practices have likely altered sedimentation rates of streams. Urbanization is the dominant land use throughout this HUC and has affected habitat through flood control activities, urban runoff, and water development. The following streams are included on the 2002 Clean Water Act section 303(d) list of impaired water bodies for high levels of diazinon, which can likely be attributed to urban runoff; Arroyo Corte Madera del Presidio, Corte Madera Creek, Coyote Creek, Napa River, Novato Creek, Petaluma River, Pinole Creek, Rodeo Creek, San Antonio Creek, San Pablo Creek, Sonoma Creek, and Wildcat Creek (CSWRCB 2003). In addition, Napa River, Petaluma River, Sonoma Creek are included on the section 303(d) list for nutrients, pathogens, and sedimentation related to agriculture, land development, and urban runoff. The lower Petaluma River has exceeded the California Toxic Rule and National Toxic Rule criteria for nickel; potential sources of nickel are municipal point source, urban runoff, and atmospheric deposition.

Presently, CCC steelhead occur in Arroyo Corte Madera del Presido, Corte Madera Creek, Napa River, Sonoma Creek, Petaluma River, Novato Creek, and Pinole Creek. Environmental conditions in the upper portions of Arroyo Corte Madera del Presido, Corte Madera Creek, and Pinole Creek watersheds are protected in parks or open space preserves.

*b. Suisun Bay Tributaries*

This HUC includes all of the watersheds draining into Suisun Bay located east of the Carquinez Bridge and west of the confluence of the San Joaquin and Sacramento rivers. This HUC contains several small to medium-sized watersheds within Solano and Contra Costa counties. Urbanization, farming, cattle grazing, and vineyard development have all contributed to habitat degradation in streams in the northern portion of the HUC. Urbanization and industrial

[11]These ESUs/DPS' are not included in this opinion since restoration activities will occur in non-tidal areas and these ESUs/DPS' are not found within tributaries within the San Francisco Bay Area.

development have contributed to habitat degradation in the southern portion of the HUC. Laurel Creek, Ledgewood Creek, Mt. Diablo Creek, Pine Creek, and Walnut Creek are included on the 2002 Clean Water Act section 303(d) list of impaired water bodies for high levels of diazinon attributable to urban runoff (CSWRCB 2003).

Suisun Creek, Green Valley Creek, and an unnamed tributary to Cordelia Slough currently support small populations of CCC steelhead; these streams are all in Solano County. Streams flowing north from eastern Contra Costa County into south Suisun Bay are generally characterized by very dry summer conditions, and these streams do not currently support steelhead.

*c. San Francisco Bay Tributaries*

This HUC includes all of the watersheds draining into San Francisco Bay south of the San Francisco-Oakland Bay Bridge and north of the Dumbarton Bridge. This HUC contains several small to medium-sized watersheds within Alameda and Contra Costa counties and contains the largest watershed draining into San Francisco Bay - Alameda Creek. Urbanization and industrial development are the predominant land use throughout the HUC; most watersheds within the HUC have severely degraded habitat. The following streams are included on the 2002 Clean Water Act section 303(d) list of impaired water bodies for high levels of diazinon attributable to urban runoff: Alameda Creek, Alamitos Creek, Arroyo de la Laguna, Arroyo del Valle, Arroyo las Positas, Arroyo Mocho, Miller Creek, San Leandro Creek, San Lorenzo Creek, and San Mateo Creek (CSWRCB 2003). Islais Creek and Mission Creek in San Francisco are particularly polluted, and both are included on the 2002 Clean Water Act section 303(d) list of impaired water bodies for factors related to industrial point sources and combined sewer overflow. These streams are included on the list because of high levels of ammonia, chlordane, chlorpyrifos, chromium, copper, dieldren, endosulfan sulfate, hydrogen sulfide, lead, mercury, mirex, PAHs, PCBs, silver, and zinc (CSWRCB 2003). Alameda Creek, Mt. Diablo Creek, San Leandro Creek, San Lorenzo Creek, and Walnut Creek historically supported steelhead, but access is currently blocked by dams, flood control facilities, or other barriers. Habitat conditions in the lower reaches of these streams are highly degraded by urbanization, but large portions of the upper watersheds located within public park land are protected from anthropogenic pollution and are generally in relatively good condition. Currently, small populations of CCC steelhead are found in Cordinices Creek, San Leandro Creek, and San Lorenzo Creek below dams.

*d. South San Francisco Bay Tributaries*

This HUC includes the watersheds draining into San Francisco Bay south of the Dumbarton Bridge. This HUC contains all of the watersheds within Santa Clara County, and a few small watersheds from San Mateo and Alameda counties. Coyote Creek is the largest watershed within the HUC. Urbanization and industrial development are the predominant land uses throughout the HUC and are the primary factors affecting aquatic habitat. The following streams from this HUC are included on the 2002 Clean Water Act section 303(d) list of impaired water bodies for high levels of diazinon attributable to urban runoff: Calabazas Creek, Coyote Creek, Guadalupe Creek, Guadalupe River, Los Gatos Creek, Matadero Creek, San Felipe Creek, San Francisquito Creek, Saratoga Creek, and Stevens Creek (CSWRCB 2003). Calero Reservoir, Guadalupe Reservoir, and Guadalupe River are included on the section 303(d) list because of elevated levels of mercury associated with historic surface mining and associated tailings, and San Francisquito Creek is included because of excess sedimentation from nonpoint sources (CSWRCB 2003). Flood control and water development have degraded habitat throughout the HUC and numerous road crossings impair fish passage. In the Guadalupe River watershed, groundwater recharge operations release water imported from the Sacramento-San Joaquin Delta into local stream channels. On Coyote Creek, gravel mining has resulted in large in-channel pools that are populated with non-native predatory bass (*Micropterus* spp.).

Reduced numbers of CCC steelhead occur in few watersheds of this HUC: Coyote Creek, Guadalupe River, San Francisquito Creek, and Stevens Creek. Anadromy is blocked in each watershed by water supply reservoirs; however, small populations of CCC steelhead continue to persist downstream. Built in 1890, Searsville Dam on San Francisquito Creek blocks access to a major portion of the upper watershed including a large tributary, Corte Madera Creek. Three San Francisquito Creek tributaries downstream of Searsville Dam, Los Trancos, West Union, and Bear creeks, all currently support steelhead populations.

4. <u>Central Coast Area</u>

The Central Coast Area encompasses the coastal area from San Francisco County south along the California coast to the southern extent of San Luis Obispo County. This area includes the following seven counties: San Francisco, San Mateo, Santa Cruz, Santa Clara, Monterey, San Benito, and San Luis Obispo. Metropolitan areas within the Central Coast Area include San Francisco, Pacifica, Half Moon Bay, Santa Cruz, the Monterey Peninsula, Hollister, Gilroy, Salinas, and San Luis Obispo. The Central Coast Area includes watersheds that flow into the Pacific Ocean which support the following three ESUs/DPSs: CCC coho salmon, CCC steelhead and S-CCC steelhead, and includes their designated critical habitats.

In general, available stream flow decreases from north to south within the Central Coast Area. In addition to highly urbanized areas, portions of the Central Coast Area are experiencing low density rural residential development. The majority of the Central Coast Area is privately owned, though there are portions under public ownership including Open Space in San Mateo County, State parklands in Santa Cruz County, and Federal lands in southern Monterey County.

The Central Coast Area contains eight $4^{th}$ Field HUCs: San Francisco Coastal South, San Lorenzo-Soquel, Pajaro, Alisal-Elkhorn Sloughs, Salinas, Estrella, Carmel, and Central Coastal. Anthropogenic factors affecting listed salmonids in these HUCs include dams constructed for water storage and aquifer recharge, summer dams constructed for recreational activities, urbanization, surface water diversion and groundwater withdrawal, in-channel sediment extraction, agriculture, flood control projects, and logging. It is unknown what surface water diversions are screened. Agriculture has had the greatest impact on the Pajaro and Salinas HUCs, while logging and urbanization have had the greatest impact on the San Lorenzo-Soquel HUC.

*a. San Francisco Coastal South*

This HUC contains all of the coastal watersheds from the Golden Gate Strait south to approximately the San Mateo/Santa Cruz county line. The watersheds within this HUC are wholly within San Mateo County. There are seven moderate-sized watersheds within the HUC: Pilarcitos Creek, Arroyo Leon, Purisima Creek, Tunitas Creek, San Gregorio Creek, San Pedro Creek, Pescadero Creek, and Butano Creek. There is limited urban development within this HUC; agriculture (*e.g.*, brussel sprouts and cattle) is the dominant land use within all of the watersheds. There are several State Parks and Open Space areas within this HUC. Butano Creek, San Gregorio Creek, Pomponio Creek, and Pescadero Creek are included on the 2002 Clean Water Act section 303(d) list of water quality limited segments (CSWRCB 2003). The pollution factors for these streams are high coliform count and sedimentation/siltation. The potential sources of these pollutants are nonpoint sources. There are no approved TMDLs within this HUC.

This HUC is within the CCC coho salmon ESU and CCC steelhead DPS. Long-term data on the abundance of coho salmon in this HUC are limited. Historical records document the presence of coho salmon in Butano Creek, Pescadero Creek, and San Gregorio Creek, though coho salmon have not been found during recent stream surveys (NMFS 2001). Only Peters Creek has historical records documenting the presence of coho salmon as well as recent documentation. Five or fewer juvenile coho salmon were observed in Peters Creek in 1999, but no juveniles were observed during surveys conducted in 2000 (NMFS 2001). Steelhead are widely distributed throughout this HUC. Steelhead were once abundant in the San Gregorio Creek watershed but are believed to be at critically low levels (NMFS 1999c). Pescadero Creek supports the most viable steelhead population in this HUC (Titus *et al.* 2002).

*b. San Lorenzo-Soquel*

This HUC begins approximately at the San Mateo/Santa Cruz county line in the north, containing Arroyo de los Frijoles in southern San Mateo County, south to and including Valencia Creek in Santa Cruz County. The HUC extends eastward to the Santa Cruz/Santa Clara county line. There are several moderate-sized streams within this HUC, including Gazos Creek, Carbonera Creek, Waddell Creek, Laguna Creek, Bear Creek, Bean Creek, Branciforte Creek, and Soquel Creek. The San Lorenzo River is the largest river in the HUC and the largest between the two closest major river systems - the Russian River in Sonoma County to the north and the Salinas River to the south. There is a fair amount of urban development within the HUC. Several State Parks (*e.g.*, Big Basin, Henry Cowell Redwoods, The Forest of Nisene Marks) are located within this HUC. Forestry operations are conducted on private timberlands and State forest in this HUC, including Big Creek Lumber Company and the Soquel Demonstration State Forest, respectively.

Aptos Creek, Bean Creek, Bear Creek, Boulder Creek, Branciforte Creek, Carbonera Creek, East Branch Waddell Creek, Fall Creek, Kings Creek, San Lorenzo River, San Lorenzo River Lagoon, Soquel Lagoon, Valencia Creek, and Zayante Creek are included on the 2002 Clean Water Act section 303(d) list of water quality limited segments (CSWRCB 2003). The pollutants in these streams are varied, including, but not limited to, pathogens, nutrients, and sedimentation/siltation. The potential sources of these pollutants are also varied. Nonpoint source, urban runoff, and road construction are just a few of the potential sources.

This HUC is within the CCC coho salmon ESU, including designated critical habitat south to, and including, the San Lorenzo River and CCC steelhead DPS, including critical habitat south to, and including Aptos Creek. Long-term data on the abundance of coho salmon in this HUC are limited. Historical records document the presence of coho salmon in Waddell Creek, East Branch Waddell Creek, Scott Creek, Big Creek, San Vicente Creek, San Lorenzo River, Hare Creek, Soquel Creek, and Aptos Creek. Records of adult spawners and outmigrating smolts from Waddell Creek between 1932 and 1942 (Shapovalov and Taft 1954) constitute the only historical record of abundance in this HUC (NMFS 2001). The San Lorenzo River represents the southern extent of designated critical habitat for CCC coho salmon although they were historically documented at least as far south as Aptos Creek. Alteration of stream flow (due to in-channel stream flow diversions and pumping via wells for domestic use) and excessive sedimentation are two primary factors affecting CCC steelhead and CCC coho salmon critical habitat in the San Lorenzo River. Rearing juvenile coho salmon were observed in 2005 in the San Lorenzo River for the first time since 1982. Coho salmon are still found in Scott and Waddell Creeks and were rediscovered in San Vicente Creek in 2002 and observed for the first time in Laguna Creek in 2005. Steelhead are widely distributed throughout this HUC. Gazos, Waddell, and Scott Creeks are in relatively good condition, overall, for CCC steelhead.

*c. Pajaro*

This HUC is comprised of the Pajaro River and its tributaries and is located in portions of Santa Cruz, Santa Clara, Monterey, and San Benito counties. Moderate-sized tributaries to the Pajaro River include Corralitos Creek, Uvas Creek, Llagas Creek, Pacheco Creek, and Santa Ana Creek. The San Benito River is also a tributary to the Pajaro River. This HUC encompasses several municipalities, including the cities of Watsonville, Gilroy, Morgan Hill, and Hollister. Agriculture is the dominant land use within all of the watersheds in this HUC. Clear Creek, Corralitos Creek, Hernandez Reservoir, Llagas Creek, Tequisquita Slough, and Watsonville Slough are included on the 2002 Clean Water Act section 303(d) list of water quality limited segments (CSWRCB 2003). The pollutants in these streams are varied, including, but not limited to, mercury, fecal coliform, and sedimentation/siltation. The potential sources of these pollutants are also varied. Nonpoint source, resource extraction (*e.g.*, via in-channel gravel mining), and pasture grazing are just a few of the potential sources. The Pajaro River is also included on the 2002 Clean Water Act section 303(d) list of water quality limited segments (CSWRCB 2003). The Pajaro River contains the following pollutants: fecal coliform, nutrients, and sedimentation/siltation. Agriculture and pasture grazing are two potential sources of the pollutants.

The Pajaro HUC is within the S-CCC steelhead DPS and designated critical habitat. The distribution and abundance of steelhead within this HUC are significantly reduced. The majority of the streams where steelhead are known to be present, are located in the northwest portion of the HUC (*e.g.*, Uvas, Llagas, Corralitos, and Pachecho creeks). The mainstem Pajaro River once contained suitable spawning and rearing habitat for S-CCC steelhead, but currently functions solely as a migratory corridor because of impacts from flood control projects, agriculture, and water withdrawals for agricultural use.

The San Benito River has been adversely impacted by water withdrawals for agricultural use and in-channel sediment extraction. Steelhead have not been documented in the San Benito River since the mid-1990s, although no formal surveys have been undertaken. However, *O. mykiss* were documented in Bird Creek (San Benito River tributary) adjacent to Hollister Hills State Park in 2003. The San Benito River is also on the 2002 Clean Water Act section 303(d) list of water quality limited segments (CSWRCB 2003) due to fecal coliform and sedimentation/siltation. The source of fecal coliform is unknown; agriculture, resource extraction, and nonpoint source have been identified as potential sources of this pollutant.

*d. Alisal-Elkhorn Sloughs*

The Alisal-Elkhorn Slough HUC encompasses watersheds between the Pajaro and Salinas rivers. This HUC has little permanent flowing water. S-CCC steelhead have been observed in the headwaters of Gabilan Creek, which contains the best freshwater habitat remaining in the HUC. The HUC features mixed oak woodlands and grasslands on rolling hills overlooking tidal salt marsh. Elkhorn Slough is a principal wetland complex in central California, and is considered one of the most ecologically important estuaries in the state and is part of the National Estuarine Research Reserve System. Land use within this HUC is primarily agriculture, though there is some urban/rural development present. Habitat within the HUC has been degraded. Portions of both nominal watersheds within this HUC are included on the 2002 Clean Water Act section 303(d) list of water quality limited segments (CSWRCB 2003). Alisal Slough and Gabilan Creek are included for high levels of fecal coliform and nitrates attributable to agriculture, urban runoff, natural sources, nonpoint sources, and unknown sources. Elkhorn Slough has high levels of pathogens, pesticides, and sedimentation from agricultural and nonpoint sources. There are no approved TMDLs for this watershed.

*e. Salinas*

The Salinas HUC is the largest in the Central Coast Area and contains the largest individual watershed within the Central Coast Area, the Salinas River. This HUC lies within interior Monterey and San Luis Obispo counties, as well as a portion of San Benito County. In addition to the Salinas River, there are three other large rivers in this HUC: the Arroyo Seco River, the San Antonio River, and the Nacimiento River. There are isolated areas of urban development, including Salinas, King City, and Paso Robles. Outside of these urban developments, agriculture is the dominant land use. Portions of the Los Padres National Forest, Ventana Wilderness, Fort Hunter Liggett, and Camp Roberts Military Reservation lie within this HUC. Several water bodies, including, but not limited to, Atascadero Creek, Blanco Drain, Cholame Creek, and the Nacimiento Reservoir, are on the 2002 Clean Water Act section 303(d) list of water quality limited segments (CSWRCB 2003) due to a variety of pollutants from several sources. The Salinas River is also on the 2002 Clean Water Act section 303(d) list of water quality limited segments (CSWRCB 2003) due to fecal coliform, nutrients, pesticides, chloride, and other pollutants derived from a variety of sources, principally agriculture.

The Salinas HUC is within the S-CCC steelhead DPS. The distribution and abundance of steelhead within the HUC are greatly reduced. The Salinas River is used as a migration corridor by S-CCC steelhead. Two of the largest tributaries, the San Antonio and Nacimiento rivers, have been dammed, eliminating steelhead access to valuable spawning and rearing habitat and severely modifying stream flow. These dams, along with an additional dam on the upper mainstem, in-channel sediment extraction, channel modification and water withdrawals for agricultural use, have impacted the Salinas River. The Arroyo Seco River contains the best spawning and rearing habitat for S-CCC steelhead in this HUC. A number of partial passage barriers affect steelhead access to habitat.

*f. Estrella*

This HUC is comprised of the Estrella River and its tributaries. Streams within the HUC include Little Chalome Creek, Cholame Creek, Navajo Creek, Sixteen Spring, and San Juan Creek (CWP 2006). Only one creek in this HUC, Cholame Creek, is listed on the 2002 Clean Water Act section 303(d) list of water quality limited segments. It is listed as impaired for boron and fecal coliform (CSWRCB 2003). S-CCC steelhead use of this HUC is believed to be extremely limited due to infrequent and inadequate winter flow regimes in the HUC and the mainstem Salinas River. Critical habitat of S-CCC steelhead was not designated for the Estrella River HUC. Historic occurrences of steelhead were documented by Franklin (2001), however, it is unknown if steelhead persist in within this HUC.

*f. Carmel*

This HUC is comprised of the Carmel River and its tributaries. Moderate-sized streams within the HUC include Las Gazas Creek, Chupines Creek, and Tularcitos Creek. None of the streams within this HUC are on the 2002 Clean Water Act section 303(d) list of water quality limited segments. There is urban development within the Monterey Peninsula and limited rural residential development elsewhere. Portions of the Los Padres National Forest lie within this HUC. The Carmel River presently maintains the largest adult run of steelhead in the S-CCC DPS (Titus *et al.* 2002) and is designated critical habitat. Impacts to S-CCC steelhead include three dams on the mainstem which hinder migration, water withdrawals for domestic use, agricultural, and golf course use, and channel modifications for flood control purposes.

*g. Central Coastal*

This long and narrow HUC contains all of the coastal watersheds from San Jose Creek near Point Lobos State Reserve in Monterey County[12] down to the San Luis Obispo/Monterey County border. Most of the streams in this HUC are short-run and high-gradient, draining directly to the Pacific Ocean. Moderate-sized streams within this HUC include the Little Sur River and the Big Sur River. This HUC is within the S-CCC steelhead DPS and is designated critical habitat. This Central Coastal HUC has experienced the least amount of adverse impacts within the Central Coast Area. The Little Sur River is recognized as the most productive steelhead river (per

---

[12] The entire HUC extends down to Arroyo Grande Creek in San Luis Obispo County. The Santa Rosa field office's jurisdiction extends down to the Monterey/San Luis Obispo County border for this coastal HUC. Therefore, the analysis does not include portions of this HUC within San Luis Obispo County.

stream mile) south of San Francisco Bay at this time (Titus *et al.* 2002). The Big Sur River is in relatively good condition as well, but anadromy is limited due to natural barriers.

## V. EFFECTS OF THE PROPOSED ACTION

The purpose of this section is to analyze the direct and indirect effects of the action and those of interrelated and interdependent actions on the listed ESUs/DPSs and/or on designated critical habitat. This biological opinion does not rely on the regulatory definition of "destruction or adverse modification" of critical habitat at 50 CFR §402.2. Instead, we have relied upon the statutory provisions of the ESA to complete the following analysis with respect to critical habitat.

NMFS is unaware of any specific interrelated or interdependent actions associated with the proposed action. The species (coho salmon, steelhead), ESUs/DPSs (SONCC coho salmon, CCC coho salmon, NC steelhead, CCC steelhead, and S-CCC steelhead) and their designated critical habitats that may be present and/or affected will vary depending on the location of each individual habitat restoration project site. For example, some sites may occur in rivers and streams that have both coho salmon and steelhead, while other sites may be located in streams where only steelhead are present.

Data to quantitatively determine the precise effects of the proposed action on coho salmon, steelhead, and their habitats are limited or unavailable; this assessment of effects, therefore, focuses mostly on qualitative assessment, except where data are available. This approach was based on a review of ecological literature concerning the effects of loss and alteration of habitat elements important to salmonids, including water, substrate, food, and adjacent riparian areas; the primary constituent elements of critical habitat that will be affected. This information was then compared to the likely effects associated with the proposed restoration project types, including: diversion of stream flow, changes to habitat diversity and complexity, loss of water quality (sediment and turbidity), loss of fish passage, and harm during capture, transport, and release.

Individual restoration projects authorized through the ten-year period that require instream activities will be implemented annually sometime during the summer low-flow period typically between June 15 and October 15. The proposed action is ambiguous on when the instream construction season begins. NMFS analyzed an instream construction season beginning on June 15 and ending on November 1 (due to the fact many project proponents request time extensions in order to complete their projects). The specific timing and duration of each individual restoration project will vary depending on the project type, specific project methods, and site conditions. However, the duration and magnitude of direct effects to listed salmonids and to salmonid critical habitat associated with implementation of individual restoration projects will be significantly minimized due to the multiple minimization measures utilized during implementation.

Implementing individual restoration projects during the summer low-flow period will avoid emigrating coho salmon and/or steelhead smolts and will avoid immigrating coho salmon and/or steelhead adults at all habitat restoration project sites. However, rearing juvenile coho salmon and steelhead may be present during project implementation. NMFS anticipates that a small number of juvenile coho salmon and/or steelhead may be within the action area for each individual restoration project work site. Most restoration activities will focus on improving areas of poor instream habitat, where large numbers of juvenile salmonids are not expected to be present due to poor habitat conditions. The small number of juvenile salmonids expected at these sites is confirmed by data provided by Collins (2004) who reviewed three years (2001-2003) of CDFG restoration projects and necessary relocation efforts associated with those projects.

A maximum of 50 projects would be implemented each year with a limit of three projects occurring in any one watershed per year (using California Interagency Watershed Map of 1999, CalWater 2.2.1) in order to minimize adverse impacts resulting from construction activities. It is estimated a maximum of 500 projects will occur over the ten-year life of this Program. Fifty projects per year translates into a maximum impact to 20,000 linear feet (lf) or 3.87 miles (50 project/yr * 400 ft/project) of anadromous fish bearing stream per year. Over the lifetime of the Program, 500 projects translates into a maximum impact to 200,000 lf or 37.88 miles (500 projects/10years * 400 ft/project) of anadromous fish bearing streams. A minimum of 1200 feet will separate restoration projects in order to further minimize adverse additive effects, such as temporary sedimentation and turbidity generated by instream construction.

**A. Dewatering**

NMFS anticipates the following project activities authorized through the proposed action may require dewatering: instream habitat improvements (Part VII, CDFG Manual), instream barrier modification for fish passage improvement (including ladders) (Part VII, CDFG Manual), stream bank stabilization (Part VII, CDFG Manual), fish passage improvements at stream crossings (Part IX, CDFG Manual and NMFS Crossing Guidelines), fish screen projects (Appendix S, CDFG Manual and NMFS Screening Guidelines), maintenance of existing ladders, and removal of concrete abutments and spillways for summer dams.

Effects associated with dewatering activities will be minimized due to the multiple minimization measures that will be utilized as described in Appendix 1 of this BO. Changes in flow are anticipated to occur within and downstream of project sites during dewatering activities. These fluctuations in flow are anticipated to be small, gradual, and short-term which should not result in any harm to salmonids. Stream flow in the vicinity of each project site should be the same as free-flowing conditions except during dewatering and at the dewatered reach where stream flow is bypassed.

Stream flow diversion and project work area dewatering are expected to cause temporary loss, alteration, and reduction of aquatic habitat. NMFS anticipates that only a small reach of stream at each project site will be dewatered for in channel construction activities. The amount of stream subject to dewatering will be no more than 300 ft for any one project site. Stream flow diversions could harm individual rearing juvenile coho salmon and steelhead by concentrating or stranding them in residual wetted areas (Cushman 1985), or causing them to move to adjacent areas of poor habitat (Clothier 1953, Clothier 1954, Kraft 1972, Campbell and Scott 1984). Rearing juvenile coho salmon and steelhead could be killed or injured if crushed during diversion activities, though direct mortality is expected to be minimal due to relocation efforts prior to installation of the diversion.

During dewatering, a qualified fisheries biologist will remain at the project work site to net and rescue any additional fish that may have become stranded throughout the dewatering process. Juvenile coho salmon and steelhead that avoid capture in the project work area will die during dewatering activities. NMFS expects that the number of juvenile coho salmon and/or steelhead that will be killed as a result of stranding during site dewatering activities is low; likely lower than those lost during relocation efforts. This is based on the spatial distribution of those projects, the small area affected during dewatering at each site, and the low numbers of juvenile salmonids expected to be present within each project site due to relocation activities and degraded habitat. Dewatering of instream project work areas may also cause short-term increases in turbidity levels as discussed in section C below.

Benthic (*i.e.*, bottom dwelling) aquatic macroinvertebrates may be temporarily lost or their abundance reduced when creek habitat is dewatered (Cushman 1985). Effects to aquatic macroinvertebrates resulting from stream flow diversions and dewatering will be temporary because construction activities will be relatively short-lived, and rapid recolonization (about one to two months) of disturbed areas by macroinvertebrates (Cushman 1985, Thomas 1985, Harvey 1986) is expected following rewatering. In addition, the effect of macroinvertebrate loss on juvenile coho salmon and/or steelhead is likely to be negligible because food from upstream sources (via drift) would be available downstream of the dewatered areas since stream flows will be maintained around the project work site. Based on the foregoing, the loss of aquatic macroinvertebrates as a result of dewatering activities is not expected to adversely affect coho salmon and steelhead.

**B. Fish Relocation Activities**

The Program's instream restoration projects in perennial stream channels require fish relocation activities prior to dewatering the project work site. Project personnel will capture and relocate fish away from the restoration project work site to avoid direct mortality and minimize the impact of take of listed juvenile salmonids. Fish in the immediate project area will be captured by seine, dip net and/or by electrofishing, and will then be transported and released to a suitable instream location. Effects associated with fish relocation activities will be significantly minimized due to the multiple minimization measures that will be utilized as described in the section entitled, *Measures to Minimize Injury and Mortality of Fish and Amphibian Species during Dewatering* within Part IX of the CDFG Manual and Appendix 1 of this BO.

Data to quantify the amount of fish relocated prior to implementation of each individual restoration project are not available. However, data and information based on two years of fish relocation activities associated with habitat restoration projects authorized through the previous Corps' RGP for CDFG-funded fish restoration projects, indicate only a small percentage (14 to 19 percent) of the total annual projects required fish relocation and dewatering activities annually (Collins 2004).

Fish relocation activities do pose risk of injury or mortality to rearing juvenile coho salmon and steelhead. Any fish collecting gear, whether passive or active (Hayes 1983) has some associated risk to fish, including stress, disease transmission, injury, or death. The amount of unintentional injury and mortality attributable to fish capture varies widely depending on the method used, the ambient conditions, and the expertise and experience of the field crew. The effects of seining and dipnetting on juvenile salmonids include stress, scale loss, physical damage, suffocation, and desiccation. Electrofishing can kill juvenile salmonids, and researchers have found serious sublethal effects including spinal injuries (Reynolds 1983, Habera *et al.* 1996, Habera *et al.* 1999, Nielsen 1998, Nordwall 1999). The long-term effects of electrofishing on salmonids are not well understood. Although chronic effects may occur, it is assumed that most impacts from electrofishing occur at the time of sampling. Since fish relocation activities will be conducted by designated qualified fisheries biologist with a minimum of three years experience following both CDFG and NMFS electrofishing guidelines, direct effects to and mortality of juvenile coho salmon and/or steelhead during capture will be minimized.

Most unintentional mortalities of coho salmon and/or steelhead during fish relocation activities will occur almost exclusively at the YOY stage, although there is a potential of unintentional mortality of a one or two year old steelhead. Data from two years (2002, 2003) of fish relocation activities in Humboldt County (California) associated with habitat restoration projects authorized under the previous Corps' 1998 RGP for CDFG-funded restoration projects, indicate mortality rates associated with individual fish relocation sites are below three percent and the mean mortality rates for all sites are below one percent (Collins 2004). In 2002, mortality rates of juvenile steelhead ranged from zero to 2.1 percent with a mean mortality rate of 0.6 percent (Collins 2004). In 2003, mortality rates of juvenile steelhead ranged from zero to 1.4 percent with a mean mortality rate of 0.2 percent (Collins 2004).

Although sites selected for relocating fish should have similar water temperature as the capture site and should have ample habitat, in some instances relocated fish may endure short-term stress from crowding at the relocation sites. Relocated fish may also have to compete with other salmonids causing increased competition for available resources such as food and habitat. Some of the fish at the relocation sites may choose not to remain in these areas and may move either upstream or downstream to areas that have more habitats and less density of fish. As each fish moves, competition remains either localized to a small area or quickly diminishes as fish disperse. NMFS cannot accurately estimate the number of fish affected by competition, but does not believe this impact will cascade through the watershed populations of these species based on the small area that will likely be affected.

### C. Increased Mobilization of Sediment within the Stream Channel

NMFS anticipates that the following restoration project activities authorized through the proposed action will increase turbidity and suspended sediment levels within the project work site and downstream areas: instream habitat improvements (Part VII, CDFG Manual), instream barrier modification for fish passage improvement (Part VII, CDFG Manual), stream bank stabilization (Part VII, CDFG Manual), fish passage improvements at stream crossings (Part IX, CDFG Manual and NMFS Crossing Guidelines), upslope watershed restoration (Part X, CDFG Manual), dewatering the project work area, maintenance of existing ladders, and removal of concrete abutments and spillways for summer dams. Other restoration project activities, such as riparian restoration (Part XI, CDFG Manual) and fish screen projects (Appendix S, CDFG Manual and NMFS Screening Guidelines), are not expected to release appreciable sediment into the aquatic environment.

Restoration activities may cause temporary increases in turbidity and alter channel dynamics and stability (Habersack and Nachtnebel 1995, Hilderbrand *et al.* 1997, Powell 1997, Hilderbrand *et al.* 1998). However, any increase in sediment and turbidity levels resulting from individual restoration activities authorized through the proposed action is expected to be minor due to the small work footprint of most projects, which makes the mobilization of large volumes of project-related sediment unlikely. Furthermore, instream sediment effects will be further minimized due to the multiple minimization measures that will be utilized in Appendix 1 of this BO.

Accumulated sediment loads behind summer dams can, in some circumstances, be substantial. Releasing large sediment loads can be detrimental to salmonids and their habitats by reducing instream spawning and rearing habitats. To minimize the potential of large sediment releases the Program will limit coverage to summer dams with $\leq$400 cubic yards of accumulated sediment behind dam sills. While properly designed projects implemented in conjunction with the minimization measures identified above will effectively minimize most potential sediment impacts, some minor short-term effects to fish behavior may still occur on certain projects. In general, sediment related impacts are expected during the summer construction season, as well as during peak-flow winter storm events when any remaining project-related sediment may be mobilized.

Sediment may affect stream fish by a variety of mechanisms. High concentrations of suspended sediment can disrupt normal feeding behavior (Berg and Northcote 1985), reduce growth rates (Crouse *et al.* 1981), and increase plasma cortisol levels (Servizi and Martens 1992). Increased sediment deposition can fill pools and reduce the amount of cover available to fish, decreasing the survival of juveniles (Alexander and Hansen 1986). Excessive fine sediment can interfere with development and emergence of salmonids (review by Chapman 1988). High levels of fine sediment in streambeds can also reduce the abundance of food for juvenile salmonids (*e.g.*, Cordone and Kelly 1961, Bjornn *et al.* 1977).

Short-term increases in turbidity are anticipated to occur during dewatering activities and/or during construction of a cofferdam. Research with salmonids has shown that high turbidity concentrations can reduce feeding efficiency, decrease food availability, reduce dissolved oxygen in the water column, result in reduced respiratory functions, reduce tolerance to diseases, and can also cause fish mortality (Berg and Northcote 1985, Gregory and Northcote 1993, Velagic 1995, Waters 1995). Mortality of very young coho salmon and steelhead fry due to increased turbidity has been reported by Sigler *et al.* (1984). Even small pulses of turbid water will cause salmonids to disperse from established territories (Waters 1995), which can displace fish into less suitable habitat and/or increase competition and predation, decreasing chances of survival. Nevertheless, much of the research mentioned above focused on turbidity levels significantly higher than those likely to result from the proposed action.

Research investigating the effects of sediment concentration on stream fish density has routinely focused on high sediment levels. For example, Alexander and Hansen (1986) measured a 50 percent reduction in brook trout (*Salvelinus fontinalis*) density in a Michigan stream after manually increasing the sand sediment load by a factor of four. In a similar study, Bjornn *et al.* (1977) observed salmonid density in an Idaho stream declined faster than available pool volume after the addition of 34.5 $m^3$ of fine sediment into a 165 m study section. Both studies attributed reduced fish densities to a loss of rearing habitat caused by increased sediment deposition. However, streams subject to infrequent episodes adding small volumes of sediment to the channel may not experience dramatic morphological changes (Rogers 2000).

Similarly, research investigating physiological stress from suspended sediment has also focused on concentrations higher than those typically found in streams subjected to minor/moderate sediment input (reviewed by Newcombe and MacDonald (1991) and Bozek and Young (1994)). Redding *et al.* (1987) observed a temporary increase in plasma cortisol concentration in both steelhead and coho salmon following exposure to high concentrations (2 - 4 gallons per liter) of suspended solids. In contrast, the lower concentrations of sediment and turbidity expected from the proposed restoration activities are unlikely to be severe enough to cause similar physiological changes in listed juvenile coho salmon and/or steelhead. However, small pulses of moderately turbid water can cause salmonids to disperse from established territories, potentially displacing affected fish into poor habitat and increasing the likelihood of interspecific and intraspecific competition as well as predation. NMFS expects behavioral effects such as these to be the most likely results from implementation of the proposed action.

Based on the effects described above, NMFS anticipates rearing juvenile coho salmon and/or steelhead downstream of restoration project sites may be temporarily adversely affected by short-term increases in suspended sediment caused during cofferdam construction and dewatering. These pulses of turbidity may cause juvenile coho salmon and/or steelhead to move downstream to avoid the turbidity temporarily vacating preferred habitat areas and/or temporarily reducing their feeding efficiency. Since most restoration activities will focus on improving areas of poor instream habitat, NMFS expects the number of fish inhabiting individual project areas during these periods of increased sediment input, and thus directly affected by construction activities, to be relatively small.

Furthermore, many rivers within the action area naturally carry high loads of sediment during winter storm events. North coast rivers have some of the highest sediment discharge volumes versus watershed area within the United States (as referenced in Kelsey 1977). Recent monitoring of newly replaced culverts in Humboldt County generally detailed minor increases in turbidity following winter storm events. Turbidity rates were approximately 16 percent greater downstream of new culverts (*i.e.*, replaced the previous summer), with 9 of the14 projects reflecting a turbidity increase of less than 10 percent. Of the 14 culverts monitored, only two culverts exhibited turbidity levels greater than the 25 nephelometric turbidity units (NTU) threshold commonly cited in literature as beginning to cause minor behavioral changes (Henley *et al.* 2000); however, both values still fell short of turbidity levels necessary to injure or kill. Considering the likely short duration of project-related turbidity effects, NMFS believes the small volume of additional sediment released through restoration activities, when compared to the high background turbidity already present during high winter flows, will likely have a negligible effect on the short-term survival and recovery of listed salmonids living in each individual project area.

Restoration practices outlined within the CDFG Manual are, for the most part, intended to fix chronic watershed problems that are presently, and will likely continue, degrading valuable aquatic habitat. Inherent within these practices is the potential that certain activities (*e.g.*, culvert replacement, road decommissioning, and bank stabilization) will minimally increase background suspended sediment loads for a short period following project completion. NMFS anticipates the potential increase in background sediment levels resulting from restoration activities will be lower than levels common to the research outlined above, and is, therefore, unlikely have a measurable effect on the health and survival of listed salmonids. Recent research in northern California (Del Norte County) streams failed to show significant differences in salmonid density and summer-time growth between control streams and streams affected by moderate levels of turbidity (Rogers 2000). Another recent study in northern California (Mendocino County) within the action area conducted during the summer low-flow period in 2003, compared control streams and streams affected by short-term high levels of turbidity (USFS 2004). Although the levels of short-term turbidity were higher than those anticipated to result from construction activities associated with individual restoration projects, the results suggest short-term changes to water quality caused a redistribution of juvenile coho salmon and steelhead but had little effect on their growth and abundance (USFS 2004).

Additionally, the limits (including temporal, numeric, and spatial scales as described above) at which project activities are restricted, will likely preclude significant additive sediment-related effects at the 4th field HUC scale. Sediment effects generated by each individual project will likely impact only the immediate footprint of the project location and may expose a small percentage of listed salmonids within the anticipated distance of 100 feet downstream to increased turbidity and sedimentation, with effects diminishing further downstream of the project. Also, effects to instream habitat and fish are only expected to be short-term, since most project-related sediment will likely mobilize during the initial high flow event the following winter season. In summary, any minor sediment input resulting from habitat restoration activities is not anticipated to appreciably affect the survival, reproduction, or distribution of listed salmonids within, or downstream of, each individual project area.

**D. Toxic Chemicals**

Equipment refueling, fluid leakage, and maintenance activities within and near the stream channel pose some risk of contamination and potential take. In addition to toxic chemicals associated with construction equipment, water that comes into contact with wet cement during construction of a restoration project can also adversely affect water quality and cause harm and potential take of listed salmonids. However, the multiple measures in Appendix 1 of this BO address and minimize this risk. Therefore, NMFS does not anticipate any localized or appreciable water quality degradation from toxic chemicals associated with the habitat restoration projects.

## E. Additional Effects and Benefits of Each Project Type

Misguided restoration efforts often fail to produce the intended benefits and can even result in further habitat degradation. Improperly constructed projects typically cause greater adverse effects than the pre-existing condition. The most common reason for this is improper identification of the design flow for the existing channel conditions. The CDFG Manual, NMFS Screening Guidelines, and NMFS Crossing Guidelines provide design guidance and construction techniques that facilitate proper design and construction of restoration projects. Properly constructed stream restoration projects will increase available habitat, access to available habitat, habitat complexity, and will stabilize channels and streambanks, increase spawning gravels, decrease sedimentation, and increase shade and cover for salmonids.

Habitat restoration projects authorized through the proposed action will be designed and implemented consistent with the techniques and minimization measures presented in the CDFG Manual, NMFS Screening Guidelines, and NMFS Crossing Guidelines to maximize the benefits of each project while minimizing effects to salmonids. More complex restoration projects covered in the CDFG Manual (*e.g.*, fish ladders) as well as summer dam abutment and apron removal will require NMFS/CDFG engineer/fish passage specialist oversight on an individual project basis. In the case of summer dam removal, evaluation by a qualified geomorphologist will also be required. All of the restoration projects are for the purpose of restoring degraded salmonid habitat and are intended to improve instream cover, pool habitat, and spawning gravels; screen diversions; remove barriers to fish passage; and reduce or eliminate erosion and sedimentation impacts. Although some habitat restoration projects may cause mild short-term effects to listed salmonids, all of these projects are anticipated to improve salmonid habitat and salmonid survival over the long-term.

### 1. <u>Instream Habitat Improvements</u>

Depending upon the individual project, properly installed instream habitat structures and improvement projects could provide predator escape and resting cover, increase spawning habitat, improve upstream and downstream migration corridors, improve pool to riffle ratios, and add habitat complexity and diversity. Some structures will be designed to reduce sedimentation, protect unstable banks, stabilize existing slides, provide shade, and create scour pools.

To evaluate the effectiveness and condition of completed projects, CDFG has evaluated restoration projects completed between 2001-2003. In a recent annual evaluation (2002/2003), the majority of instream habitat improvement projects were rated as either excellent (84 percent) or good (12 percent) for their integrity (Collins 2003). Although the majority of instream habitat improvement projects were rated as either excellent (57 percent) or good (12 percent) for their function, 25 percent were rated as fair, and 6 percent were rated as either poor or no value (Collins 2003).

For placement of root wads, digger logs, upsurge weirs, boulder weirs, vortex boulder weirs, boulder clusters, and boulder wing-deflectors (single and opposing), long-term beneficial effects are expected to result from the creation of scour pools that will provide rearing habitat for juvenile coho salmon and steelhead. Improper use of weir and wing-deflector structures can cause accelerated erosion on the opposing bank, however, this can be avoided with proper design considerations. Proper placement of single and opposing log wing-deflectors and divide logs, will provide long-term beneficial effects from the creation or enhancement of pools for summer rearing habitat and cover for adult salmonids during spawning. Proper placement of digger logs will likely create scour pools that will provide complex rearing habitat, with overhead cover, for juvenile salmonids and low velocity resting areas for migrating adult salmonids. Spawning gravel augmentation will provide long-term beneficial effects by increasing spawning gravel availability while reducing inter-gravel fine sediment concentrations.

Also, for projects that also have stream bank erosion concerns, the various weir structures and wing-deflector structures direct flow away from unstable banks and provide armor (a hard point) to protect the toe of the slope from further erosion. Boulder faces in the deflector structures have the added benefit of providing invertebrate habitat, and space between boulders provides juvenile salmonid escape cover.

2. Instream Barrier Modification for Fish Passage Improvement

Instream barrier modification for fish passage improvement projects will improve salmonid fish passage and increase access to suitable salmonid habitat. Long-term beneficial effects are expected to result from these projects by improving passage at sites that are partial barriers, or by providing passage at sites that are total barriers. Both instances will provide better fish passage and will increase access to available habitat.

3. Stream Bank Stabilization

Stream bank stabilization projects will reduce sedimentation from watershed and bank erosion, decreasing turbidity levels, and improving water quality for salmonids over the long-term.

4. Fish Passage Improvement

Thousands of dilapidated stream crossings exist on roadways and other obstructions throughout the coastal drainages of northern and central California, many preventing listed salmonids from accessing vast expanses of historic spawning and rearing habitat located upstream of the structure. In recent years, much attention has been focused on analyzing fish passage at stream crossings through understanding the relationship between culvert hydraulics and fish behavior (including juvenile movement) (Six Rivers National Forest Watershed Interaction Team 1999). Low water crossings, which can act as significant barriers to migration, are particularly prevalent in the more southern 4$^{th}$ Field HUCs (J. Ambrose, personal observation, 2000-2006).

Most juvenile coho salmon spend approximately one year in freshwater before migrating to the ocean, while juvenile steelhead may rear in freshwater for up to four years prior to emigration. Thus, juveniles of both species are highly dependent on stream habitat. Juvenile salmonids often migrate relatively long distances (*i.e.*, several kilometers) in response to: 1) changes in their environment (*e.g.*, summer warming, pollution events), 2) changes in resource needs as they grow, and 3) competition with other individuals. The movements of stream-dwelling salmonids have been the subject of extensive research (Chapman 1962, Edmundson *et al.* 1968, Fausch and

White 1986, Gowan *et al.* 1994, Bell 2001, Kahler *et al.* 2001). Although many juvenile salmonids are territorial or exhibit limited movement, many undergo extensive migrations (Gowan *et al.* 1994, Fausch and Young 1995).

Reestablishing the linkages between mainstem migratory habitat and headwater spawning/rearing habitat will greatly facilitate the recovery of salmonids throughout the action area. Reintroducing listed salmonids into previously unavailable upstream habitat will also likely increase reproductive success and ultimately fish population size in watersheds where the amount of quality freshwater habitat is a limiting factor.

5. Riparian Habitat Restoration

Stream riparian zones include the area of living and dead vegetative material adjacent to a stream. They extend from the edge of the ordinary high water mark of the wetted channel, upland to a point where the zone ceases to have an influence on the stream channel. Riparian zones help provide hydraulic diversity to the stream channel, add structural complexity, buffer runoff energy from storm events, moderate water temperatures through shading, protect water quality, and provide a source of food and nutrients. Riparian zones are especially important as a LWD source for streams. LWD creates stream habitat complexity critical to anadromous species survival by forming and maintaining pool structures in streams. Pools provide refuge from predators and high-flow events for juvenile salmonids, especially coho salmon and steelhead that rear for extended periods in freshwater.

Riparian habitat restoration techniques as outlined within the CDFG Manual, are not likely to adversely affect listed salmonids or their habitat in any of the 4th field HUCs described in the *Environmental Baseline*. All planting or removal (in the case of exotic species) of vegetation will likely occur on streambanks and floodplains adjacent to the wetted channel and not in flowing water. Since the majority of work will occur during the summer growing season (a few container plants require winter planting), riparian plantings should be sufficiently established prior to the following winter storm season. Thus, project-related erosion following the initial planting season is unlikely since established plants will help anchor the restoration worksite. The long-term benefit from riparian restoration will be the rebirth of a vibrant, functional riparian corridor providing juvenile and adult fish with abundant food and cover. By restoring degraded riparian systems throughout the state, listed salmonids will be more likely to survive and recover in the future.

Riparian restoration projects will improve shade and cover, protecting rearing juveniles, reducing stream temperatures, and improving water quality through pollutant filtering. Beneficial effects of constructing livestock exclusionary fencing in or near streams include the rapid regrowth of grasses, shrubs, and other vegetation released from overgrazing and the reduction of excessive nitrogen, phosphorous, and sediment loads in the streams (Line *et al.* 2000, Brenner and Brenner 1998). Another documented, beneficial, long-term effect is the reduction in bankfull width of the active channel and the subsequent increase in pool area in streams (Magilligan and McDowell 1997). All will contribute to a more properly functioning ecosystem for listed species by providing additional spawning and cover habitat.

6. Upslope Watershed Restoration

Upslope watershed restoration projects will stabilize potential upslope sediment sources, which will reduce excessive delivery of sediment to anadromous salmonid streams. Some of these projects will reduce the potential for catastrophic erosion and delivery of large amounts of sediment to stream channels. Road improvement projects will reduce sediment delivery to streams in the long-term. Road decommissioning projects should be even more beneficial than road improvement projects in that all or nearly all of the hydrologic and sediment regime effects of the roads would be removed. Long-term beneficial effects will result from these activities including rehabilitation of hydrologic functions, reduced risk of washouts and landslides, and reduction of sediment delivery to streams. In the long-term, these projects will tend to rehabilitate substrate habitat by reducing the risk of sediment delivery to streams and restore fish passage by correcting fish barriers caused by roads. Road decommissioning projects will also tend to rehabilitate impaired watershed hydrology by reducing peak flows resulting from rapid concentrated runoff and reducing the drainage network.

7. Fish Screens

Water diversions can greatly affect aquatic life when organisms are sucked into intake canals or pipes -- an estimated 10 million juvenile salmonids were lost annually through unscreened diversions in the Sacramento River alone (Upper Sacramento River Fisheries and Riparian Habitat Advisory Council 1989). Once entrained, juvenile fish can be transported to less favorable habitat (*e.g.*, a reservoir, lake or drainage ditch) or killed instantly by turbines. Fish screens are commonly used to prevent entrainment of juvenile fish in water diverted for agriculture, power generation, or domestic use. In general, screening projects do not introduce sufficient sediment into the aquatic environment to alter downstream habitat or degrade water quality. The most likely effect resulting from screening projects will be harassment during fish relocation activities, since the majority of project sites will have to be dewatered prior to work commencing. Also, captured fish are sometimes relocated in areas with lower habitat quality, potentially altering essential behavior, and increasing predation risk in the short-term. In seasonal/intermittent stream reaches common to areas south of Monterey Bay, California, screening projects are not anticipated to affect listed salmonids if all work is performed while the channel is naturally dry (*i.e.*, during summer no-flow conditions).

Fish screens substantially decrease juvenile fish loss in stream reaches where surface flow is regularly diverted out of channel. Surface diversions vary widely in size and purpose, from small gravity-fed diversion canals supplying agricultural water to large hydraulic pumping systems common to municipal water or power production. All screening projects have similar goals, most notably preventing fish entrainment into intake canals and impingement against the mesh screen. To accomplish this, all screening projects covered by this opinion will strictly follow guidelines drafted by CDFG (Appendix S of the CDFG Manual) and NMFS Screen Guidelines which outline screen design, construction and placement, as well as designing and implementing successful juvenile bypass systems that return screened fish back to the stream channel.

Between 2000 and 2003, the majority of fish screening projects that were authorized through the Corps' 1998 RGP for CDFG-funded restoration projects occurred within watersheds dominated by agricultural usage. Fish screen projects will reduce the risk for fish being entrained or sucked into irrigation systems. Well-designed fish screens and associated diversions ensure that fish injury or stranding is minimized, and fish are able to migrate through stream systems at the normal time of year.

8. Summer Dam Removal

Summer dams are on-stream impoundments constructed primarily for recreational and aesthetic purposes on mainstem rivers and their tributaries and, until recently, were relatively common in many watersheds in the action area. The dam operators ranged from large municipalities to small private landowners who typically impounded water between early summer through early fall. The two most common types of dams are gravel push up dams and flashboard dams with pre-existing concrete abutments and spillways.

Summer dams can adversely affect salmonids. Salmonids require cool, clear, running water to support their freshwater life history stages (Bjornn and Reiser 1991). Incubating salmonid eggs require clean gravel substrates. Juvenile fish typically rear in free-flowing streams providing a complex of alternating shallow, swift riffles and low-velocity pools with abundant cover in the form of woody debris, boulders, and undercut banks. Summer dams convert such natural stream habitats to artificial ponds that may extend a few hundred feet up to several thousand yards in length. The precise length of a summer pond is dependent upon both the height of the dam and the stream's gradient.

Most summer dam owners and operators can no longer obtain the necessary permits to install their facilities and therefore, the number of dams has been significantly reduced. However, the infrastructure for flashboard dams remain and their spillways, aprons, and abutments often pose substantial barriers to adult migration and juvenile movement. Removal of this summer dam infrastructure will benefit salmonids by removing these impediments to migration and instream movement.

9. Fish Ladders/Fishway Maintenance

Throughout the action area there are numerous existing fish ladders/fishways that facilitate salmonid access over partial and complete migration barrier. Most of these ladders were installed prior to the listing of coho salmon and steelhead and therefore do not have incidental take authorization for some necessary maintenance actions. Often ladders become clogged with sediment, urban debris, and wood to the point that fish passage is partially or completely blocked and therefore, the intended benefits of the ladder are not realized. The presence of juveniles in fish ladders/fishways often precludes their maintenance, particularly when dewatering is required to remove accumulated sediment. Facilitating maintenance under this Program will help ensure that existing fish ladders/fishways can function according to their original design specifications and facilitate access to spawning and rearing habitats.

## F. Interdependent and Interrelated Actions

NMFS does not anticipate any interdependent or interrelated actions associated with the proposed action.

# VI. CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area considered in this opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA. Other than the impacts of on-going activities described above in the Environmental Baseline section, NMFS is unaware of future State (except as described below), tribal, local, or private actions reasonably certain to occur that will affect the action area.

# VII. INTEGRATION AND SYNTHESIS OF EFFECTS

Coho salmon populations throughout the action area have shown a dramatic decrease in both numbers and distribution; SONCC coho salmon and CCC coho salmon do not occupy many of the streams where they were found historically. Although SONCC coho salmon are within the action area relatively more abundant and better distributed than CCC coho salmon, both the presence-absence and trend data available suggest that the SONCC coho salmon numbers in the Eel River continue to decline. The information available suggests that CCC coho salmon abundance is very low, the ESU is not able to produce enough offspring to maintain itself (population growth rates are negative), and populations have experienced range constriction, fragmentation, and a loss of genetic diversity. Many subpopulations that may have acted to support the species' overall numbers and geographic distribution have likely been extirpated (*i.e.*, Russian, San Francisco Bay Area, Napa HUCs). The poor condition of their habitat in many areas and the compromised genetic integrity of some stocks pose a serious risk to the survival and recovery of SONCC coho salmon and CCC coho salmon. Based on the above information, recent status reviews have concluded that SONCC coho salmon are "likely to become endangered in the foreseeable future," and CCC coho salmon are "presently in danger of extinction."

Steelhead populations throughout central and northern California have also shown a decrease in abundance, but are still widely distributed in most coastal DPSs. However, S-CCC steelhead are not evenly distributed throughout the DPS. Distribution of S-CCC steelhead within many watersheds across the DPS is very patchy, with better distribution in the coastal basins (*e.g.*, Carmel and Central Coast HUCs) and poor distribution in the interior basins (*e.g.*, Pajaro and Salinas River HUCs). Although NC steelhead, CCC steelhead, and S-CCC steelhead have experienced significant declines in abundance, and long-term population trends suggest a negative growth rate, they have maintained a better distribution overall when compared to coho salmon ESUs. This suggests that, while there are significant threats to the population, they possess a resilience (based in part, on a more flexible life history) that likely slows their decline.

However, the poor condition of their habitat in many areas and the compromised genetic integrity of some stocks pose a risk to the survival and recovery of NC steelhead, CCC steelhead, and S-CCC steelhead. Based on the above information, recent status reviews and available information indicate NC steelhead, CCC steelhead, and S-CCC steelhead are "likely to become endangered in the foreseeable future."

Currently accessible salmonid habitat throughout the action area has been severely degraded, and the condition of designated critical habitats, specifically its ability to provide for their long-term conservation, has also been degraded from conditions known to support viable salmonid populations. Logging (in the more northern HUC's), agricultural (particularly in the Russian River, Napa, Pajaro, and Salinas HUCs) and mining activities (Russian, Pajaro and Tomales Bay HUCs), urbanization (*i.e*, the four San Francisco Bay Area HUCs), stream channelization (*i.e.*, Pajaro and the four San Francisco Bay Area HUCs), dams (*i.e.*, Russian, Carmel, Salinas, Pajaro HUCs), wetland loss (*i.e.*, San Lorenzo-Aptos HUC), and water withdrawals (*i.e.*, Salinas and Carmel HUCs), and unscreened diversions for irrigation have been identified as causes contributing to the modification and curtailment of salmonid habitat in central and northern California. Impacts of concern include alteration of stream bank and channel morphology, alteration of water temperatures, loss of spawning and rearing habitat, fragmentation of habitat, loss of downstream recruitment of spawning gravels and LWD, degradation of water quality, removal of riparian vegetation resulting in increased stream bank erosion, increases in erosion entry to streams from upland areas, loss of shade (higher water temperatures), and loss of nutrient inputs (61 FR 56138).

Although projects authorized through the Program are for the purpose of restoring anadromous salmonid habitat, adverse effects to listed salmonids and critical habitats are expected. Adverse effects to listed salmonids at these sites are primarily expected to be in the form of short-term behavioral effects with a minimal amount of mortality. Salmonids present during the implementation of restoration projects may be disturbed, displaced, injured or killed by project activities, and salmonids present in some project work areas will be subject to capture, relocation, and related stresses. Anticipated mortality rates from relocation activities, as reported by Collins (2004), are expected to be as low as 0.6 percent of fish relocated. Few, if any fish, are expected to remain in construction areas after relocation efforts.

The number of fish injured or killed during relocation or construction is not expected to have a detectable effect on the overall individual stream populations of salmonids. This is because only a small portion of an ESU/DPS's entire juvenile population will be exposed to electrofishing over the Program's ten year period and only a very small portion of those salmonids electrofished will be injured or killed. An even smaller portion of an ESU/DPS's juvenile population will be injured or killed during dewatering and construction activities. It is unlikely that the loss of a few juveniles from each watershed each year will impact future adult returns. Due to the relatively large number of juveniles produced by each spawning pair, salmon and steelhead spawning in these watersheds in future years are likely to produce enough juveniles to replace the one that may be lost during relocation and dewatering. In addition, NMFS expects the improvements to habitat conditions resulting from the Program will likely increase juvenile salmonid production in many of these streams in future years (see below).

Habitat restoration projects authorized through this consultation will be designed and implemented consistent with techniques and minimization measures presented in the Appendix 1 and the project description, NMFS/CDFG's guidelines of salmonid passage at stream crossings, NMFS' electrofishing guidelines, and NMFS' Screening Guidelines in order to maximize the benefits of each project while minimizing adverse effects to salmonids. All of the restoration projects are intended to restore degraded salmonid habitat and improve instream cover, pool habitat, and spawning gravel; screen diversions; remove barriers to fish passage; and reduce or eliminate erosion and sedimentation impacts. Although there will be short-term impacts to salmonid habitat, including critical habitats, associated with a small percentage of projects implemented annually, NMFS anticipates most projects will provide long-term improvements to salmonid habitat. NMFS also anticipates that the additive beneficial effects to salmonid habitat over the ten-year period of the proposed action should improve local instream salmonid habitat conditions for multiple life stages of salmonids and should improve survival of local populations of salmonids into the future.

Therefore, the effects of individual restoration projects and their combined effects are not likely to appreciably reduce the numbers, distribution, or abundance of SONCC coho salmon, CCC coho salmon, NC steelhead, CCC steelhead or S-CCC steelhead; and are not likely to diminish the value of designated critical habitat for these species and CC Chinook salmon.

## VIII. CONCLUSION

After reviewing the best available scientific and commercial information, the current status of SONCC coho salmon, CCC coho salmon, NC steelhead, CCC steelhead, and S-CCC steelhead, the environmental baseline for the action area, the effects of the proposed projects, and the cumulative effects, it is NMFS' opinion that the proposed Program is not likely to jeopardize the continued existence of SONCC coho salmon, CCC coho salmon, NC steelhead, CCC steelhead, and S-CCC steelhead.

After reviewing the best available scientific and commercial information, the current status and value of salmonid critical habitat, the environmental baseline for the action area, the effects of the proposed project, and the cumulative effects, it is NMFS opinion that the proposed Program is not likely to destroy or adversely modify designated critical habitat for SONCC coho salmon, CCC coho salmon, NC steelhead, CCC steelhead, S-CCC steelhead, and CC Chinook salmon.

## IX. INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and Federal regulation pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by NMFS as an act which actually kills or injures fish or wildlife. Such an act may 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. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not the purpose of the agency action is not considered to be prohibited taking under the ESA provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are nondiscretionary, and must be undertaken by the Corps so that they become binding conditions of any grant or permit issued to individual project applicant for the exemption in section 7(o)(2) to apply. The Corps and NOAA RC have a continuing duty to regulate the activity covered by this incidental take statement. If the Corps and/or NOAA RC (1) fails to assume and implement the terms and conditions or (2) fails to require individual project applicants to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the Corps or NOAA RC must report the progress of the action and its impact on the species to NMFS as specified in the incidental take statement (50 CFR §402.14(i)(3)).

### A. Amount or Extent of Take

The number of ESA-listed salmonids that may be incidentally taken during implementation of Program restoration projects is anticipated to be small but cannot be accurately quantified because: 1) the specific number of fish that may be present is unknown; and 2) the specific number of restoration projects that will result in incidental take of listed salmonids is unknown (but likely much less than 50 per year). Therefore, take is quantified as: (1) all fish located in project areas where dewatering and fish relocation is necessary to implement a restoration project, (2) three projects per watershed per year, (3) 300 feet of dewatering per project, (4) a 1,200 ft buffer between projects, and (5) 500 projects over the life of the program.

Take will mostly be in the form of capturing and relocating fish. A small percentage (less than three percent) of fish captured will be harmed or killed by relocation efforts. A small percentage (less than three percent) of fish in these areas will avoid capture and die during dewatering and construction. NMFS does not anticipate fish will be taken from accidental chemical spills or temporary elevated levels of turbidity.

### B. Effect of the Take

In the accompanying biological opinion, NMFS determined this level of anticipated take is not likely to result in jeopardy to the species.

### C. Reasonable and Prudent Measures

NMFS believes the following reasonable and prudent measures are necessary and appropriate to minimize take of SONCC coho salmon, CCC coho salmon, NC steelhead, CCC steelhead and/or S-CCC steelhead:

1. Project sites shall be monitored by a qualified fisheries biologist during construction to prevent adverse and unforeseen effects to listed salmonids.

2. A monitoring report shall be provided to NMFS following the completion of construction.

3. A spill prevention plan shall be in place prior to construction.

4. Project proponents shall review and incorporate the minimization and avoidance measures, as proposed by the Corps and/or NOAA RC, prior to final project design submittal and construction.

5. Construction of new fish ladders, including step pools, Denil, and Alaskan step-pass ladders, should be considered as a last resort when evaluating improvements to salmonid passage.

6. Restoration projects shall not result in the introduction of anadromous salmonids into non-native habitats.

7. Sediment minimization measures shall apply to LWD placement actions.

8. Additional permit conditions may be added by the NOAA RC.

## D. Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the ESA, the Corps and the permittee (NOAA RC) must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline required reporting/monitoring requirements. These terms and conditions are nondiscretionary.

1. The following terms and conditions implement Reasonable and Prudent Measure 1, which states that measures shall be taken to minimize harm and mortality to listed salmonids resulting from construction:

   a. The fisheries biologist shall monitor work activities and instream habitat a minimum of three times per week during construction for the purpose of identifying and reconciling any condition that could adversely affect salmonids or their habitat.

   b. The fisheries biologist shall have the authority to cease construction activities in order to resolve any unanticipated adverse impact resulting from construction.

2. The following term and condition implements Reasonable and Prudent Measure 2, which states that a monitoring report shall be provided to NMFS:

   A written report shall be provided to NMFS (Jonathan Ambrose) within 120 calendar days following the completion of the construction phase of each restoration project. The report shall include, in addition to measures outlined in Appendix B of the BA, the number and approximate size (mm) of listed salmonids captured and removed; any effect of the proposed action on listed salmonids; and photographs taken before, during, and after the activity from photo reference points.

3. The following term and condition implements Reasonable and Prudent Measure 3, which states a spill prevention plan will be in place prior to construction:

   The spill prevention plan will be reviewed and approved by NOAA RC prior to construction. The plan will be sent to the following address 30 days prior to construction:

   Mr. Patrick Rutten
   NOAA Restoration Center
   777 Sonoma Avenue, Rm. 219
   Santa Rosa, California 95404

4. The following terms and conditions implement Reasonable and Prudent Measure 4, which states project proponents shall review and implement the minimization and avoidance measures, as proposed by the Corps, prior to construction:

   a. Appendix 1 of this BO and the terms and conditions of the BO shall be provided in the final Corps authorization for restoration projects authorized under this consultation.

   b. Construction crews and the qualified fisheries biologist(s) shall have a copy of Appendix 1 and the terms and conditions of this BO on site during construction.

5. The following term and condition implements Reasonable and Prudent Measure 5, which states construction of new fish ladders shall be considered as a last resort when evaluating improvements to salmonids passage:

   Project proponents of new fish ladders shall include an analysis, including financial feasibility, of barrier modification (*i.e.*, culvert removal, bridge reconstruction, concrete apron removal, *etc.*) in place of ladder construction. Project proponents shall also evaluate the feasibility (including financial feasibility) of construction of a natural fishway in place of ladder construction. This analysis shall be provided for review and consideration by the TEAM prior to NMFS/CDFG engineering/fish passage review.

6. The following term and condition implements Reasonable and Prudent Measure 6, which states that restoration projects shall not result in the introduction of anadromous salmonids into non-native habitats.:

   Fish passage enhancement actions, that facilitate anadromous salmonid migration into stream reaches without any prior historical access, are not permitted.

7. The following term and condition implements Reasonable and Prudent Measure 7, which states sediment minimization measures shall apply to LWD placement actions:

   Root wads placed instream to enhance salmonid habitat shall be largely free of fine sediment prior to placement.

8. The following term and condition implements Reasonable and Prudent Measure 8, which states that additional permit conditions may be added by the NOAA RC:

   The NOAA RC may place additional site specific conditions on any restoration project in order to protect listed salmonids or their critical habitat from otherwise unforeseen adverse circumstances. The Corps shall incorporate these additional site specific conditions into their permits.

## X. REINITIATION NOTICE

This concludes formal consultation on the actions outlined in the proposed action for salmonid habitat restoration projects. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal 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 action that may affect listed species in a manner or to an extent not previously considered in this opinion, (3) the action is subsequently modified in a manner that causes an effect to the listed species is not considered in this opinion, or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, formal consultation shall be reinitiated immediately.

## XI. CONSERVATION RECOMMENDATIONS

NMFS has no conservation recommendations for this proposed action.

## XII. LITERATURE CITED

Adams, P. B., M. J. Bowers, H. E. Fish, T. E. Laidig, and K. R. Silberberg. 1999. Historical and current presence-absence of coho salmon (*Oncorhynchus kisutch*) in the Central California Coast Evolutionarily Significant Unit. National Marine Fisheries Service, Southwest Fisheries Science Center Administrative Report SC-99-02, Tiburon, California.

Alexander, G. R., and E. A. Hansen. 1986. Sand bed load in a brook trout stream. North American Journal of Fisheries Management 6:9-23.

Baker, P., and F. Reynolds. 1986. Life history, habitat requirements, and status of coho salmon in California. Report to the California Fish and Game Commission.

Barnhart, R. A. 1986. Species profiles: Life histories and environmental requirements of coastal fishes and invertebrates (Pacific Southwest) -- steelhead. United States Fish and Wildlife Service Biological Report 82 (11.60).

Beamish, R. J., C. M. Neville, and A. J. Cass. 1997. Production of Fraser River sockeye salmon (*Oncorhynchus nerka*) in relation to decadal-scale changes in the climate and the ocean. Canadian Journal of Fisheries and Aquatic. 54:543-554.

Beamish, R. J., and D. R. Bouillion. 1993. Pacific salmon production trends in relation to climate. Canadian Journal of Fisheries and Aquatic Sciences 50:1002-1016.

Bell, E. 2001. Survival, growth and movement of juvenile coho salmon (*Oncorhynchus kisutch*) over-wintering in alcoves, backwaters, and main channel pools in Prairie Creek, California. Master of Science Thesis, Humboldt State University, Arcata, California.

Bell, M. C. 1973. Fisheries handbook of engineering requirements and biological criteria. United States Army Corps of Engineers, Fisheries Engineering Research Program, Portland, Oregon. Contract No. DACW57-68-C-006.

Berg, L., and T. G. Northcote. 1985. Changes in territorial, gill-flaring, and feeding behavior in juvenile coho salmon (*Oncorhynchus kisutch*) following short-term pulses of suspended sediment. Canadian Journal of Fisheries and Aquatic Sciences 42:1410-1417.

Berggren, T. J., and M. J. Filardo. 1993. An analysis of variables influencing the migration of juvenile salmonids in the Columbia River Basin. North American Journal of Fisheries Management 13:48-63.

Beschta, R. L., R. E. Bilby, G. W. Brown, L. B. Holtby, and T. D. Hofstra. 1987. Stream Temperature and Aquatic Habitat: Fisheries and Forestry Interactions. Pages 191-232 *in* E. O. Salo and T. W. Cundy, editors. Streamside Management: Forestry and Fishery Interactions, Contribution No. 57: University of Washington, College of Forest Resources, Seattle, Washington.

Bilby, R. E., B. R. Fransen, and P. A. Bisson. 1996. Incorporation of nitrogen and carbon from spawning coho salmon into the trophic system of small streams: evidence from stable isotopes. Canadian Journal of Fisheries and Aquatic Sciences 53:164-173.

Bilby, R. E., B. R. Fransen, P. A. Bisson, and J. K. Walter. 1998. Response of juvenile coho salmon (*Oncorhynchus kisutch*) and steelhead (*Oncorhynchus mykiss*) to the addition of salmon carcasses to two streams in southwestern Washington, United States. Canadian Journal of Fisheries and Aquatic Sciences 55:1909-1918.

Bilby, R. E., and P. A. Bisson. 1998. Function and distribution of large woody debris. Pages 324-346 *in* R. Naiman and R. E. Bilby, editors. River and Stream Ecology. Springer-Verlag. New York, New York.

Bjornn, T. C., and D. W. Reiser. 1991. Habitat requirements of salmonids in streams. Pages 83-138. *In*: W.R. Meehan, editor. Influences of Forest and Rangeland Management on Salmonid Fishes and their Habitats. American Fisheries Society Special Publication 19. American Fisheries Society. Bethesda, Maryland.

Bjornn, T. C., M. A. Brusven, M. P. Molnau, J. H. Milligan, R. A. Klamt, E. Chacho, and C. Schaye. 1977. Transport of granitic sediment in streams and its effect on insects and fish. University of Idaho, Forest, Wildlife, and Range Experiment Station, Bulletin 17, Moscow.

Bozek, M. A., and M. K. Young. 1994. Fish mortality resulting from the delayed effects of fire in the greater Yellowstone ecosystem. Great Basin Naturalist 54:91-95.

Bratovich, P. M., and D. W. Kelley. 1988. Investigations of salmon and steelhead in Lagunitas Creek, Marin County, California: Volume I. Migration, Spawning, Embryo Incubation and Emergence, Juvenile Rearing, Emigration. Prepared for the Marin Municipal Water District, Corte Madera, California.

Brenner, F. J., and E. K. Brenner. 1998. Watershed management: practice, policies and coordination. Pages 203-219. *In*: Robert J. Reimold (editor). A Watershed Approach to Agricultural Nonpoint Source Pollution Abatement. United Kingdom: McGraw-Hill Book Company, Europe.

Brett, J. R. 1952. Temperature tolerance in 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. State of California Department of Fish and Game, Fish Bulletin 94.

Brown, L. R., and P. B. Moyle. 1991. Status of coho salmon in California. Report to the National Marine Fisheries Service, submitted July, 1991. National Marine Fisheries Service, Portland, Oregon.

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.

Brungs, W. A., and B. R. Jones. 1977. Temperature criteria for freshwater fish: protocol and procedures. United States Environmental Protection Agency, Environmental Research Laboratory, EPA-600/3-77-061, Duluth, Minnesota.

Bryant, M. D. 1980. Evolution of large, organic debris after timber harvest: Maybeso Creek, 1949 to 1978, United States Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station.

Busby, P. J., T. C. Wainwright, G. J. Bryant, L. Lierheimer, R.S. Waples, F.W. Waknitz, and I.V. Lagomarsino. 1996. Status review of west coast steelhead from Washington, Idaho, Oregon, and California. United States Department of Commerce, NOAA Technical Memo NMFS-NWFSC-27.

California State Lands Commission. 1993. California's rivers: A public trust report. Second edition, California State Lands Commission, 334 pages. [Available from California State Lands Commission, 1807 13th Street, Sacramento, California 95814.]

California Watershed Portal (CWP), 2006. Information about the Estrella River HUC and its tributaries obtained from the CWP website, url: http://cwp.resources.ca.gov.

Campbell, R. N. B., and D. Scott. 1984. The determination of minimum discharge for 0+ brown trout (*Salmo trutta L.*) using a velocity response. New Zealand Journal of Marine and Freshwater Research. 18:1-11.

CDFG (California Department of Fish and Game). 1965. California fish and wildlife plan. Volume III supporting data: part B, inventory salmon-steelhead and marine resources. California Department of Fish and Game, Sacramento, California.

CDFG (California Department of Fish and Game). 1997. Eel River Salmon and Steelhead Restoration Action Plan, Final Review Draft, January 28, 1997. California Department of Fish and Game, Inland Fisheries Division, Sacramento, California.

CDFG (California Department of Fish and Game). 2001. Draft Russian River Basin Fisheries Restoration Plan. California Department of Fish and Game, Central Coast Region. Hopland, California.

CDFG (California Department of Fish and Game). 2002. Status review of California coho salmon north of San Francisco. Candidate species status review report 2002-3 provided to the California Fish and Game Commission. California Department of Fish and Game, Sacramento, California.

CDFG (California Department of Fish and Game). 2003. Recovery Strategy for California Coho Salmon *(Oncorhynchus kisutch)*. Report to the California Fish and Game Commission, Public Review Draft, November 2003. State of California, Resources Agency, California Department of Fish and Game. Sacramento, California.

Chamberlin, T. W. 1982. Influence of Forest and Rangeland Management on Anadromous Fish Habitat in Western North America. General Technical Report PNW-136. United States Department of Agriculture, Forest Service, Pacific Northwest Research Station, Portland, Oregon.

Chamberlin, T. W., R. D. Harr, and F. H. Everest. 1991. Timber Harvesting, Silviculture, and Watershed Processes. Pages 181-206 *in* W.R. Meehan, editor. Influences of Forest and Rangeland Management on Salmonid Fishes and their Habitats. American Fisheries Society Special Publication 19. American Fisheries Society. Bethesda, Maryland.

Chapman, D. W. 1962. Aggressive behavior in juvenile coho salmon as a cause of emigration. Journal of Fisheries Resource Board of Canada 19:1047-1080.

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

Chapman, D. W., and T. C. Bjornn. 1969. Distribution of salmonids in streams, with special reference to food and feeding, pages 153-176. *In*: T.G. Northcote, editor. Symposium on Salmon and Trout in Streams. H.R. Macmillan Lectures in Fisheries. Institute of Fisheries, University of British Columbia, Vancouver, British Columbia.

Clothier, W. D. 1953. Fish loss and movement in irrigation diversions from the west Gallatin River, Montana. Journal of Wildlife Management 17:144-158.

Clothier, W. D. 1954. Effect of water reductions on fish movement in irrigation diversions. Journal of Wildlife Management 18:150-160

Collins, B. W. 2003. Northern and Central California Watershed Restoration Project Evaluation Report, State Fiscal Year 2002/2003. California Department of Fish and Game, Northern California and North Coast Region. Fortuna, California.

Collins, B. W. 2004. Report to the National Marine Fisheries Service for Instream Fish Relocation Activities associated with Fisheries Habitat Restoration Program Projects Conducted Under Department of the Army (Permit No. 22323N) within the United States Army Corps of Engineers, San Francisco District During 2002 and 2003. California Department of Fish and Game, Northern California and North Coast Region. March 24, 2004. Fortuna, California.

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

Corps (United States Army Corps of Engineers). 1982. Northern California Streams Investigation Russian River Basin Study. Final Report. San Francisco, California.

Crouse, M. R., C. A. Callahan, K. W. Malueg, and S. E. Dominguez. 1981. Effects of fine sediments on growth of juvenile coho salmon in laboratory streams. Transactions of the American Fisheries Society 110:281-286.

CRWQCB (California Regional Water Quality Control Board). 2001. Assessment of Aquatic Conditions in the Mendocino Coast Hydrologic Unit. California Regional Water Quality Control Board, North Coast Region, Santa Rosa, California.

CSWRCB (California State Water Resources Control Board). 2003. 2002 Clean Water Act section 303(d) list of water quality limited segments. California Regional Water Quality Control Board, Sacramento, California.

Cushman, R. M. 1985. Review of ecological effects of rapidly varying flows downstream from hydroelectric facilities. North American Journal of Fisheries Management 5:330-339.

Eames, M., T. Quinn, K. Reidinger, and D. Haring. 1981. Northern Puget Sound 1976 adult coho and chum tagging studies. Washington Department of Fisheries Technical Report 64:1-136.

Edmundson, E., F. E. Everest, and D. W. Chapman. 1968. Permanence of station in juvenile Chinook salmon and steelhead trout. Journal of Fisheries Resource Board of Canada 25(7):1453-1464, 1968.

Entrix Incorporated. 2000. Final biological assessment for the seismic retrofit of San Clemente Dam. Prepared for United States Army Corps of Engineers, San Francisco District on behalf on California-American Water Service Company. January 7.

Fausch, K. D., and R. J. White. 1986. Competition among juveniles of coho salmon, brook trout, and brown trout in a laboratory stream, and implications for Great Lakes tributaries. Transactions of the American Fisheries Society 115:363-381.

Fausch, K. D., and M. K. Young. 1995. Evolutionarily significant units and movement of resident stream fishes: a cautionary tale. American Fisheries Society Symposium 17:360-370.

Florsheim, J. L., and P. Goodwin. 1993. Geomorphic and hydrologic conditions in the Russian River, California: historic trends and existing conditions. Prepared for the California State Coastal Conservancy and the Mendocino County Water Agency.

Flosi, G., S. Downie, J. Hopelain, M. Bird, R. Coey, and B. Collins. 1998. California Salmonid Stream Habitat Restoration Manual. Third Edition. Inland Fisheries Division. California Department of Fish and Game. Sacramento, California.

Franklin, H. 2001. Steelhead and Salmon Migrations in the Salinas River. Report. 67 p.

Furniss, M. J., T. D. Roelofs, and C. S. Yee. 1991. Road Construction and Maintenance. Pages 297-323 *in* W.R. Meehan, editor. Influences of Forest and Rangeland Management on Salmonid Fishes and their Habitats. American Fisheries Society Special Publication 19. American Fisheries Society. Bethesda, Maryland.

Gowan, C., Young, M. K., Fausch, K. D., and S. C. Riley. 1994. Restricted movement in resident stream salmonids: A paradigm lost? Canadian Journal of Fisheries and Aquatic Sciences 50:2626-2637.

Gregory, R. S., and T. G. Northcote. 1993. Surface, planktonic, and benthic foraging by juvenile Chinook salmon (*Oncorhynchus tshawytscha*) in turbid laboratory conditions. Canadian Journal of Fisheries and Aquatic Sciences 50:233-240.

Gresh, T., J. Lichatowich, and P. Schoonmaker. 2000. An estimation of historic and current levels of salmon production in the northeast pacific ecosystem. Fisheries 15(1):15-21.

Groot, C., and L. Margolis. 1991. Pacific salmon life histories. University of British Columbia, Vancouver, Canada.

Habera, J. W., R. J. Strange, B. D. Carter, and S. E. Moore. 1996. Short-term mortality and injury of rainbow trout caused by three-pass AC electrofishing in a southern Appalachian stream. North American Journal of Fisheries Management 11:192-200.

Habera, J. W., R. J. Strange, and A. M. Saxton. 1999. AC electrofishing injury of large brown trout in low-conductivity streams. North American Journal of Fisheries Management 19:120-126.

Habersack, H., and H. P. Nachtnebel. 1995. Short-term effects of local river restoration on morphology, flow field, substrate and biota. Regulated Rivers: Research & Management 10(3-4):291-301.

Hall, J. D., and R. L. Lantz. 1969. Effects of logging on the habitat of coho salmon and cutthroat trout in coastal streams. Pages 355-375 *in* T. G. Northcote, editor. Symposium on salmon and trout in streams. University of British Columbia, Vancouver, Canada.

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 of Science Thesis. Sonoma State University, Rohnert Park, California.

Harvey, B. C. 1986. Effects of suction gold dredging on fish and invertebrates in two California streams. North American Journal of Fisheries Management 6:401-409.

Hassler, T. J. 1987. Species Profiles: life histories and environmental requirements of coastal fishes and invertebrates (Pacific Southwest) - coho salmon. United States Fish and Wildlife Service Biological Report 82:1-19.

Hassler, T. J., C. M. Sullivan, and G. R. Stern. 1991. Distribution of coho salmon in California. Final report submitted to California Department of Fish and Game for contract No. FG7292. California Department of Fish and Game, Sacramento, California.

Hayes, M. L. 1983. Active Capture Techniques. Pages 123-146 *in* L. A. Nielsen and D. L. Johnson, editors. Fisheries Techniques. American Fisheries Society. Bethesda, Maryland.

Henley, W. F., M. A. Patterson, R. J. Neves, and A. D. Lemly. 2000. Effects of sedimentation and turbidity on lotic food webs: a concise review for natural resource managers. Reviews in Fisheries Science 8(2):125-139.

Higgins, P., S. Dobush, and D. Fuller. 1992. Factors in the northern California threatening stocks with extinction. Unpublished Manuscript, Humboldt Chapter American Fisheries Society.

[Available from Humboldt Chapter of the American Fisheries Society, Post Office Box 210, Arcata, California 95521.]

Hilderbrand, R. H., A. D. Lemly, C. A. Dolloff, and K. L. Harpster. 1997. Effects of large woody debris placement on stream channels and benthic macroinvertebrates. Canadian Journal of Fisheries and Aquatic Sciences 54:931-939.

Hilderbrand, R. H., A. D. Lemly, C. A. Dolloff, and K. L. Harpster. 1998. Design considerations for large woody debris placement in stream enhancement projects. North American Journal of Fisheries Management 18(1):161-167.

Holtby, L. B., B. C. Anderson, and R. K. Kadowaki. 1990. Importance of smolt size and early ocean growth to interannual variability in marine survival of coho salmon (*Oncorhynchus kisutch*). Canadian Journal of Fisheries and Aquatic Sciences 47(11):2181-2194.

Jensen, P. T., and P. G. Swartzell. 1967. California salmon landings 1952 through 1965. California Department of Fish and Game, Fish Bulletin 135:1-57.

Johnson, S.L. 1988. The effects of the 1983 El Niño on Oregon's coho (*Oncorhynchus kisutch*) and Chinook (*O. tshawytscha*) salmon. Fisheries Research 6:105-123.

Jones and Stokes Associates, Incorporated. 1998. Draft supplemental environmental impact report for the Carmel River Dam and Reservoir project. November 13. Prepared for the Monterey Peninsula Water Management District.

Kahler, T. H., P. Roni, and T. P. Quinn. 2001. Summer movement and growth of juvenile anadromous salmonids in small western Washington streams. Canadian Journal of Fisheries and Aquatic Sciences 58:1947-2637

Keller, E. A., and F. J. Swanson. 1979. Effects of large organic material on channel form and fluvial processes. Earth Surface Processes 4:361-380.

Kelsey, H. M. 1977. Landsliding, channel changes, sediment yield and land use in the Van Duzen River basin, north coastal California, 1941 - 1975. Ph. D. Thesis. University of California, Santa Cruz.

Kohler, C. C., and W. A. Hubert. 1993. Inland Fisheries Management in North America. American Fisheries Society. Bethesda, Maryland.

Kraft, M. E. 1972. Effects of controlled flow reduction on a trout stream. Journal of Fisheries Research Board of Canada 29:1405-1411.

Leopold, L. B. 1968. Hydrology for urban land planning - A guidebook on the hydrologic effects on urban land use. United States Geologic Service Circular 554.

Line, D. E., W. A. Harman, G. D. Jennings, E. J. Thompson, and D. L. Osmond. 2000. Nonpoint source pollutant load reductions associated with livestock exclusion. Journal of Environmental Quality 29:1882-1890.

Maahs, R. P., S. A. Dressing, J. Spooner, M. D. Sniolen, and F. J. Himenik. 1984. Best management practices for agricultural nonpoint source control-IV. Pesticides. National Water Quality Evaluation Project Report. North Carolina University, Raleigh, North Carolina.

Magilligan, F. J., and P. F. McDowell. 1997. Stream channel adjustments following elimination of cattle grazing. Journal of the American Water Resources Association 34:867-878.

McElhany P., M. H. Rucklelshaus, M. J. Ford, T. C. Wainwright, and E. P. Bjorkstedt. 2000. Viable salmonid populations and the recovery of evolutionarily significant units. United States Department of Commerce, National Oceanic and Atmospheric Administration Technical Memorandum NMFS-NWFSC-42. Seattle, Washington.

McMahon, T. E. 1983. Habitat suitability index models: coho salmon. United States Fish and Wildlife Service, FWS/OBS-82/10.49.

Meehan, W. R., and T. C. Bjornn. 1991. Salmonid distribution and life histories. Pages 47 to 82. *In*: W. R. Meehan, editor. Influences of Forest and Rangeland Management on Salmonid Fishes and their Habitats. American Fisheries Society Special Publication 19.

Myers, J. M., R. G. Kope, G. J. Bryant, D. Teel, L. J. Lierheimer, T. C. Wainwright, W. S. Grant, F. W. Waknitz, K. Neely, S. T. Lindley, and R. S. Waples. 1998. Status Review of Chinook Salmon from Washington, Idaho, Oregon, and California. United States Department of Commerce, National Oceanic and Atmospheric Administration Technical Memorandum NMFS-NWFSC-35, Seattle, Washington.

National Marine Fisheries Service (NMFS). 1996. Factors for decline: a supplement to the notice of determination for West Coast steelhead under the Endangered Species Act. United States Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service.

NMFS (National Marine Fisheries Service). 1997a. Fish Screening Criteria for Anadromous Salmonids. NOAA Fisheries Southwest Region, January.

National Marine Fisheries Service (NMFS). 1997b. Status review update for deferred and candidate ESUs of West Coast Steelhead (Lower Columbia River, Upper Willamette River, Oregon Coast, Klamath Mountains Province, Northern California, Central Valley, and Middle Columbia River ESUs). United States Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service.

National Marine Fisheries Service (NMFS). 1998. Factors contributing to the decline of Chinook salmon: an addendum to the 1996 West Coast steelhead factors for decline report.

United States Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service.

National Marine Fisheries Service (NMFS). 1999a. Impacts of California sea lions and Pacific harbor seals on salmonids and West Coast ecosystems. Report to Congress. [Available from National Marine Fisheries Service, Protected Resources Division, 777 Sonoma Avenue, Room 325, Santa Rosa, California 95404.]

National Marine Fisheries Service (NMFS). 1999b. Status review update for the deferred ESUs of West Coast Chinook salmon from Washington, Oregon, California, and Idaho. United States Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service.

National Marine Fisheries Service (NMFS). 1999c. Biological and conference opinion on the Natural Resources Conservation Service's Emergency watershed protection project on La Honda Creek. United States Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service. File Number 151422SWR99SR811. Santa Rosa Area Office. March 1, 1999.

National Marine Fisheries Service (NMFS). 2000. Final Draft. Guidelines for Salmonids Passage at Stream Crossings. Southwest Region. May 16, 2000.

National Marine Fisheries Service (NMFS). 2001. Status review update for coho salmon (*Oncorhynchus kisutch*) from the Central California Coast and the California portion of the Southern Oregon/Northern California Coasts Evolutionarily Significant Units. United States Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service.

National Marine Fisheries Service (NMFS). 2002. Biological opinion for the proposed license amendment for the Potter Valley Project (Federal Energy Regulatory Commission Project Number 77-110). United States Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service. File Number 151422SWR02SR6412. Santa Rosa Area Office. November 26, 2002.

National Marine Fisheries Service (NMFS). 2003. Preliminary conclusions regarding the updated status of listed ESUs of West Coast salmon and steelhead. February 2003 co-manager review draft. United States Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service.

National Marine Fisheries Service (NMFS). 2005. Updated Status of Federally Listed ESUs of West Coast Salmon and Steelhead. United States Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service. 655 pages.

National Research Council. 1995. Science and the Endangered Species Act. National Research Council Committee on Scientific Issues in the Endangered Species Act. National Academy Press, Washington, D.C.

National Research Council. 1996. Upstream: Salmon and Society in the Pacific Northwest. National Research Council Committee on Protection and Management of Pacific Northwest Anadromous Salmonids. National Academy Press, Washington, D.C.

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 16:4-21.

Newcombe, C. P., and D. D. MacDonald. 1991. Effects of suspended sediments on aquatic ecosystems. North American Journal of Fisheries Management 11:72-82.

Nielsen, J. L. 1992. Microhabitat-specific foraging behavior, diet, and growth of juvenile coho salmon. Transactions of the American Fisheries Society 121:617-634.

Nielsen, J. L. 1998. Electrofishing California's endangered fish populations. Fisheries 23:6-12.

Nordwall, F. 1999. Movements of brown trout in a small stream: effects of electrofishing and consequences for population estimates. North American Journal of Fisheries Management 19:462-469.

Osborne, L. L., and D. A. Kovacic. 1993. Riparian vegetated buffer strips in water-quality restoration and stream management. Freshwater Biology 29(2):243-258.

Pimm, S. L., H. L. Jones, and J. Diamond. 1988. On the risk of extinction. American Naturalist 132(6):757-785.

Powell, M. A. 1997. Water-quality concerns in restoration of stream habitat in the Umpqua basin. Pages 129-132 *in* J. D. Hall, P. A. Bisson, and R. E. Gresswell, editors. Sea-run Cutthroat Trout: Biology, Management, and Future Conservation. American Fisheries Society, Oregon Chapter, Corvallis, Oregon.

Redding, J. M., C. B. Schreck, and F. H. Everest. 1987. Physiological effects on coho and steelhead of exposure to suspended solids. Transactions of the American Fisheries Society 116:737-744.

Reid, L. M. 1994. In review. Evaluating timber management effects on beneficial uses in Northwest California. United States Department of Agriculture, Forest Service, Pacific Southwest Research Station. Report to the California Department of Fire and Forestry Protection.

Reiser, D. W., T. C. Bjornn. 1979. Habitat requirements of anadromous salmonids *in* W. R. Meehan, editor. Influence of Forest and Rangeland Management on Anadromous Fish Habitat in the Western United States and Canada. United States Department of Agriculture Forest Service General Technical Report PNW-96.

Reynolds, J. B. 1983. Electrofishing. Pages 147-164 *in* L. A. Nielsen and D. L. Johnson, editors. Fisheries Techniques. American Fisheries Society. Bethesda, Maryland.

Roelofs, T. D. 1983. Current status of California summer steelhead (*Salmo gairdneri*) stocks and habitat, and recommendations for their management. A report presented to Region 5, USDA Forest Service. Humboldt State University, Arcata, California.

Rogers, F. R. 2000. Assessing the effects of moderately elevated fine sediment levels on stream fish assemblages. Master of Science Thesis. Humboldt State University, Arcata, California.

Salo, E., and W. H. Bayliff. 1958. Artificial and natural production of silver salmon, *Oncorhynchus kisutch*, at Minter Creek, Washington. Washington Department of Fisheries Research Bulletin 4. Washington Department of Fish and Wildlife, Olympia, Washington.

San Francisco Estuary Project. 1992. State of the Estuary, A report on conditions and problems in the San Francisco Bay/Sacramento-San Joaquin Delta Estuary. Prepared under Cooperative Agreement #CE-009486-02 with the United States Environmental Protection Agency by the Association of Bay Area Governments, Oakland, California. June 1992.

Sandercock, F. K. 1991. Life history of coho salmon (*Oncorhynchus kisutch*). Pages 395-445 *in* C. Groot and L. Margolis, editors. Pacific Salmon Life Histories. University of British Columbia Press, Vancouver, British Columbia.

Schiewe, M. H. 1997. Memorandum to William Stelle and William Hogarth: status review update for West Coast steelhead from Washington, Idaho, Oregon, and California. United States Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Northwest Fisheries Science Center, Seattle, Washington.

SEC (Steiner Environmental Consulting). 1996. A history of the salmonid decline in the Russian River. Steiner Environmental Consulting, Potter Valley, California.

Servizi, J. A., and D. W. Martens. 1992. Sublethal responses of coho salmon (*Oncorhynchus kisutch*) to suspended sediments. Canadian Journal of Fisheries and Aquatic Sciences 49:1389-1395.

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, Fish Bulletin 98:1-375.

Shirvell, C. S. 1990. Role of instream rootwads as juvenile coho salmon (*Oncorhynchus kisutch*) and steelhead trout (*O. mykiss*) cover habitat under varying stream flows. Canadian Journal of Fisheries and Aquatic Sciences 47:852-860.

Sigler, J. W., T. C. Bjornn, and F. H. Everest. 1984. Effects of chronic turbidity on density and growth of steelhead and coho salmon. Transactions of the American Fisheries Society 113:142-150.

Simpson (Simpson Resource Company). 2002. Aquatic Habitat Conservation Plan and Candidate Conservation Agreement with Assurances. July, 2002.

Six Rivers National Forest Watershed Interaction Team. 1999. FishXing software, version 2.2.

Spence, B. C., G. A. Lomnicky, R. M. Hughes, R. P. Novitzki. 1996. An Ecosystem Approach to Salmonid Conservation. Management Technology. Corvallis, Oregon.

Standiford, R. B., and R. Arcilla. 2001. A scientific basis for the prediction of cumulative watershed effects. University of California Wildland Resource Center Report No. 46.

Stein, R. A., P. E. Reimers, and J. D. Hall. 1972. Social interaction between juvenile coho (*Oncorhynchus kisutch*) and fall Chinook salmon (*O. tshawytscha*) in Sixes River, Oregon. Journal of the Fisheries Research Board of Canada 29:1737-1748.

Sundermeyer, D. R. 1999. Hatchery influence on Pajaro River steelhead analyzed with microsatellite DNA. Mater of Science Thesis. Department of Biological Sciences. San Jose State University, San Jose, California.

Swanson, F. J., and G. W. Lienkaemper. 1978. Physical consequences of large organic debris in pacific northwest streams. General Technical report PNW-69. United States Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station, Portland, Oregon.

Thomas, V. G. 1985. Experimentally determined impacts of a small, suction gold dredge on a Montana stream. North American Journal of Fisheries Management 5:480-488.

Titus, R. G., D. C. Erman, and W. M. Snider. July 5, 2002. History and status of steelhead in California coastal drainages south of San Francisco Bay. *In preparation.*

Upper Sacramento River Fisheries and Riparian Habitat Advisory Council. 1989. Upper Sacramento River fisheries and riparian habitat management plan (SB 1086 Plan). Report to California Legislature. Resources Agency, Sacramento, California.

USDA and USDOI (United States Department of Agriculture and United States Department of Interior). 1994. Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl. United States Forest Service, United States Bureau of Land Management. April 13, 1994.

USFS (United States Forest Service). 2004. Project Completion Report for South Fork Caspar Creek Pond Cleanout. Prepared by Rodney Nakamoto. January 30, 2004. United States Department of Agriculture, Forest Service, Pacific Southwest Research Station. Arcata, California.

Velagic, E. 1995. Turbidity study: a literature review. Prepared for Delta planning branch, California Department of Water Resources by Centers for Water and Wildland Resources, University of California, Davis.

Waples, R. S. 1991. Genetic interactions between hatchery and wild salmonids: lessons from the Pacific Northwest. Canadian Journal of Fisheries and Aquatic Sciences 48 (supplement 1):124-133.

Waples, R. S. 1999. Dispelling some myths about hatcheries. Fisheries 24(2):12-21.

Waters, T. F. 1995. Sediment in Streams: Sources, Biological Effects, and Control. American Fisheries Society Monograph 7.

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. United States Department of Commerce, National Oceanic and Atmospheric Administration Technical Memorandum NMFS-NWFSC-24.

Werner, I., T. Smith, M. Johnson, and J. Feliciano. 2001. Heat-shock protein (hsp70) expression and apparent growth differences among steelhead parr along a coastal temperature gradient. Platform presentation, Annual Meeting of the American Fisheries Society, California-Nevada and Humboldt Chapters, March 29-31, 2001. Santa Rosa, California.

**A. Federal Register Notices Cited**

61 FR 56138. October 31, 1996. Endangered and Threatened Species; Threatened Status for Central California Coast Coho Salmon Evolutionarily Significant Unit (ESU). United States Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service. Final Rule. Federal Register, Volume 61.

62 FR 43937 August 18. 1997. National Marine Fisheries Service. Final Rule: Listing of Several Evolutionary Significant Units of West Coast Steelhead. Federal Register, Volume 62.

62 FR 24588. May 6, 1997. National Marine Fisheries Service. Final Rule: Threatened Status for Southern Oregon/Northern California Coasts Evolutionarily Significant Unit of Coho Salmon. United States Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service. Federal Register, Volume 62.

62 FR 43974. August 18, 1997. Notice: Partial 6-Month Extension on the Final Listing Determination for Several Evolutionarily Significant Units (ESUs) of West Coast Steelhead. United States Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service. Federal Register, Volume 62.

64 FR 24049. May 5, 1999. National Marine Fisheries Service. Final Rule and Correction: Designated Critical Habitat for Central California Coast Coho and Southern Oregon/Northern

California Coast Coho Salmon. United States Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service. Federal Register, Volume 64.

65 FR 36074. June 7, 2000. Endangered and threatened species: Threatened status for one steelhead Evolutionarily Significant Unit (ESU) in California. United States Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service; Final Rule. Federal Register, Volume 65.

69 FR 71880. December 10, 2004. Endangered and threatened species: Designation of critical habitat for seven Evolutionarily Significant Unit of Pacific salmon (*Oncorhynchus tshawytscha*) and steelhead (*O. mykiss*) in California; Proposed Rule. Federal Register, Volume 69.

70 FR 37160. June 28, 2005. Final Listing Determinations for 16 ESUs of West Coast Salmon, and Final 4(d) Protective Regulations for Threatened Salmonid ESUs. Federal Register, Volume 70.

70 FR 52487. Sept. 2, 2005. Endangered and threatened Species; Designation of Critical Habitat for Seven Evolutionarily Significant Units of West Coast Salmon and Steelhead in California. **NOTE**: See *70 FR 52487 (F) thru (L) for ESU-specific designation regulations/maps. Federal Register, Volume 70.

**B. Personal Communications and Observations**

Ambrose, J. 2000-2006. Personal observation. Biologist. NMFS, Protected Resources Division, Santa Rosa, California.

Cox, B. 2003. Personal communication. Fisheries biologist. CDFG – Region 3.

Jahn, J. 2003. Personal communication. Fisheries biologist. NMFS, Protected Resources Division, Santa Rosa, California.

Ketcham, B. 2003. Personal communication. Biologist. National Park Service, Pt. Reyes, California.

Logan, D. 2003. Personal communication. Fisheries biologist. NMFS, Protected Resources Division, Santa Rosa, California.

McKeon, J. 2003. Personal communication. Fisheries biologist. NMFS, Protected Resources Division, Santa Rosa, California.

**Appendix 1**

## Protection and Minimization Measures as Described in the Biological Assessment

The following protection and minimization measures, as they apply to a particular project, shall be incorporated into the project descriptions for individual projects authorized under this programmatic fisheries restoration project (Program).

### A. General Protection Measures

1. Work shall not begin until the U.S. Army Corps of Engineers (Corps) has notified the permittee that the requirements of the Endangered Species Act (ESA) have been satisfied and that the activity is authorized.

2. The general construction season will be from June 15 to October 15. Restoration, construction, fish relocation, and dewatering activities within any wetted and/or flowing creek channel shall only occur within this window. As such, all non-revegetation-associated earthmoving activities will be complete by October 15. Revegetation outside of the active channel may continue beyond October 15 until November 15, if necessary. Limited earthmoving associated with preparation of the site for revegetation may occur within the October 15 - November 15 timeframe, but only as necessary for revegetation efforts. Work beyond this time frame may be authorized following consultation with and approval of the National Marine Fisheries Service (NMFS) and the California Department of Fish and Game (CDFG) on an individual project basis, provided it could be completed prior to the first significant rainfall event (rainfall event > two inches).

3. Prior to construction, each contractor will be provided with the specific protective measures to be followed during implementation of the project. In addition, a qualified biologist will provide the construction crew with information on the listed species in the project area, the protection afforded the species by the ESA, and guidance on those specific protection measures that must be implemented as part of the project.

4. All adverse aquatic impacts, including temporary impacts, must proceed through a sequencing of impact reduction: avoidance, reduction in size of impact, and compensation (mitigation). Mitigation may be proposed to compensate for the adverse impacts to water of the United States. Mitigation shall generally be in kind, with no net loss of waters of the United States on a per project basis. Mitigation work shall proceed in advance or concurrently with project construction.

5. Construction within 200 feet of established riparian vegetation or other bird nesting habitats shall be avoided during the migratory bird nesting season (February 15 - August 1), to avoid damage or disturbance to nests. If construction must occur during this period, a qualified biologist or individual approved by CDFG will conduct a pre-construction survey for bird nests or nesting activity in the project area. If any active nests or nesting behaviors are found (for native species), an exclusion zone of 75 feet shall be established to protect nesting birds (200 ft for raptors) and maintained until birds have fledged or nest is abandoned. If any listed or

sensitive bird species are identified, CDFG will be notified prior to further action. Take of active bird nests is prohibited under this Program.

6. Poured concrete shall be excluded from the wetted channel for a period of 30 days after it is poured. During that time the poured concrete shall be kept moist, and runoff from the concrete shall not be allowed to enter a live stream. Commercial sealants may be applied to the poured concrete surface where difficulty in excluding water flow for a long period may occur. If sealant is used, water shall be excluded from the site until the sealant is dry and fully cured according to the manufacturer's specifications.

7. Herbicides may be applied to control established stands of non-native species including, but not limited to, vinca, ivy, and broom. Herbicides must be applied to those species according to the registered label conditions. Herbicides must be applied directly to plants and may not be spread upon any water. Herbicides will be tinted with a biodegradable dye to facilitate visual control of the spray.

8. Rock used for bank stabilization or to anchor large woody debris (LWD) structures, shall be large and heavy enough to remain stationary under the 100-year median January or February flow event (which ever is greater).

9. If the thalweg of the stream has been altered due to construction activities, efforts will be undertaken to reestablish it to its original configuration. (*Note: Projects that may include activities such the use of willow baffles which may alter the thalweg are allowed under the Program.*)

### B. Requirements for Fish Relocation and Dewatering Activities

1. Guidelines for Dewatering:

Project activities authorized under the Program may require fish relocation and/or dewatering activities. Dewatering may not be appropriate for some projects that will result in only minor input of sediment, such as placing logs with hand crews or helicopters, or installing boulder clusters. Adherence to these general guidelines will minimize potential impacts for projects that do require dewatering of a stream/creek:

a. In those specific cases where it is deemed necessary to work in a flowing stream/creek, the work area shall be isolated and all the flowing water shall be temporarily diverted around the work site to maintain downstream flows during construction. Dewatering will likely not be necessary for most LWD enhancement activities.

b. Exclude fish from reentering the work area by blocking the stream channel above and below the work area with fine-meshed net or screens. The bottom of the seine must be completely secured to the channel bed to prevent fish from reentering the work area prior to dewatering. Exclusion screening must be placed in areas of low water velocity to minimize fish impingement. Screens must be checked periodically and cleaned of debris to permit free flow of water. Block net mesh shall be sized to ensure salmonids upstream or downstream do not enter the areas proposed for dewatering between passes with the electrofisher or seine.

c. Prior to dewatering, determine the best means to bypass flow through the work area to minimize disturbance to the channel and avoid direct mortality of fish and other aquatic vertebrates (as described more fully below under *General Conditions for Fish Capture and Relocation*). The project applicant shall bypass stream flow around the work area and concurrently maintain the stream flow to channel below the construction site.

d. Coordinate project site dewatering with a qualified biologist to perform fish and amphibian relocation activities. The qualified biologist(s) will possess a valid State of California Scientific Collection Permit as issued by CDFG and will be familiar with the life history and identification of listed salmonids and listed amphibians within the action area.

e. Prior to dewatering a construction site, qualified individuals will capture and relocate fish and amphibians to avoid direct mortality and minimize take. This is especially important if listed species are present within the project site.

f. Minimize the length of the dewatered stream channel and duration of dewatering. A maximum of 300 feet (ft) may be dewatered under the Program. Exceeding the 300 ft limit will disqualify the project from inclusion in the Program.

g. Any temporary dam or other artificial obstruction constructed shall only be built from materials such as sandbags or clean gravel which will cause little or no siltation or turbidity. Visqueen shall be placed over sandbags used for construction of cofferdams to minimize water seepage into the construction areas. The visqueen shall be firmly anchored to the streambed to minimize water seepage. Cofferdams and the stream diversion systems shall remain in place and fully functional throughout the construction period.

h. Downstream flows adequate to prevent stranding will be maintained at all times during dewatering activities.

i. When cofferdams with bypass pipes are installed, debris racks will be placed at the bypass pipe inlet. Bypass pipes will be monitored a minimum of two times per day, seven days a week, during the construction period. All accumulated debris shall be removed by the contractor or project applicant.

j. Bypass pipe diameter will be sized to accommodate, at a minimum, twice the summer baseflow.

k. The work area may need to be periodically pumped dry of seepage. Place pumps in flat areas, well away from the stream channel. Secure pumps by tying off to a tree or stake in place to prevent movement by vibration. Refuel in an area well away from the stream channel and place fuel absorbent mats under pump while refueling. Pump intakes shall adhere to NMFS' *Fish Screening Criteria for Anadromous Salmonids* (NMFS 1997a). Check intake periodically for impingement of fish or amphibians.

l. When pumping is necessary to dewater a work site temporary siltation basin are required to ensure sediment does not re-enter the wetted channel. Screens on pumps will adhere to NMFS' *Fish Screening Criteria for Anadromous Salmonids* (NMFS 1997a).

m. When construction is completed, the flow diversion structure shall be removed as soon as possible in a manner that will allow flow to resume with the least disturbance to the substrate. Cofferdams will be removed so surface elevations of water impounded above the cofferdam will not be reduced at a rate greater than one inch per hour. This will minimize the risk of beaching and stranding of fish as the area upstream becomes dewatered.

## C. General Conditions for all Fish Capture and Relocation Activities

Fish relocation and dewatering activities shall only occur between June 15 and October 15 of each year.

1. <u>Overview</u>

All seining, electrofishing, and relocation activities shall be performed by a qualified fisheries biologist. The qualified fisheries biologist shall capture and relocate listed salmonids prior to construction of the water diversion structures (*e.g.,* cofferdams). The qualified fisheries biologist shall document the number of salmonids observed in the affected area, the number and species of salmonids relocated, and the date and time of collection and relocation. The qualified fisheries biologist shall have a minimum of three years field experience in the identification and capture of salmonids, including juvenile salmonids, considered in the biological opinion. The qualified biologist will adhere to the following requirements for capture and transport of salmonids:

a. Determine the most efficient means for capturing fish. Complex stream habitat generally requires the use of electrofishing equipment, whereas in deep pools, fish may be concentrated by pumping-down the pool and then seining or dipnetting fish.

b. Notify NMFS two weeks prior to capture and relocation of salmonids to provide NMFS an opportunity to attend (call Jonathan Ambrose at 707-575-6091 or via email at jonathan.ambrose@noaa.gov).

c. Initial fish relocation efforts will be conducted several days prior to the start of construction. This provides the fisheries biologist an opportunity to return to the work area and perform additional electrofishing passes immediately prior to construction. In many instances, additional fish will be captured that eluded the previous day's efforts.

d. During dewatering, a fisheries biologist will remain at the project work site to net and rescue any additional fish that may have become stranded throughout the dewatering process.

e. In regions of California with high summer water temperatures, perform relocation activities during morning periods.

f. Prior to capturing fish, determine the most appropriate release location(s). Consider the following when selecting release site(s):

   *i.* similar water temperature as capture location;

   *ii.* ample habitat availability prior to release of captured fish; and

   *iii.* low likelihood of fish reentering work site or becoming impinged on exclusion net or screen.

g. Periodically measure air and water temperatures. Cease activities when measured water temperatures exceed 17.8 degree Celsius (°C) (or 18.4°C in areas where coho salmon are not present). Temperatures will be continuously measured at the head-of-riffle tail-of-pool interface during relocation activities.

2. Electrofishing Guidelines

The following methods shall be used if fish are relocated via electrofishing:

a. All electrofishing will be conducted according to NMFS' *Guidelines for Electrofishing Waters Containing Salmonids Listed Under the Endangered Species Act*, June 2000.

b. The backpack electrofisher shall be set as follows when capturing fish:

Voltage setting on the electrofisher shall not exceed 300 volts.

| | Initial | Maximum |
|---|---|---|
| Voltage: | 100 Volts | 300 Volts |
| Duration: | 500 μs (microseconds) | 5 ms (milliseconds) |
| Frequency: | 30 Hertz | 70 Hertz; |

c. A minimum of three passes with the electrofisher shall be utilized to ensure maximum capture probability of salmonids within the area proposed for dewatering.

d. No electrofishing shall occur if water conductivity is greater than 350 microSiemens per centimeter (μS/cm) or when instream water temperatures exceed 17.8° C (or 18.4° C in areas where coho salmon are not present). Water temperatures shall be measured at the pool/riffle interface. Only direct current (DC) shall be used.

e. A minimum of one assistant shall aid the fisheries biologist by netting stunned fish and other aquatic vertebrates.

3. Seining Guidelines

The following methods shall be used if fish are removed with seines:

a. A minimum of three passes with the seine shall be utilized to ensure maximum capture probability of salmonids within the area.

b. All captured fish shall be processed and released prior to each subsequent pass with the seine.

c. The seine mesh shall be adequately sized to ensure fish are not gilled during capture and relocation activities.

4. Guidelines for Relocation of Salmonids

The following methods shall be used during relocation activities associated with either method of capture (electrofishing or seining):

a. Fish shall not be overcrowded into buckets; allowing approximately six cubic inches per 0+ individual and more for larger/older fish.

b. Every effort shall be made not to mix (including use of separate containers) 0+ (young of the year) salmonids with larger salmonids, or other potential predators, which may consume the smaller salmonids. Have at least two containers and segregate 0+ fish from larger age-classes. Place larger amphibians, such as Pacific-giant salamanders (*Dicamptodon ensatus*), in container with larger fish.

c. Salmonid predators, such as sculpins (*Cottus sp.*) and Pacific-giant salamanders, collected and relocated during electrofishing or seining activities shall not be relocated so as to concentrate them in one area. Particular emphasis shall be placed on avoiding relocation of sculpins and Pacific-giant salamanders into the steelhead and coho salmon relocation pools. To minimize predation on salmonids, these species shall be distributed throughout the wetted portion of the stream so as to not concentrate them in one area.

d. All captured salmonids shall be relocated, preferably upstream, of the proposed construction project and placed in suitable habitat. Captured fish shall be placed into a pool, preferably with a depth of greater than two feet and with available instream cover (undercut banks, complex LWD features).

e. All captured salmonids will be processed and released prior to conducting a subsequent electrofishing or seining pass.

f. All native captured fish will be allowed to recover from electrofishing before being returned to the stream.

g. Minimize handling of salmonids. However, when handling is necessary, always wet hands or nets prior to touching fish. Handlers will not wear DEET-based insect repellants during relocation activities.

h. Temporarily hold fish in cool, shaded, aerated water in a container with a lid. Provide aeration with a battery-powered external bubbler. Protect fish from jostling and noise and do not remove fish from this container until time of release.

i. Place a non-mercury thermometer in holding containers and, if necessary, periodically conduct partial water changes to maintain a stable water temperature. If water temperature reaches or exceeds those allowed by CDFG and NMFS, fish shall be immediately released.

j. If instream temperatures exceed authorized temperature limits, capture and relocation will cease.

k. In areas where aquatic vertebrates are abundant, periodically cease capture, and release at predetermined locations.

l. Visually identify species and estimate year-classes of fish at time of release. Count and record the number of fish captured. Avoid anesthetizing or measuring fish.

m. If more than three percent of the steelhead and Southern Oregon/Northern California Coast (SONCC) Evolutionary Significant Unit (ESU) coho salmon, or one percent of CCC ESU coho captured are killed or injured, the project permittee shall contact NMFS' biologist Jonathan Ambrose by phone immediately at (707) 575-6091. If Mr. Ambrose cannot be reached, the Santa Rosa NMFS Office will be contacted at Federal Relay 1-866-327-8877 ([707] 578-8555). The purpose of the contact is to review the activities resulting in the lethal take and to determine if additional protective measures are required. All steelhead and coho mortalities must be retained, placed in an appropriately sized whirl-pak or zip-lock bag, labeled with the date and time of collection, fork length, location of capture, and frozen as soon as possible. Frozen samples must be retained until specific instructions are provided by NMFS.

**D. Measures to Minimize and Avoid Disturbance from Instream Construction**

Measures to minimize and avoid disturbance associated with instream habitat restoration construction activities are presented below:

1. If the stream channel is seasonally dry between June 15 and October 15, construction will occur during this dry period.

2. Debris, soil, silt, bark, rubbish, creosote-treated wood, raw cement/concrete or washings thereof, asphalt, paint or other coating material, oil or other petroleum products, or any other substances which could be hazardous to aquatic life, resulting from project-related activities, shall be prevented from contaminating the soil and/or entering the waters of the State. Any of

these materials, placed within or where they may enter a stream or lake, by the applicant or any party working under contract, or with permission of the applicant, shall be removed immediately. During project activities, all trash that may attract potential predators of salmonids will be properly contained, removed from the work site, and disposed of daily.

3. Where feasible, the construction shall occur from the bank, or on a temporary pad underlain with filter fabric.

4. No mechanized equipment (with internal combustion engines), including internal combustion handtools, will enter wetted channels.

5. Use of heavy equipment (in dewatered channels) shall be avoided in a channel bottom with rocky or cobbled substrate. If access to the work site requires crossing a rocky or cobbled substrate, a rubber tire loader/backhoe is the preferred vehicle. Only after this option has been determined infeasible will the use of tracked vehicles be considered. The amount of time this equipment is stationed, working, or traveling within the creek bed shall be minimized. When heavy equipment is used, woody debris and vegetation on banks and in the channel shall be minimally disturbed if outside of the project's scope.

6. Hydraulic fluids in mechanical equipment working within the stream channel shall not contain organophosphate esters. Vegetable-based hydraulic fluids are preferred.

7. The use or storage of petroleum-powered equipment shall be accomplished in a manner to prevent the potential release of petroleum materials into waters of the State (Fish and Game Code 5650).

8. Areas for fuel storage, refueling, and servicing of construction equipment must be located in an upland location.

9. Prior to use, clean all equipment to remove external oil, grease, dirt, or mud. Wash sites must be located in upland locations so wash water does not flow into the stream channel or adjacent wetlands.

10. All construction equipment must be in good working condition, showing no signs of fuel or oil leaks. Prior to construction, all mechanical equipment shall be thoroughly inspected and evaluated for the potential of fluid leakage. All questionable motor oil, coolant, transmission fluid, and hydraulic fluid hoses, fittings, and seals shall be replaced. The contractor shall document in writing all hoses, fittings, and seals replaced and shall keep this documentation until the completion of operations. All mechanical equipment shall be inspected on a daily basis to ensure there is no motor oil, transmission fluid, hydraulic fluid, or coolant leaks. All leaks shall be repaired in the equipment staging area or other suitable location prior to resumption of construction activity.

11. Oil absorbent and spill containment materials shall be located on site when mechanical equipment is in operation within 100 feet of the proposed watercourse crossings. If a spill occurs, (1) no additional work shall occur in-channel until the mechanical equipment is inspected

by the contractor, and the leak has been repaired, (2) the spill has been contained, and (3) CDFG and NMFS are contacted and have evaluated the impacts of the spill.

## E. Measures to Minimize Degradation of Water Quality

Construction or maintenance activities for the projects covered under this Program may result in temporary increases in turbidity levels in the stream. In general, these activities must not result in significant increases in turbidity levels beyond the naturally occurring, background conditions. The following measures would be implemented to reduce the potential for impacts to water quality during and after construction:

1. General Erosion Control during Construction

    a. Isolate the construction area from flowing water until project materials are installed and erosion protection is in place except as provided in Section B. Most large woody debris projects will not require dewatering.

    b. Effective erosion control measures shall be in place at all times during construction. Do not start construction until all temporary erosion control devices (straw bales with sterile, weed-free straw, silt fences, *etc.*) are in place downslope or downstream of project site within the riparian area. The devices shall be properly installed at all locations where the likelihood of sediment input exists. These devices shall be in place during and after construction activities for the purposes of minimizing fine sediment and sediment/water slurry input to flowing water and of detaining sediment-laden water on site. If continued erosion is likely to occur after construction is completed, then appropriate erosion prevention measures shall be implemented and maintained until erosion has subsided.

    c. Sediment shall be removed from sediment controls once it has reached one-third of the exposed height of the control. Whenever straw bales are used, they shall be staked and dug into the ground 12 centimeters (cm) and only sterile, weed free straw shall be utilized. Catch basins shall be maintained so that no more than 15 cm of sediment depth accumulates within traps or sumps.

    d. Sediment-laden water created by construction activity shall be filtered before it leaves the right-of-way or enters the stream network or an aquatic resource area. Silt fences or other detention methods shall be installed as close as possible to culvert outlets to reduce the amount of sediment entering aquatic systems.

    e. The contractor/project applicant is required to inspect and repair/maintain all erosion control practices prior to and after any significant storm event, at 24 hour intervals during extended storm events, and a minimum of every two weeks until all erosion control measures have been completed.

2. Post Construction Erosion Control

a. Immediately after project completion and before close of seasonal work window, stabilize all exposed soil with mulch, seeding, and/or placement of erosion control blankets. Remove all artificial erosion control devices after the project area has fully stabilized. All exposed soil present in and around the project site shall be stabilized within seven days.

b. All bare and/or disturbed slopes (> 10 ft x 10 ft of bare mineral soil) will be treated with erosion control measures such as hay bales, netting, fiber rolls, native mulch/slash, and hydroseed as permanent erosion control measures.

c. Where straw, mulch, or slash is used as erosion control on bare mineral soil, the minimum coverage shall be 95 percent with a minimum depth of two inches.

d. When seeding is used as an erosion control measure, only native seed will be used.

e. Sterile, weed-free straw, free of exotic weeds, is required when hay bales are used as an erosion control measure.

3. Guidelines for Temporary Stockpiling

a. Minimize temporary stockpiling of material. Stockpile excavated material in areas where it cannot enter the stream channel. Prior to start of construction, determine if such sites are available at or near the project location. If nearby sites are unavailable, determine location where material will be deposited. Establish locations to deposit spoils well away from watercourses with the potential to deliver sediment into streams supporting, or historically supporting populations of listed salmonids. Spoils shall be contoured to disperse runoff and stabilized with mulch and (native) vegetation. Use devices such as plastic sheeting held down with rocks or sandbags over stockpiles, silt fences, or berms of hay bales, to minimize movement of exposed or stockpiled soils.

b. If feasible, conserve topsoil for reuse at project location or use in other areas. End haul spoils away from watercourses as soon as possible to minimize potential sediment delivery.

**F. Minimizing Potential for Adverse Effects Due to Scour**

1. When needed, utilize instream grade control structures to control channel scour, sediment routing, and headwall cutting.

2. If a pipe or structure that empties into a stream is installed, an energy dissipater shall be installed to reduce bed and bank scour.

3. The toe of rock slope protection shall be placed below bed scour to ensure stability.

## H. Measures to Minimize Loss or Disturbance of Riparian Vegetation

Measures to minimize loss or disturbance to riparian vegetation are described below. The revegetation and success criteria that will be adhered to for projects implemented under this Program that result in disturbance to riparian vegetation are also described below.

1. Minimizing Disturbance

    a. Retain as many trees and brush as feasible, emphasizing shade producing and bank stabilizing trees and brush.

    b. Use project designs and access points that minimize riparian disturbance without affecting less stable areas, which may increase the risk of channel instability.

    c. Prior to construction, determine locations and equipment access points that minimize riparian disturbance. Avoid entering unstable areas.

    d. Decompact disturbed soils at project completion as the heavy equipment exits the construction area. At the completion of the project, soil compaction that is not an integral element of the design of a crossing shall be decompacted.

    e. If riparian vegetation is to be removed with chainsaws, consider using saws that operate with vegetable-based bar oil.

2. Revegetation and Success Criteria

    a. Any stream bank area left barren of vegetation as a result of the implementation or maintenance of the restoration practices shall be restored to a natural state by seeding, replanting, or other agreed upon means (including natural recruitment) with native trees, shrubs, and/or grasses prior to November 15 of the project year. Barren areas shall typically be planted with a combination of willow stakes, native shrubs and trees and/or erosion control grass mixes.

    b. Native plant species shall be used for revegetation of disturbed and compacted areas. The species used shall be specific to the project vicinity or the region of the state where the project is located, and comprised of a diverse community structure (plantings shall include both woody and herbaceous species).

    c. For projects where re-vegetation is implemented to compensate for riparian vegetation impacted by project construction, a re-vegetation monitoring report will be required after five years to document success. Success is defined as 80 percent (%) survival of plantings or 80% ground cover for broadcast planting of seed after a period of three years. If revegetation efforts will be passive (*i.e.*, natural regeneration), success will be defined as total cover of woody and herbaceous material equal to or greater than pre-project conditions. If at the end of three years, the vegetation has not successfully been re-established, the applicant will be responsible for replacement planting, additional watering, weeding, invasive exotic eradication, or any other practice, to achieve these requirements. If success is not achieved within the first five years, the project applicant will need to prepare a follow-up report in an additional five years. This requirement will proceed in five year increments until success is achieved.

## I. Measures to Minimize Impacts to Non-Surfaced Roads in Project Area

Upon the completion of restoration activities, non-surfaced roads within the riparian zone used for the permitted activity shall be weather proofed according to measures as described in *Handbook for Forest and Ranch Roads* by Weaver and Hagans (1994) of Pacific Watershed Associates and in Part X of the CDFG Restoration Manual entitled "*Upslope Assessment and Restoration Practices*". The following are some of the methods that may be applied to non-surfaced roads impacted by project activities implemented under this Program:

1. Establish waterbreaks (*e.g.*, waterbars and rolling dips) on all seasonal roads, skid trails, paths, and fire breaks by October 15. Do not remove waterbreaks until May 15.

2. Maximum distance for waterbreaks shall not exceed the following standards: (a) for road or trail gradients less than 10%: 100 ft; (b) for road or trail gradients 11-25%: 75 ft; (c) for road or trail gradients 26-50%: 50 ft; (d) for road or trail gradients greater than 50%: 50 ft. Depending on site specific conditions, more frequent intervals may be required to prevent road surface rilling and erosion.

3. Locate waterbreaks to allow water to be discharged onto some form of vegetative cover, slash, rocks, or less erodible material. Do not discharge waterbreaks onto unconsolidated fill.

4. Waterbreaks shall be cut diagonally a minimum of six inches into the firm roadbed, skid trail, or firebreak surface and shall have a continuous firm embankment of at least six inches in height immediately adjacent to the lower edge of the waterbreak cut.

5. The maintenance period for waterbreaks and any other erosion control facilities shall occur after every major storm event for the first year after installation.

6. Rolling-dips are preferred over waterbars. Waterbars shall only be used on unsurfaced roads where winter use (including use by bikes, horses, and hikers) will not occur or in steep areas where rolling dips are not practical.

7. After the first year of installation, erosion control facilities shall be inspected prior to the winter period (October 15) after the first major storm event, and prior to the end of the winter period (May 15).

8. The applicant will establish locations to deposit spoils well away from watercourses with the potential to deliver sediment into streams supporting, or historically supporting, populations of listed salmonids. Spoils shall be contoured to disperse runoff and stabilized with mulch and (native) vegetation.

9. No berms are allowed on the outside of the road edge.

10. No herbicides shall be used on vegetation on inside ditches.

**J. Requirements for New Fish Ladders and Fishways**

1. New fish ladders/fishways shall be checked (and maintained as necessary) at least two times per week to ensure the pools are free of excess sediment or debris that may impair passage for the life of the ladder.

2. If the fish ladder/fishways becomes damaged or ineffective the project applicant shall, as soon as reasonably possible, repair any damage or modify the ladder (in consultation with NMFS and CDFG engineers/fish passage specialists).

3. Fish ladders/fishways will be checked prior to the adult migration season. All debris and sediment will be removed to ensure the ladder is fully functional according to fish passage design criteria.

4. The final design must be reviewed and approved by a NMFS/CDFG engineers/fish passage specialist. The design must address the following:

   a. species of salmonids present in the river system, as well as magnitude and timing of adult migration;

   b. probable access route to the barrier, including areas where fish will congregate below the obstruction;

   c. extent of spawning and nursery areas and potential salmonid production from both above and below the obstruction;

   d. type and quantity of anticipated transportable debris;

   e. frequency, duration, timing, and magnitude of anticipated flows, especially extreme high and low flows; and

   f. location of other barriers in the stream system, and their possible effects to distribution of salmonids.

5. The ladder shall not exceed 30 feet in height.

6. A maintenance plan for the ladder/fishway must be reviewed and approved by NMFS/CDFG engineers/fish passage specialists and NOAA RC.

7. Adequate access to the ladder/fishway to facilitate necessary maintenance activities during winter high flows and summer low flow periods must be included in the design.

8. Flow patterns must be stable, with no water surges.

9. Flows in and near the ladder/fishway entrance should be sufficient to attract fish at all water levels.

10. Minimum height between pools in fish ladders shall not exceed six inches.

11. New ladders shall be constructed to provide passage conditions suitable for year round bidirectional, adult and juvenile salmonid movement.

12. A debris deflector should be incorporated at the flow intake.

13. The upstream exit must allow fish to easily reach secure resting habitat.

14. Fishways/ladders must be deep enough for the largest known fish in the system.

**K. Summer Dam Abutment Removal**

1. Summer dam removal will require design review and approval from a NMFS and/or CDFG fish passage specialist prior to project authorization and design review by a qualified geomorphologist.

2. Sediment composition and quantity, and effects of sediment transport must be evaluated by a qualified geomorphologist for all summer dam removal projects.

3. Summer dams with > 400 cubic yards of accumulated sediment behind dam sills are not permitted under the Program.

## A. Pre-Project Monitoring and Submittal Requirements

The following information will be collected by the applicants with assistance from qualified consulting biologists. Project applicants would submit the following information either to the U.S. Army Corps of Engineers (Corps) (as part of their application for a Corps Permit) or directly to the NOAA Restoration Center (NOAA RC) (for Restoration Center funded projects).

1. Pre-project photo monitoring data (per California Department of Fish and Game's (CDFG) Manual).

2. The project description shall include the following:

   a. A project problem statement.

   b. The project goals and objectives (including target species), *etc.*

   c. The watershed context.

   d. A description of the type of project and restoration techniques proposed (culvert replacement, instream habitat improvements, *etc*).

   e. The project dimensions, including an analysis of hydrology and sediment transport for ladders and culvert retrofits.

   f. A description of construction activities anticipated (types of equipment, timing, staging areas or access roads required).

   g. If dewatering of the work site will be necessary, a description of temporary dewatering methods including qualified individual(s) who will be onsite to transport and relocate protected salmonids.

   h. The proposed construction start and end dates.

   i. The estimated number of creek crossings and type of vehicle(s) that will cross.

   j. The materials that are proposed to be used as part of the restoration action.

   k. When vegetation will be adversely affected as a result of the project, (including removal and replacement), the project applicant will provide a visual assessment of dominant native shrubs and trees, approximate species diversity, and approximate acreage.

   l. A description of existing site conditions and explanation of how proposed activities improve or maintain these conditions for steelhead and/or coho salmon.

m. A description of key habitat elements for coho salmon and steelhead in the project area (*i.e.*, temperature, type of pool, riffle, and flatwater habitats, an estimate of instream shelter and shelter components, maximum water depths, dominant substrate types, *etc.*).

n. A description of applicable minimization and avoidance measures incorporated into the individual project (as described in Appendix 1 of this Biological Opinion (BO)).

o. A description of any proposed deviations from that authorized in the biological assessment (BA) and associated BO from the National Marine Fisheries Service (NMFS) will be clearly described. It is likely that any proposed deviations from the activities described in the *Project Description* of the enclosed BO, will result in the project not being covered under this Program and would require individual consultation with the Corps.

p. A proposed monitoring plan for the project describing how the project applicants will ensure compliance with the applicable monitoring requirements described in this Program description (revegetation, *etc.*), including the source of funding for implementation of the monitoring plan.

q. For projects that may result in incidental take of coho salmon (*i.e.*, that will require dewatering and fish relocation activities in a stream historically known to support coho, see Appendix C of the BA), the applicant will also need to comply with the requirements of the California Endangered Species Act (CESA). CESA requires that impacts be minimized and fully mitigated and that funding for implementation is assured. Therefore, for projects that have grant funding for implementation, the funding assurance shall be the grant/agreement itself, showing monies earmarked for implementation of necessary protection measures during implementation and follow-up monitoring, or another mechanism approved by CDFG in writing. For projects that have no such grant funding, the applicant shall be required to provide security in the form of a cash deposit in an amount approved in writing by CDFG and held by CDFG or another mechanism approved in writing by CDFG. The funding security will be held until the required measures have been successfully implemented.

r. A "Checklist" of project conditions that the applicant will sign, verifying the will adhere to these project conditions during project design and implementation (Enclosure B of the BA).

**B. Post Construction Monitoring and Reporting Requirements**

Implementation monitoring would be conducted for all projects implemented under the proposed Program. Following construction, individual applicants would submit a post-construction, implementation report to NOAA RC and the Corps. Submittal requirements would include project as-built plans and photo documentation of project implementation taken before, during, and after construction utilizing CDFG photo monitoring protocols. For fish relocation activities, the report would include: all fisheries data collected by a qualified fisheries biologist which shall include the number of listed salmonids killed or injured during the proposed action; the number and size (in millimeters) of listed salmonids captured and removed; and any effects of the proposed action on listed salmonids not previously considered.

1. Specific Requirements for New Fish Ladder/Fishway Projects

The following additional requirements must be documented in the post construction report(s) for fish ladder/fishway projects:

1. At least four photo reference points of the fish ladder/fishway shall be established following construction. Photos shall be taken under a variety of flow conditions including winter high flows (including at least one bankfull event) and summer low flows once a year for a minimum of two years.

2. The report shall contain all information available indicating the project was constructed as designed (or changes are clearly shown). Additionally, a design validation report shall be completed after seasonal flows have occurred through the fish ladder/fishway. The design validation report (that shall include verification of velocity, jump heights, water depths and energy dissipation) is to ensure the design criteria as outlined in the 90 percent design plans are met. Validation shall include an evaluation of the ladder for depth and velocities at the range of design flows and operational configurations.

3. The implementation report and photographs for fish ladder/fishway projects shall be submitted to NMFS and CDFG engineers/fish passage specialist. This review may be facilitated by NOAA RC and TEAM.

**C. Annual Report**

Annually, NOAA RC will prepare a report summarizing results of projects implemented under this Program during the most recent construction season and results of post-construction implementation and effectiveness monitoring for that year and previous years. The annual report shall include a summary of the specific type and location of each project, stratified by individual project, 4$^{th}$ field hydrologic unit code (HUC) and Evolutionary Significant Unit (ESU) and/or Distinct Population Segment (DPS). A copy of the report will be provided to NMFS, CDFG, and the Corps. The report shall include the following project-specific summaries:

1. A summary detailing fish relocation activity, including the number and species of fish relocated and the number and species injured or killed.

2. The number and type of instream structures implemented within the stream channel.

3. The length of streambank (feet) stabilized or planted with riparian species.

4. The number of culverts replaced or repaired, including the number of miles of restored access to unoccupied salmonid habitat.

5. The distance (feet) of aquatic habitat disturbed at each project site.

**Enclosure 2**

## MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT ESSENTIAL FISH HABITAT CONSERVATION RECOMMENDATIONS

The Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), established new requirements for the identification and description of Essential Fish Habitat (EFH) in Federal fishery management plans (FMP) and required Federal agencies to consult with NOAA's National Marine Fisheries Service (NMFS) on activities that may adversely affect EFH. EFH for Pacific Coast salmon has been identified and described in Appendix A, Amendment 14 to the Pacific Coast Salmon FMP. The U.S. Army Corps of Engineers' (Corps) permitting of the implementation of fisheries restoration practices to EFH on private and public lands will affect streams in within the regulatory jurisdiction of NMFS' Santa Rosa office as described below.

The Pacific Coast Salmon FMP applies to Central California Coast Evolutionarily Significant Unit (ESU) coho salmon (*Oncorhynchus kisutch*), Southern Oregon/Northern California ESU coho salmon, California Coastal ESU Chinook salmon (*O. tshawytscha*), and Central Valley Fall Run ESU Chinook salmon. The EFH Conservation Recommendations provided below address EFH for those managed species only.

## I. IDENTIFICATION OF ESSENTIAL FISH HABITAT

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

Amendment 14 to the Pacific Salmon FMP identifies EFH as all streams, lakes, ponds, wetlands, and other water bodies currently or historically accessible to Federally managed salmon in Washington, Oregon, Idaho, and California. Salmon EFH excludes areas upstream of longstanding naturally impassible barriers (*i.e.,* natural waterfalls in existence for several hundred years), but includes aquatic areas above all artificial barriers except specifically named impassible dams.

## II. PROPOSED ACTION

The Corps proposes to authorize the placement of fill material into the waters of the United States for the annual implementation of multiple salmonid habitat restoration projects (Program).

This action will apply to portions of the following counties within the regulatory jurisdictional boundaries of the NMFS' Santa Rosa office: San Benito, northern San Luis Obispo, Monterey, Santa Cruz, San Mateo, Santa Clara, San Francisco, Alameda, Contra Costa, Solano, Napa, Marin, Sonoma, and Mendocino. The counties of San Benito, San Luis Obispo, and Monterey were included in the accompanying biological opinion; however, waterbodies in these counties have not been designated as EFH for salmon.

Restoration activities typically occur in watersheds subjected to significant levels of logging, road building, urbanization, mining, grazing, and other activities that have reduced the quality and quantity of instream habitat available for native anadromous salmonids. Types of permitted projects include: instream habitat improvement, fish passage improvement (including construction of new fish ladders/fishways and maintenance of existing ladders), bank stabilization, riparian restoration, upslope restoration, and fish screens. The majority of the actions considered in the accompanying biological opinion (BO) follow those described in: (1) California Department of Fish and Game's (CDFG) *California Salmonid Stream Habitat Restoration Manual, Third Edition, Volume II* with three new chapters *(Part IX: Fish Passage Evaluation at Stream Crossings, Part X: Upslope Assessment and Restoration Practices, and Part XI: Riparian Habitat Restoration*) added in 2003 and 2004 (Flosi *et al.* 1998), (2) NMFS' *Guidelines for Salmonid Passage at Stream Crossings* (NMFS 2000), and (3) NMFS' *Fish Screening Criteria for Anadromous Salmonids* (NMFS 1997a).

## III. EFFECTS OF THE PROJECT ACTION

NMFS has evaluated the proposed project for potential adverse effects to EFH pursuant to Section 305(b)(2) of the MSFCMA. As described and analyzed in the accompanying BO, NMFS anticipates some short-term sediment and turbidity will occur up to 100 feet downstream of the project locations. Increased turbidity could further degrade already degraded habitat conditions in many of the proposed project locations. Flowing water may be temporarily diverted up to 300 feet around some projects, resulting in short-term loss of habitat space and short-term reductions in macroinvertebrates (food for salmon). Chemical spills from construction equipment may occur, but NMFS judges the chance of spills to be low based on the practices to be deployed when heavy construction equipment is used.

The duration and magnitude of direct effects to EFH associated with implementation of individual conservation projects will be significantly minimized due to the multiple minimization measures utilized during implementation. In addition, no more than 50 projects per year , with a maximum of three projects per watershed per year, separated by at least 1,200 feet within a watershed are expected to occur throughout the entire regulatory jurisdiction of NMFS' Santa Rosa Area Office (Figure 1 in the BO) over the next ten years of the proposed action. These temporal and spatial scales will likely preclude substantial additive effects. Short-term adverse effects that occur will be offset by long-term beneficial effects to the function and value of EFH.

## IV. CONCLUSION

After reviewing the effects of the project, the habitat conservation measures included in the project description, and expected spatial and temporal scales of project activities, NMFS concludes that the project action, as proposed, will not substantially adversely affect the EFH of coho salmon or Chinook salmon within streams currently or historically supporting this species in Mendocino, Sonoma, Contra Costa, Solano, Napa, Marin, San Francisco, Alameda, San Mateo, Santa Clara, and Santa Cruz counties. The temporary, minimal adverse effects that occur will be offset by beneficial, long-term effects.

## V. EFH CONSERVATION RECOMMENDATIONS

Section 305(b)(4)(A) of the MSFCMA authorizes NMFS to provide EFH Conservation Recommendations that will minimize adverse effects of an activity on EFH. In order to avoid, minimize and/or mitigate for the short-term potential adverse effects anticipated to occur as a result of project activities, NMFS provides the following EFH Conservation Recommendations.

NMFS recommends the Corps implement Appendix 1 and Reasonable and Prudent Measures (RPM) # 3-7 of the associated BO including all of the associated Terms and Conditions.

## VI. FEDERAL AGENCY STATUTORY REQUIREMENTS

The MSFCMA (Section 305(b)(4)(B)) and Federal regulations (50 CFR Section 600.920(j)) to implement the EFH provisions of the MSFCMA require Federal action agencies to provide a written response to EFH Conservation Recommendations within 30 days of its receipt. A preliminary response is acceptable if final action cannot be completed within 30 days. The final response must include a description of measures proposed to avoid, mitigate, or offset the adverse impacts of the activity on EFH. If your response is inconsistent with our EFH Conservation Recommendations, you must provide an explanation for not implementing those recommendations at least 10 days prior to permit issuance.

## VIII. LITERATURE CITED

Flosi, G., S. Downie, J. Hopelain, M. Bird, R. Coey, and B. Collins. 1998. California Salmonid Stream Habitat Restoration Manual. Third Edition. Inland Fisheries Division. California Department of Fish and Game. Sacramento, California.

NMFS (National Marine Fisheries Service). 1997a. Fish Screening Criteria for Anadromous Salmonids. NOAA Fisheries Southwest Region, January.

National Marine Fisheries Service (NMFS). 2000. Final Draft. Guidelines for Salmonids Passage at Stream Crossings. Southwest Region. May 16, 2000.