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

In response refer to:
2010/01038

JUN - 9 2010

Ms. Jane M. Hicks
Chief, Regulatory Branch
Department of the Army
San Francisco District, Corps of Engineers
1455 Market Street
San Francisco, California 94103-1398

Dear Ms. Hicks:

Thank you for your March 17, 2009, request for consultation under the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C 1531§ et *seq*.), for the U.S. Army Corps of Engineers (Corps) issuance of a five-year regional general permit (RGP) for habitat restoration activities under the California Department of Fish and Game's (CDFG) Fisheries Restoration Grant Program (Grant Program). This letter transmits NOAA's National Marine Fisheries Service's (NMFS) final biological opinion (Enclosure 1) and Essential Fish Habitat (EFH) consultation (Enclosure 2) pertaining to the proposed issuance of the five-year RGP. In addition, this letter transmits our response to the Corps' request for concurrence that the proposed RGP is unlikely to adversely affect certain ESA listed species.

The enclosed biological opinion concludes formal consultation for activities in the Grant Program that will be included under the RGP. The enclosed biological opinion is based on NMFS' review of information provided with the Corps' March 17, 2009, request for formal consultation, the Corps' March 22, 2010, letter with additional information, multiple correspondences with CDFG and the Corps during the consultation. The biological opinion addresses potential adverse effects on the following listed species' Evolutionarily Significant Unit (ESU) or Distinct Population Segment (DPS) and designated critical habitat in accordance with section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C 1531§ et *seq*.):

Threatened Southern Oregon/Northern California (SONCC) coho salmon (*Oncorhynchus kisutch*)
Listing determination (70 FR 37160; June 28, 2005)
Critical habitat designation (64 FR 24049; May 5, 1999)

Endangered Central California Coast (CCC) coho salmon

Listing determination (70 FR 37160; June 28, 2005)
Critical habitat designation (64 FR 24049; May 5, 1999)

Threatened California Coastal (CC) Chinook salmon (*O. tshawytscha*)
Listing determination (70 FR 37160; June 28, 2005)
Critical habitat designation (70 FR 52488; September 2, 2005)

Threatened Northern California (NC) steelhead (*O. mykiss*)
Listing determination (71 FR 834; January 5, 2006)
Critical habitat designation (70 FR 52488; September 2, 2005)

Threatened Central California Coast (CCC) steelhead
Listing determination (71 FR 834; January 5, 2006)
Critical habitat designation (70 FR 52488; September 2, 2005)

Threatened Southern-Central California Coast (S-CCC) steelhead
Listing determination (62 FR 43937; August 18, 1997)
Critical habitat designation (70 FR 52488; September 2, 2005)

It is our finding in the biological opinion that the proposed action is not likely to jeopardize the continued existence of SONCC coho salmon, CCC coho salmon, CC Chinook salmon, NC steelhead, CCC steelhead, or S-CCC steelhead; and is not likely to result in the destruction or adverse modification of designated critical habitat for SONCC coho salmon, CCC coho salmon, CC Chinook salmon, NC steelhead, CCC steelhead, or S-CCC steelhead. NMFS expects the proposed action will result in incidental take of SONCC coho salmon, CCC coho salmon, CC Chinook salmon, NC steelhead, CCC steelhead, and S-CCC steelhead. An incidental take statement is included with the enclosed biological opinion. The incidental take statement includes non-discretionary reasonable and prudent measures and terms and conditions that are expected to reduce incidental take of SONCC coho salmon, CCC coho salmon, CC Chinook salmon, NC steelhead, CCC steelhead, or S-CCC steelhead occurring as a result of the proposed action. Additionally, three discretionary conservation recommendations are provided in the biological opinion.

In addition, NMFS concurs with the Corps' determination that the Pacific eulachon's southern DPS (*Thaleichthys pacificus*), North American green sturgeon's southern DPS (*Acipenser medirostris*), Sacramento River winter-run Chinook salmon ESU, Central Valley Steelhead DPS, and the Central Valley Spring-run Chinook ESU are not likely to be adversely affected by the proposed action. The green sturgeon, Sacramento River winter-run Chinook salmon, Central Valley steelhead and Central Valley spring-run Chinook salmon are not likely to be adversely affected because the project activities do not occur in Central Valley streams where these species occur. In addition, sediment effects to San Francisco Bay, where these species rear and migrate through, are expected to be discountable or insignificant. The proposed restoration activities occur outside of the eulachon spawning and incubation period. In addition, no restoration projects will occur in estuaries, and sediment input from upstream project sites into estuaries are expected to be discountable or insignificant. Therefore, eulachon and green sturgeon are not likely to be adversely affected while they rear or feed in estuaries.

This concludes ESA consultation in accordance with 50 CFR 402.12 for the proposed RGP's impacts on Pacific eulachon, North American green sturgeon, Sacramento River winter-run Chinook salmon ESU, Central Valley Steelhead DPS, and the Central Valley Spring-run Chinook ESU. However, further consultation may be required if: 1) new information becomes available indicating that listed species or habitat may be affected by the project in a manner or to an extent not previously considered; 2) current project plans change in a manner that causes an effect to listed species or critical habitat in a manner not previously considered; or 3) a new species is listed or critical habitat designated that may be affected by the action.

The enclosed EFH consultation (Enclosure 2) was prepared pursuant to section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA). The proposed action includes areas identified as EFH for coho salmon and Chinook salmon under the Pacific Coast Salmon Fishery Management Plan. Based on our analysis, NMFS concludes that EFH for Pacific groundfish and coastal pelagic species would not be affected by the project, however the project would adversely affect EFH for coho salmon and Chinook salmon and one EFH conservation recommendation is provided in the EFH consultation. The MSFCMA and Federal regulations (50 CFR 600.920) to implement the EFH provisions require Federal action agencies to provide a written response to EFH Conservation Recommendations within 30 days of receipt. The final response must include a description of measures proposed to avoid, mitigate, or offset the adverse impacts of the activity. If the response is inconsistent with the EFH Conservation Recommendations, an explanation of the reasons for not implementing them must be included.

If you have any questions regarding these consultations, please contact Justin Ly at (707) 825-5154 or justin.ly@noaa.gov; or Rick Rogers at (707) 578-8552 or rick.rogers@noaa.gov

Sincerely,

FOR [signature]

Rodney R. McInnis
Regional Administrator

Enclosures
1. Biological Opinion
2. EFH Consultation

cc: Copy to File: ARN 151422SWR2009AR00155

Enclosure 1

BIOLOGICAL OPINION

ACTION AGENCY:	United States Army Corps of Engineers, San Francisco District
ACTION:	Issuance of a Regional General Permit to the California Department of Fish and Game for the Fisheries Restoration Grant Program implementation.
CONSULTATION CONDUCTED BY:	National Marine Fisheries Service, Southwest Region
TRACKING NUMBER:	2010/01038
DATE ISSUED:	JUN - 9 2010

I. CONSULTATION HISTORY

On March 23, 2009, the NOAA's National Marine Fisheries Service (NMFS) received a request from the U.S. Army Corps of Engineers (Corps) for formal consultation under section 7(a)(2) of the Endangered Species Act), as amended (16 U.S.C. 1531 *et seq.*) for the proposed issuance of a regional general permit (RGP) authorizing the placement of fill material into the waters of the United States for a five year period starting in 2010. The proposed RGP is for habitat restoration activities under the California Department of Fish and Game's (CDFG) Fisheries Restoration Grant Program (Grant Program). The request for consultation concerns the effects of the proposed Grant Program and associated restoration activities on the threatened Southern Oregon/Northern California Coast (SONCC) coho salmon (*Oncorhynchus kisutch*), Central California Coast coho salmon, California Coastal (CC) Chinook salmon (*O. tshawytscha*), Northern California (NC) steelhead (*O. mykiss*), Central California Coast (CCC) steelhead, Southern-Central California Coast (S-CCC) steelhead, and their designated critical habitats. In addition, the Corps also requested consultation on the Central Valley steelhead, Central Valley spring-run Chinook salmon, and the Sacramento River winter-run Chinook salmon.

In response to the March 23, 2009, consultation request, NMFS responded with a letter, dated May 12, 2009, requesting additional information about the implementation period, number and location of restoration activities, and effects of the proposed action. To address these concerns, NMFS and CDFG personnel met several times during the last half of 2009 to discuss further refinements of the proposed action and potential limits (or "sideboards") that would help inform the scope and intensity of Grant Program implementation. To briefly summarize, CDFG agreed to amend the proposed action by limiting the number and spacing between sediment-producing[1] restoration projects, including fish screen maintenance and repair as part of the Grant Program, and requiring the precautionary removal of stored sediment associated with instream structures either modified or removed through the Grant Program. The amended proposed action was forwarded by CDFG to the Corps on February 1, 2010, and from the Corps to NMFS via a letter dated March 19, 2010, that also amended their consultation request to include: 1) formal consultation on the recently listed Pacific eulachon (*Thaleichthys pacificus*), and 2) a request for concurrence that the RGP was not likely to adversely affect the threatened North American green sturgeon (*Acipenser medirostris*). NMFS received the Corps letter on March 22, 2010, and responded with a letter dated March 26, 2010, acknowledging that consultation has been initiated.

On April 27, 2010, staff from the Corps and NMFS discussed the Corps' request for consultation on the Central Valley steelhead, Central Valley spring run Chinook salmon, Sacramento River winter-run Chinook salmon, and Pacific eulachon. Based on the discussion, the Corps determined that these species are not likely to be adversely affected and transmitted that determination to NMFS via an email that day.

A complete administrative record for this consultation is held at the NMFS Arcata Area Office.

II. DESCRIPTION OF THE PROPOSED ACTION

The Corps proposes to issue a five-year Department of the Army RGP to CDFG pursuant to section 404 of the Federal Clean Water Act for the placement of fill material into the waters of the United States to annually implement anadromous salmonid habitat restoration projects under the Grant Program. The proposed RGP applies to portions of the following coastal counties that are within the regulatory jurisdictional boundaries of the Corps' San Francisco District: San Benito, San Luis Obispo, Monterey, Santa Cruz, San Mateo, Santa Clara, San Francisco, Alameda, Contra Costa, Solano, Napa, Marin, Sonoma, Mendocino, Humboldt, Del Norte, Shasta, Siskiyou, Trinity, Glen, and Lake (Figure 1). Types of projects to be authorized include: instream habitat improvement, fish passage improvement, bank stabilization, riparian restoration, streamflow augmentation, upslope restoration, and fish screen installation, maintenance and repair. NMFS does not anticipate any interrelated or interdependent activities.

Based on information obtained from CDFG's Application for Department of the Army Permit, signed November 3, 2008; the CDFG Manual; CDFG's 2010 Mitigated Negative

1 Sediment-producing projects are those projects that are likely to deliver appreciable sediment into the stream environment, and include the following project types: instream habitat restoration, streambank stabilization, fish passage improvement, upslope road restoration, and fish screen installation.

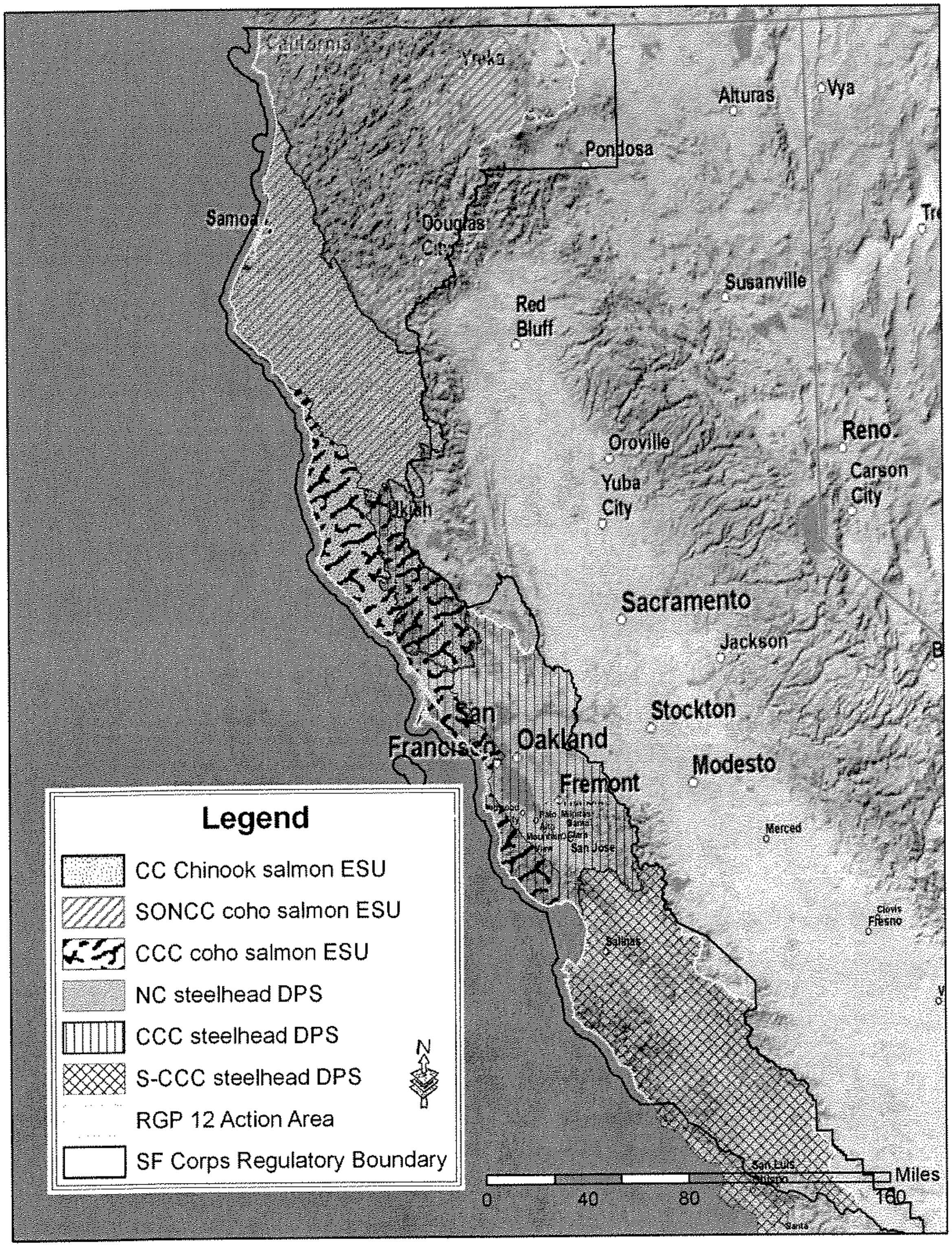

Figure 1. Action area and listed salmonid species range.

Declaration (Flosi and Carpio 2010); the Corps' March 19, 2010, letter and enclosure; and subsequent discussions with the Corps and CDFG, the following is a description of the proposed action. The Grant Program has an annual grant cycle, initiated in the spring of each year, that provides both Federal and state funds to applicants to restore anadromous salmonid habitat in coastal streams. Each proposal goes through a rigorous review process by the CDFG Technical Review Team (members include personnel from CDFG, NMFS and the State Coastal Conservancy), regional field evaluators, the California Coastal Salmonid Restoration Grants Peer Review Committee and the Director of CDFG. During the review process, reviewers evaluate the biological soundness, technical feasibility, and the cost effectiveness of each proposal and make recommendations for funding based on coast-wide and regional goals and priorities, including recommendations identified in the *Steelhead Restoration and Management Plan for California* (CDFG 1996), *Recovery Strategy for California Coho Salmon* (CDFG 2003), and the *Recovery Plan for the CCC Coho Salmon Evolutionarily Significant Unit* (ESU; NMFS 2010). Projects selected for funding are typically announced the following January. Projects that do receive funding from the Grant Program are designed to restore anadromous salmonid habitat with the goal of increasing populations of wild anadromous salmonids. Not all projects chosen in January will necessarily be implemented in the following low-flow season. Implementation is dependent upon the scope and scheduling of individual projects, but must be implemented within two to five years of receiving the grant. The CDFG manages the grants for each project that receives funding and coordinates with each applicant for permitting and implementation. The majority of the Grant Program funding goes to restoration projects that improve instream cover, pool habitat, and spawning habitat; screen diversions; remove barriers to fish passage; and reduce or eliminate erosion and sedimentation impacts.

Similar to the previous Grant Program operation, Adaptive Watershed Management funded (Adaptive funded) projects and certain non-CDFG funded projects (at CDFG's discretion) will be included under the RGP. Adaptive and non-CDFG funded projects are expected to be similar in scope and magnitude to those projects covered within this opinion, and will produce similar effects on listed fish and critical habitat. CDFG and NMFS do not expect more than several additional projects per year to result from these inclusions. However, inclusion will be contingent upon each individual project meeting the terms outlined below, which generally ensure that Adaptive and non-CDFG funded projects will undergo the same review process and include the same Best Management Practices as CDFG-funded projects.

(a) Projects will adhere to the same requirements as projects that are funded through the Grant Program;

(b) Projects will be high priority projects, as determined by CDFG, that were developed with assistance by CDFG;

(c) Techniques utilized will adhere to the CDFG Habitat Restoration Manual (Restoration Manual);

(d) The 1602 Agreement issued by CDFG will be conditioned upon language stated in the mitigated negative declaration and the RGP (including NMFS Terms and Conditions from this biological opinion, Clean Water Act 401 and 404 requirements); and

(e) CDFG oversight will include 100 percent implementation monitoring and 10 percent effectiveness/validation monitoring.

On an annual basis, prior to the summer low-flow construction season, CDFG will provide the Corps notification and a list of the scheduled restoration projects that fall within the scope and coverage of the RGP. Projects that are not within the scope of the RGP and that may affect listed salmonids will require separate consultation by the Corps and NMFS under section 7 of the ESA. Projects that include dam removal, large fish ladders, fish hatchery operation/fish stocking, salmon in the classroom, obstruction blasting (with explosives), and pile driving fall outside of the scope of this RGP and, thus, will not be authorized through the RGP and must be consulted on separately.

All restoration projects authorized through the proposed RGP will conform to mandates of the California Legislature in the Fish and Game Code and Public Resources Code, and will be consistent with the procedures described in the Restoration Manual. Part IX of the Restoration Manual includes multiple measures to minimize impacts to salmonids and salmonid habitat during implementation of habitat restoration projects. In addition, habitat restoration projects will adhere to current CDFG and/or NMFS Guidelines and Criteria as identified and referenced in the Restoration Manual.

A. Description of Restoration Project Types

The proposed RGP will authorize minor fill discharges of earth, rock, and wood associated with the implementation and construction of individual habitat restoration projects. Projects authorized through the RGP that require instream restoration activities will be implemented annually during the summer low-flow period[2]. Work around streams is restricted to the period of June 15 through November 1 or the first significant rainfall. The Restoration Manual provides information, guidance, and techniques for proper implementation of various types of salmonid restoration projects. For this consultation, restoration projects have been grouped together by type and are summarized below. A more detailed description of restoration projects is provided by the referenced chapters of the Restoration Manual.

1. Instream Habitat Improvements

Instream habitat structures and improvements are intended to provide escape from predators and resting cover, increase spawning habitat, improve upstream and downstream migration corridors, improve pool to riffle ratios, or add habitat complexity and diversity. These types of projects

[2] NMFS may grant a project-specific exemption allowing instream work after November 1 if significant precipitation has yet to fall and NMFS determines that the chance of encountering adult salmon/steelhead remains unlikely.

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. Specific techniques for instream habitat improvements are described in Part VII of the Restoration Manual, entitled *Project Implementation*, and 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), or placement of imported spawning gravel.

Large woody debris (LWD) may also be used to enhance pool formation and improve habitat. Selected logs will have a minimum diameter of 12 inches and a minimum length 1.5 times the mean bankfull width of the stream channel reach type at the deployment site. Root wads will have a minimum root bole diameter of five feet, a minimum bole length of 15 feet, and span at least half the channel type bankfull width.

2. Instream Barrier Modification for Fish Passage Improvement

Instream barrier modification projects attempt to improve salmonid fish passage and increase access to currently inaccessible salmonid habitat. Techniques for improving fish passage are described in Part VII of the Restoration Manual, entitled *Project Implementation.* These activities include modifying log jams (typically less than 10 cubic yards), beaver dams, natural waterfalls and chutes, and landslides, to improve salmonid fish passage. CDFG will only modify natural features such as these if there is a clear benefit to salmonids. This category also includes the removal and/or modification of flashboard dam structures[3]. Implementing fish passage improvement projects may require heavy equipment use (*i.e.*, self-propelled logging yarders, mechanical excavators, backhoes, *etc.*); however, hand labor will be used when possible. Although in some cases the Restoration Manual will recommend the use of small explosives to modify a fish passage barrier, this activity will not be analyzed in this opinion due to additional effects associated with using explosives. Thus, projects that utilize explosives will not be authorized through the RGP.

3. Stream Bank Stabilization

Reducing sediment delivery to the stream environment will improve fish habitat and fish survival by increasing fish embryo and alevin survival in spawning gravels, reducing juvenile salmonid injury from high concentrations of suspended sediment, and minimizing pool loss from excess sediment deposition. The proposed activities will attempt to reduce sediment from bank erosion

[3] Flashboard dams are small hardened sills spanning the stream channel that impound small sections of stream through placing and removing wooden slats; the structures are most often associated with diversion headgates or pumps supplying an agricultural water supply. Flashboard dams are typically small, simple structures that trap little sediment upstream of the sill, the potential effects to salmonids from removing or modifying these structures would be inline with effects resulting from culvert removal or replacement projects (*i.e.*, minor, short-term sediment impacts and potential harm from capturing and relocating fish during project construction).

by stabilizing stream banks with appropriate site-specific techniques, including: boulder stabilization structures, log stabilization structures, tree revetment, native plant material revetment, willow wall revetment, willow siltation baffles, brush mattresses, check dams, brush check dams, water bars, and exclusionary fencing. Guidelines for stream bank stabilization techniques are described in Part VII of the Restoration Manual, entitled *Project Implementation.* Implementing these types of projects may require the use of heavy equipment (*e.g.*, self-propelled logging yarders, mechanical excavators, backhoes); however, hand labor will be used when possible.

4. Fish Passage Improvement at Stream Road Crossings

Fish passage improvement projects attempt to improve or restore salmonid access to spawning and rearing areas blocked by stream crossings such as culverts, bridges, and paved and unpaved fords. Part IX of the Restoration Manual, entitled *Fish Passage Evaluation at Stream Crossings*, provides 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. Fish Passage Improvement projects will result in new or retrofitted crossings where the crossing will be at least as wide as the active channel, will be designed to pass the 100-year storm flow, and will have culvert or piling bottoms buried below the streambed. Projects may also contain downstream grade control or small fish ladders, if NMFS and CDFG engineers believe those features improve the stability and function of the crossing. Part XII of the Restoration Manual describes methods and designs for improving fish passage at stream crossings.

Projects that will be authorized through the RGP must be designed and implemented consistent with the CDFG *Culvert Criteria for Fish Passage* (Appendix IX-A, Restoration Manual) and NMFS Southwest Region *Guidelines for Salmonid Passage at Stream Crossings* (Appendix IX-B, Restoration Manual). In addition, all future projects that are authorized through the RGP will require field review, design review, and design approval from a CDFG or NMFS fish passage specialist prior to project implementation.

5. Riparian Habitat Restoration

The goal of riparian restoration is to improve salmonid habitat through increased stream shading that will lower stream temperatures, increase future LWD recruitment, and increase bank stability and invertebrate production. Riparian habitat restoration projects will also restore riparian habitat by increasing plant numbers and plant groupings. Chapter XI of the Restoration Manual describes riparian restoration methods and design, including guidance on natural regeneration, livestock exclusionary fencing, bioengineering, and revegetation projects.

6. Upslope Watershed Restoration

Upslope watershed restoration projects attempt to reduce excessive sediment delivery to anadromous salmonid streams. Part X of the Restoration Manual, entitled *Upslope Assessment and Restoration Practices*, describes methods for identifying and assessing erosion problems, evaluating appropriate treatments, and implementing erosion control treatments in salmonid watersheds. Road related upslope watershed restoration projects will include: road decommissioning, upgrading, and storm proofing. The specific project elements may include road ripping or decompacting; installing or maintaining rolling dips (critical dips); installing or maintaining waterbars and crossroad drains; removing, replacing, maintaining or cleaning culverts; outsloping roadbeds; revegetating work sites; and excavating stream crossings with spoils stored on site or end-hauled. Only sites that are expected to erode and deliver sediment to the stream are proposed for restoration work (Flosi and Carpio 2010).

7. Fish Screens[4]

Screens are utilized to prevent juvenile salmonid entrainment within water diverted for agriculture, power generation, or domestic use. Screens are needed on both gravity flow and pump diversion systems. Current fish screen design standards specify the following screening criteria: 1) perforated metal plate, or mesh material, with openings sized to prevent entrainment of juvenile salmonids; 2) debris cleaning devices, typically brushes, water jets, or compressed air, to prevent plugging; and 3) bypass routes return fish to the stream channel. Normally, a flow measuring device and head gate are also required to monitor and control diversion flows. This section also includes maintenance, cleaning and repair of associated fish screens funded and constructed through the Grant Program.

Screen designs are complex and site specific, and many require professional engineering; therefore, specific screen designs are not included within the Restoration Manual. However, Appendix S in the Restoration Manual provides guidelines and criteria for designing functional downstream-migrant fish passage facilities at water withdrawal projects, including guidance on structure placement, approach velocity, sweeping velocity, screen openings, and screen construction. Projects that are authorized through the Grant Program must be designed and implemented consistent with the most current versions of the CDFG *Fish Screen Criteria* and the NMFS Southwest Region *Fish Screening Criteria for Salmonids,* as discussed and referenced in Appendix S in the Restoration Manual.

8. Streamflow Augmentation

CDFG funds projects to enhance and restore stream flows for anadromous salmonids. The three project types include:

[4] Only fish screen installation, maintenance and repair is considered as part of the Proposed Action. This biological opinion does not consider or analyze the effect any water diversion may have on instream flow levels and salmonid habitat, and does not include incidental take authorization for the act of diverting water.

a. Water Conservation Measures

Eligible water conservation projects are those that provide more efficient use of water extracted from stream systems, enabling reduced water diversion requirements. Ditch lining, piping, stock-water systems, and tail-water recovery/management systems are included in this category. Water saved by these projects must be dedicated to the stream for anadromous salmonid benefits. CDFG will not pay for water conservation measures without an instream dedication of the water saved.

b. Water Measuring Devices (Instream and Water Diversion)

Eligible water measuring device projects are those that will install, test and maintain instream and water diversion measuring devices. These devices enable diversions from the stream to be controlled so excess withdrawals can be avoided. Project designs must follow guidelines described in the Water Measurement Manual, third edition (United States Bureau of Reclamation; http://www.usbr.gov/pmts/hydraulics_lab/pubs/wmm/wmm.html). The instream gauges must be installed so they do not impede fish passage in anadromous streams.

c. Water Purchase / Lease

Eligible water purchase projects are those that include the purchase, lease, or acquisition of water rights, both short- and long-term, that will protect and improve water quality and quantity. This category includes water conservation purchases or leases that will result in quantifiable amounts of water being made available in streams for fish use. Proposals for water conservation purchases or leases must describe the mechanism that would be used to track downstream travel of water purchased or leased.

B. Sideboards, Minimization Measures, and Best Management Practices

1. Sideboards

A key component of this RGP involves the use of "sideboards" that establish a minimum distance between instream projects and limit the number of instream projects annually constructed within a watershed. These sideboards also establish specific, measurable project metrics that, when exceeded, signify that the adverse effects analyzed within the biological opinion may be exceeded, and re-consultation may be necessary. For the following discussion, sediment-producing projects include instream habitat improvement, instream barrier removal, stream bank stabilization, fish passage improvement, upslope road work, and fish screen construction (unless the screen is located in a diversion ditch and is disconnected from the waterway).

The following are sideboards proposed by CDFG for the proposed action:

a. Distance between instream projects

Each year, all instream projects will be separated both upstream and downstream from other proposed RGP permitted instream projects by at least 1500 lineal feet in fish bearing stream reaches. In non-fish bearing reaches, the distance separating sediment-producing projects will be 500 feet.

b. Annual limit on the number of sediment-producing projects per HUC 10 watershed

CDFG will limit the number of instream projects implemented annually within any HUC 10 watershed in accordance with Table 1 below.

Table 1. Maximum annual number of proposed instream and upslope projects per HUC 10 watershed.

Square mile of HUC 10 watershed	Maximum number of instream and upslope projects per year
<50	2
51-100	3
101-150	4
151-250	5
251-350	6
351-500	9
>500	12

The sideboards identified above will help ensure that potential sediment impacts will remain spatially isolated, thus minimizing cumulative turbidity effects. The number of projects allowed per HUC 10 watershed was proportionally derived with regard to watershed size under the assumption that larger watersheds can better absorb project effects since projects will likely be spread over a greater spatial area.

2. Minimization Measures and Best Management Practices

a. Fish Relocation and Dewatering

The following project activities authorized through the proposed RGP may require fish relocation and/or dewatering activities when fish are present at a project location: Instream Habitat Improvements, Instream Barrier Modification for Fish Passage Improvement, Stream Bank Stabilization, Fish Passage Improvements at Stream Crossings, Fish Passage Design and Implementation and Fish Screen Projects.

CDFG personnel (or designated agents) will capture and relocate fish and amphibians away from the restoration project work site to avoid direct mortality and minimize injury or death of listed species. Fish relocation activities will be consistent with the measures presented below, excerpted from *Measures to Minimize Impacts to Aquatic Habitat and Species during Dewatering of Project Sites*, on pages IX-51 and IX-52 of Restoration Manual.

CDFG will ensure the following measures are followed in order to minimize adverse impacts.

- 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.

- Coordinate project site dewatering with a fisheries biologist qualified to perform fish and amphibian relocation activities.

- Minimize the length of the dewatered stream channel and duration of dewatering.

- Bypass stream flow around the work area while maintaining stream flow below the construction site.

- The work area must often 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 should be covered with 1/8-inch mesh to prevent entrainment of fish or amphibians that failed to be removed. Check intake periodically for impingement of fish or amphibians, and relocate them using the same measures outlined above.

- Discharge wastewater from construction area to an upland location where it will not drain sediment-laden water back to the stream channel.

For minor actions, where the disturbance to construct coffer dams and dewater in order to isolate the work site would be greater than to complete the action (for example, placement of a single boulder cluster), the action will be carried out without dewatering and fish relocation. Furthermore, measures will be put in place immediately downstream of the work site to capture suspended sediment. This may include installation of silt catchment fences across the stream, or placement of a filter berm of clean river gravel. Silt fences and other non-native materials will be removed from the stream following completion of the activity. Gravel berms may be left in place after breaching, provided they do not impede the stream flow.

Additional measures to minimize injury and mortality of salmonids during fish relocation and dewatering activities (excerpted from *Measures to Minimize Injury and Mortality of Fish and Amphibian Species during Dewatering*, on pages IX-52 and IX-53 of the Restoration Manual) are presented below:

> Prior to dewatering a construction site, fish and amphibian species should be captured and relocated to avoid direct mortality and minimize take. This is especially important if listed species are present within the project site.
>
> - Fish relocation activities must be performed only by qualified fisheries biologists, with a current CDFG collectors permit, and experience with fish capture and handling. Check with a CDFG biologist for assistance.
> - In regions of California with high summer air temperatures, perform relocation activities during morning periods.
> - Periodically measure air and water temperatures. Cease activities when instream water temperature exceeds 18 °C.
> - Exclude fish from reentering the work area by blocking the stream channel above and below the work area with fine-meshed net or screen. Mesh should be no greater than 1/8-inch diameter. It is vital to completely secure the bottom edge of net or screen to the channel bed to prevent fish from reentering the work area. Exclusion screening should be placed in areas of low water velocity to minimize fish impingement. Screens should be regularly checked and cleaned of debris to permit free flow of water.
> - Prior to capturing fish, determine the most appropriate release location(s). Consider the following when selecting release site(s):
>   a. Similar water temperature as capture location
>   b. Ample habitat for captured fish
>   c. Low likelihood of fish reentering work site or becoming impinged on exclusion net or screen.

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

- Electrofishing should only be conducted by properly trained personnel following CDFG and NOAA guidelines.

- Minimize handling of salmonids. However, when handling is necessary, always wet hands or nets prior to touching fish.

- 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.

- Place a thermometer in holding containers and, if necessary, periodically conduct partial water changes to maintain a stable water temperature. If water temperature reaches or exceeds 18 °C, fish should be released and rescue operations ceased.

- Avoid overcrowding in containers. Have at least two containers and segregate young-of-year (YOY) fish from larger age-classes to avoid predation. Place larger amphibians, such as Pacific giant salamanders, in container with larger fish. If fish are abundant, periodically cease capture, and release fish at predetermined locations.

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

- Submit reports of fish relocation activities to CDFG and NOAA in a timely fashion.

- If feasible, plan on performing initial fish relocation efforts 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.

- If mortality during relocation exceeds 5 percent, stop efforts and immediately contact the appropriate agencies.

b. Instream Construction

Measures to minimize disturbance associated with instream habitat restoration are presented below. Measures are excerpted from *Measures to Minimize Disturbance from Construction,* on page IX-50 of the Restoration Manual:

- Construction should occur during the dry period if the channel is seasonally dry.
- Prevent any construction debris from falling into the stream channel. Any material that does fall into a stream during construction should be immediately removed in a manner that has minimal impact to the streambed and water quality.
- Where feasible, the construction should occur from the bank, or on a temporary pad underlain with filter fabric.
- Temporary fill must be removed in its entirety prior to close of work-window.
- Areas for fuel storage, refueling, and servicing of construction equipment must be located in an upland location.
- Prior to use, clean all equipment to remove external oil, grease, dirt, or mud. Wash sites must be located in upland locations so that dirty wash water does not flow into the stream channel or adjacent wetlands.
- All construction equipment must be in good working condition, showing no signs of fuel or oil leaks.
- Petroleum products, fresh cement, and other deleterious materials must not enter the stream channel.
- Operators must have spill clean-up supplies on site and be knowledgeable in their proper use and deployment.
- In the event of a spill, operators must immediately cease construction, start clean-up, and notify the appropriate authorities.

c. Water Quality

Measures to minimize water quality degradation associated with construction activities are presented below, which are excerpted from *Measures to Minimize Degradation of Water Quality,* on pages IX-50 and IX-51 of the Restoration Manual:

- Isolate the construction area from flowing water until project materials are installed and erosion protection is in place.

- Erosion control measures shall be in place at all times during construction. Do not start construction until all temporary control devices (straw bales, silt fences, *etc.*) are in place downslope or downstream of project site.

- Maintain a supply of erosion control materials onsite to facilitate a quick response to unanticipated storm events or emergencies.

- Use erosion controls that protect and stabilize stockpiles and exposed soils to prevent movement of materials. 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.

- 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 unavailable, determine location where material will be deposited. If feasible, conserve topsoil for reuse at project location or use in other areas.

- Minimize temporary stockpiling of excavated material.

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

- 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.

- To limit the downstream discharge of sediment following the construction, replacement or retrofitting of a culvert, channel stabilization structure, or any other structure that has accumulated an upstream "wedge" of sediment, at least 80% of that wedge must be removed as part of the design and construction of that project. The required volume to be removed may be modified if NMFS or CDFG hydrologists or hydraulic engineers agree that removing a smaller amount will better protect and enhance fish habitat in the area of the project (*e.g.*, leaving some sediment to replenish areas downstream that lack suitable substrate volume or quality).

d. Riparian Vegetation

Measures to minimize the loss or disturbance of riparian vegetation associated with habitat restoration are presented below, which are excerpted from *Measures to Minimize Loss or Disturbance of Riparian Vegetation,* on page IX-50 of the Restoration Manual:

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

- Retain as much understory brush and as many trees as feasible, emphasizing shade producing and bank stabilizing vegetation.

- Minimize soil compaction by using equipment with a greater reach or that exerts less pressure per square inch on the ground, resulting in less overall area disturbed and less compaction of disturbed areas.

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

- Decompact disturbed soils at project completion as heavy equipment exits the construction area.

- Revegetate disturbed and decompacted areas with native species specific to the project location that comprise a diverse community of woody and herbaceous species.

e. Fish Screens

Measures to minimize effects to salmonids associated with fish screen construction, maintenance, and repair are presented below.

- Screening projects will only take place on diversions with a capacity of 60 cfs or less. Screening larger diversions will require separate consultation.
- Fish screens shall be operated and maintained in compliance with current law, including Fish and Game Code, and CDFG fish screening criteria. CDFG screening criteria may be referenced on the internet at: http://www.dfg.ca.gov/fish/Resources/Projects/Engin/Engin_ScreenCriteria.asp

- Notwithstanding Fish and Game Code section 6027, fish screens and bypass pipes or channels shall be in-place and maintained in working order at all times water is being diverted.

- If a screen site is dewatered for repairs or maintenance when targeted fish species are likely to be present, measures will be taken to minimize harm and mortality to targeted species resulting from fish relocation and dewatering activities. The responsible party shall notify CDFG before the project site is de-watered and streamflow diverted. The notification will provide a reasonable time for personnel to supervise the implementation of a water diversion plan and oversee the safe removal and relocation of salmonids and other fish life from the project area. If the project requires site dewatering and fish relocation, the responsible party will implement the following measures to minimize harm and mortality to listed salmonids:

- The responsible party will provide fish relocation data to CDFG on a form provided by CDFG.

- Additional measures to minimize injury and mortality of salmonids during fish relocation and dewatering activities shall be implemented as described in Part IX, pages 52 and 53 of the Restoration Manual.

- If a fish screen is removed for cleaning or repair, measures shall be undertaken to ensure juvenile fish are not passively entrained into the diversion canal. The area should be isolated, cleared of fish, and dewatered prior to screen maintenance or replacement. If dewatering the work area is infeasible, then the area in front of the screen should be cleared of fish utilizing a seine net that remains in place until the project is complete. In the case of a damaged screen, a replacement screen shall be installed immediately or the diversion shut down until a screen is in place.

- Fish screens shall be inspected and maintained regularly (not less than two times per week) to ensure that they are functioning as designed and meeting CDFG fish screening criteria. During the diversion season, screens will be visually inspected while in operation to ensure they are performing properly. Outside the diversion season when the screening structure is dewatered, the screen and associated diversion structure shall be more thoroughly evaluated.

- Existing roads shall be used to access screen sites with vehicles and/or equipment whenever possible. If it is necessary to create access to a screen site for repairs or maintenance, access points should be identified at stable stream bank locations that minimize riparian disturbance.

- Sediment and debris removal at a screen site shall take place as often as needed to ensure that screening criteria are met. Sediment and debris will be removed and disposed at a location where they will not re-enter the water course.

- Stationary equipment used in performing screen maintenance and repairs, such as motors, pumps, generators, and welders, located within or adjacent to a stream shall be positioned over drip pans.

- Equipment which is used to maintain and/or repair fish screens shall be in good condition and checked and maintained on a daily basis to prevent leaks of materials that could be deleterious to aquatic life, wildlife, or riparian habitat.

- All activities performed in or near a stream will have absorbent materials designed for spill containment and cleanup at the activity site for use in case of an accidental spill. Clean-up of spills shall begin immediately after any spill occurs. The State Office of Emergency Services (1-800-852-7550) and CDFG shall be notified immediately after any spill occurs.

- To the extent possible repairs to a fish screen or screen site shall be made during a period of time when the target species of fish are not likely to be present (for example, in a seasonal creek, repair work should be performed when the stream is dry).

- Equipment used to maintain and/or repair fish screens shall not operate in a live stream except as may be necessary to construct coffer dams to divert stream flow and isolate the work site.

- For minor actions, where the disturbance to construct coffer dams to isolate the work site would be greater than to complete the action, measures will be put in place immediately downstream of the work site to capture suspended sediment.

- Turbid water which is generated by screen maintenance or repair activities shall be discharged to an area where it will not re-enter the stream. If the CDFG determines that turbidity/siltation levels resulting from screen maintenance or repair activities constitute a threat to aquatic life, all activities associated with the turbidity/siltation shall cease until effective CDFG-approved sediment control devices are installed and/or abatement procedures are implemented.

- No debris, soil, silt, sand, bark, slash, spoils, sawdust, rubbish, cement, or concrete or washings thereof; asphalt, paint, or other coating material; oil or petroleum products; or other organic or earthen material from any fish screen operation/maintenance/repair or associated activity of whatever nature shall be allowed to enter into, or placed where it may be washed by rainfall or runoff into a stream channel. When operations are completed, any excess materials or debris shall be removed from the work area and disposed of in a lawful manner.

f. Streamflow Augmentation

Water conservation projects that include water storage tanks and a Forbearance Agreement for the purpose of storing winter water for summer use require registration of water use pursuant to the Water Code §1228.3, and consultation with CDFG and compliance with all lawful conditions required by CDFG. Diversions to fill storage facilities during the winter and spring months shall be made pursuant to a Small Domestic Use Appropriation (SDU) filed with the State Water Resources Control Board (SWRCB). CDFG will review the appropriation of water to ensure fish and wildlife resources are protected. The following conditions shall then be applied:

a. Seasonal Restriction: No pumping is allowed when stream flow drops below 0.7 cubic feet per second (cfs) except as permitted by CDFG in the event of an emergency.

b. Bypass Flows: Pumping withdrawal rates shall not exceed 5% of stream flow. If CDFG determines that the streamflow monitoring data indicate that fisheries are not adequately protected, then the bypass flows are subject to revision by CDFG and NMFS.

c. Cumulative Impacts: Pumping days shall be assigned to participating landowner(s) when streamflows drop below 1.0 cfs to prevent cumulative impacts from multiple pumps operating simultaneously.

d. Pump Intake Screens: Pump intake screens shall comply with the "2000 California Department of Fish and Game Screening Criteria" (available at http://www.dfg.ca.gov/fish/Resources/Projects/Engin/Engin_ScreenCriteria.asp) for California streams that provide habitat for juvenile coho, Chinook and steelhead. The landowner shall be responsible for annual inspection and maintenance of screens. Additionally, the landowner, or an authorized representative of the landowner, shall be responsible for cleaning screens as needed to keep them free of debris and ensure that screen function complies with the criteria specifications.

e. CDFG shall be granted access to inspect the pump system. Access is limited to the portion of the landowner's real property where the pump is located and those additional portions of the real property that must be traversed to gain access to the pump site. Landowner shall be given reasonable notice and any necessary arrangements will be made prior to requested access, including a mutually-agreed-upon time and date. Notice may be given by mail or by telephone with the landowner, or an authorized representative of the landowner. The landowner shall agree to cooperate in good faith to accommodate CDFG access.

C. Action Area

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). The action area includes all non-tidal stream channels, riparian areas and hydrologically-linked upslope areas that will be affected by the implementation of the proposed restoration projects that are authorized under RPG 12 by the Corp's San Francisco District. The action area encompasses the following counties: Alameda, Contra Costa, Del Norte, Glenn, Humboldt, Lake, Marin, Mendocino, Monterey, Napa, San Benito, San Francisco, San Luis Obispo, San Mateo, Santa Clara, Santa Cruz, Siskiyou, Solano, Sonoma, and Trinity (Figure 1). Effects resulting from most restoration activities will be restricted to the immediate restoration project site, while some activities may result in turbidity for a short distance downstream. The specific extent of impact from each individual habitat restoration project will vary depending on project type, specific project methods, and site conditions.

III. ANALYTICAL APPROACH

Pursuant to ESA section 7(a)(2), Federal agencies are directed to ensure that any federal action funded, permitted, or carried out, is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of critical habitat. To evaluate whether an action is likely to result in jeopardy to a listed species or result in the destruction or adverse modification of designated critical habitat, NMFS considers the combination of the status of the species and critical habitat, effects of the action, and cumulative effects. An action that is not likely to jeopardize the continued existence of the listed species is one that is not likely to appreciably reduce the likelihood of both the survival and recovery of the species in the wild by reducing its numbers, reproduction, or distribution (50 CFR § 402.02). This biological opinion does not rely on the regulatory definition of destruction or adverse modification of critical habitat at 50 CPR 402.02[5]. Instead, we have relied upon the statutory provisions of the ESA to complete the following analysis with respect to critical habitat.

A. Jeopardy Analysis

NMFS equates a listed species' probability (or risk) of extinction with the likelihood of both the survival and recovery of the species in the wild for purposes of conducting jeopardy analyses under section 7(a)(2) of the ESA. In the case of listed salmonids, we use the Viable Salmonid Populations (VSP) framework (McElhany *et al.* 2000) as surrogates for numbers, reproduction, and distribution, the criteria found within the regulatory definition of jeopardy (50 CFR 402.20). The fourth VSP parameter, diversity, relates to all three criteria. A designation of "a high risk of extinction" or "low likelihood of becoming viable" indicates that the species faces significant risks from stresses and threats that can drive it to extinction. The status of the species and the environmental baseline sections of this opinion establish the species' risk of extinction.

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5 This regulatory definition has been invalidated by Federal Courts (*Gifford Pinchot Task Force v. U.S. Fish and wildlife* 378 F.3d 1059 [9th Cir. 2004] and *Sierra Club v. U.S. Fish and wildlife Service*, 245 F.3d 434 [5th Cir. 2001]).

For salmonids, the four VSP parameters are important to consider because they are predictors of extinction risk, and reflect general biological and ecological processes that are critical to the survival and recovery of the listed salmonid species (McElhany *et al.* 2000). The VSP parameters of productivity, abundance, and population spatial structure are consistent with, and are used as surrogates for, the "reproduction, numbers, or distribution" criteria found within the regulatory definition of jeopardy (50 CFR 402.02). The VSP parameter of diversity relates to all three jeopardy criteria. For example, numbers, reproduction, and distribution are all affected when genetic or life history variability is lost or constrained, resulting in reduced population resilience to environmental variation at local or landscape-levels.

Analysis of "jeopardy" is conducted in a series of steps. First, the species and life stages that may be exposed to the proposed project elements are identified. Second, available information is examined to identify direct and indirect physical, chemical, and biotic effects of the proposed actions on listed species in the action area. Available information is evaluated to identify the probable response of individuals of a species, including behavioral responses. Third, the risk to individuals is used to assess the risk to populations, stratums, and then the ESU or distinct population segment (DPS) using the VSP parameters. The risk to the ESUs or DPSs integrates available information on the current status of the respective species, the environmental baseline of the action area, and the cumulative effects to determine whether the proposed action would reasonably be expected to appreciably reduce a species' likelihood of surviving and recovering in the wild.

The jeopardy analysis in this biological opinion places an emphasis on the range-wide likelihood of both survival and recovery of listed species and the role of the action area in the survival and recovery of listed species. The significance of the effects of the proposed Federal action is considered in this context, taken together with cumulative effects, for purposes of making the jeopardy determination. We use a hierarchical approach that focuses first on whether or not the effects on salmonids in the action area will impact their respective population. If the population will be impacted, we assess whether this impact is likely to affect the ability of the population to support the survival and recovery of the DPS or ESU.

B. Adverse Modification Determination

The basis of the "destruction or adverse modification" analysis is to evaluate whether the proposed action results in negative changes in the function and value of the critical habitat in the conservation of the species. Therefore, NMFS bases the critical habitat analysis on the affected areas and functions of critical habitat essential for the conservation of the species (not on how individuals of the species will respond to changes in habitat quantity and quality).

For purposes of the adverse modification determination, we add the effects of the proposed Federal action on designated critical habitat in the action area, and any cumulative effects, to the environmental baseline and then determine if the resulting changes to the conservation value of critical habitat in the action area are likely to cause an appreciable reduction in the conservation value of critical habitat ESU/DPS-wide. Similar to the hierarchical approach used above, if the proposed action will negatively affect the primary constituent elements (PCEs) of critical habitat in the action area we then assess whether the conservation value of the stream reach or river, larger watershed areas, and whole watersheds will be reduced. If these larger geographic areas are likely to have their critical habitat value reduced, we then assess whether or not this reduction will impact the conservation value of the DPS or ESU critical habitat designation as a whole.

C. Use of Best Available Scientific and Commercial Information

To conduct the assessment, NMFS examined an extensive amount of information from a variety of sources. Detailed background information on the biology and status of the listed species and critical habitat has been published in a number of documents including peer reviewed scientific journals, primary reference materials, and governmental and non-governmental reports. Additional information regarding the effects of the project's actions on the listed species, their anticipated response to these actions, and the environmental consequences of the actions as a whole was formulated from the aforementioned resources, the years of monitoring reports for the Grant Program, and applicable project meeting notes.

IV. STATUS OF THE SPECIES

This biological opinion analyzes the effects of the proposed action on the following listed species and their designated critical habitats:

Threatened Southern Oregon/Northern California coho salmon (*Oncorhynchus kisutch*)
Listing determination (70 FR 37160; June 28, 2005)
Critical habitat designation (64 FR 24049; May 5, 1999)

Endangered Central California Coast (CCC) coho salmon
Listing determination (70 FR 37160; June 28, 2005)
Critical habitat designation (64 FR 24049; May 5, 1999)

Threatened California Coastal (CC) Chinook salmon (*O. tshawytscha*)
Listing determination (70 FR 37160; June 28, 2005)
Critical habitat designation (70 FR 52488; September 2, 2005)

Threatened Northern California (NC) steelhead (*O. mykiss*)
Listing determination (71 FR 834; January 5, 2006)
Critical habitat designation (70 FR 52488; September 2, 2005)

Threatened Central California Coast (CCC) steelhead
Listing determination (71 FR 834; January 5, 2006)

Critical habitat designation (70 FR 52488; September 2, 2005)

Threatened Southern-Central California Coast (S-CCC) steelhead
Listing determination (62 FR 43937; August 18, 1997)
Critical habitat designation (70 FR 52488; September 2, 2005)

NMFS assessed the status of these species by examining four types of information, all of which help inform a population's ability to survive and recover. These population viability parameters are: abundance, population growth rate, spatial structure, and diversity (McElhany *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 and factors responsible for the current status of each ESU and DPS.

A. Species Life History and Range

Life history diversity of federally listed species substantially contributes to their persistence, and conservation of such diversity is a critical element of recovery efforts (Beechie *et al.* 2006). Waples *et al.* (2001) and Beechie *et al.* (2006) found that life history and genetic diversity of Pacific salmon and steelhead (*Oncorhynchus* spp.) show a strong, positive correlation with the extent of ecological diversity experienced by a species.

1. <u>Coho salmon</u>

a. Life History

Adult coho salmon reach sexual maturity at 3 years, and die after spawning. Precocious 2 year olds, especially males, also make up a small percentage of the spawning population. Coho salmon adults migrate and spawn in small streams that flow directly into the ocean, or tributaries and headwater creeks of larger rivers (Sandercock 1991; Moyle 2002). Adults migrate upstream to spawning grounds from September through late December, peaking in October and November. Spawning occurs mainly in November and December, with fry emerging from the gravel in the spring, approximately 3 to 4 months after spawning. Juvenile rearing usually occurs in tributary streams with a gradient of 3 percent or less, although they may move up to streams of 4 percent or 5 percent gradient. Juveniles have been found in streams as small as 1 to 2 meters wide. They may spend 1 to 2 years rearing in freshwater (Bell and Duffy 2007), or emigrate to an estuary shortly after emerging from spawning gravels (Tschaplinski 1988). Coho salmon juveniles are also known to "redistribute" into non-natal rearing streams, lakes, or ponds, often following rainstorms, where they continue to rear (Peterson 1982). At a length of 38 to 45 mm, fry may migrate upstream a considerable distance to reach lakes or other rearing areas (Godfrey 1965; Sandercock 1991; Nickelson *et al.* 1992). Emigration from streams to the estuary and ocean generally takes place from March through May.

b. Range

The SONCC coho ESU includes all naturally spawned populations of coho salmon in coastal streams from the Elk River, Oregon, through the Mattole River, California. It also includes three artificial propagation programs: Cole River Hatchery in the Rogue River Basin, Trinity River and Iron Gate Hatcheries in the Klamath-Trinity River Basin.

The CCC coho ESU includes all naturally spawned populations of coho salmon from Punta Gorda in northern California south to and including the San Lorenza River in central California, as well as populations in tributaries to San Francisco Bay, excluding the Sacramento-San Joaquin River system, as well as four artificial propagation programs: the Don Clausen Fish Hatchery Captive Broodstork Program, Scott Creek/Kind Fisher Flats Conservation Program, Scott Creek Captive Broodstock Program, and the Noyo River Fish Station egg-take Program coho hatchery Programs.

2. <u>Chinook salmon</u>

a. Life History

Adult Chinook salmon reach sexual maturity usually at 3 to 5 years, and die soon after spawning. Precocious 2 year olds, especially male jacks, make up a relatively small percentage of the spawning population. Healey (1991) describes two basic life history strategies for Chinook salmon, stream-type and ocean-type, within which there is a strategy that provides variation within the species. Like most salmonids, Chinook salmon have evolved with variation in juvenile and adult behavioral patterns, which can help decrease the risk of catastrophically high mortality in a particular year or habitat (Healey 1991). Spring-run Chinook salmon are often stream-type (Healey 1991; Moyle 2002). Adults return to lower-order headwater streams in the spring or early summer before they reach sexual maturity, and hold in deep pools and coldwater areas until they spawn in early fall (Healey 1991; Moyle 2002). This strategy has been allowing spring-run Chinook salmon to take advantage of mid-elevation habitats inaccessible during the summer and fall due to low flows and high water temperatures (Moyle 2002). Juveniles emerge from the gravel in the early spring and typically spend one year in freshwater before migrating downstream to estuaries and then the ocean (Moyle 2002). A CDFG outmigrant trapping program on the Mad River found a small proportion of Chinook juveniles oversummer in freshwater (Sparkman 2002).

Fall-run Chinook salmon are unambiguously ocean-type (Moyle 2002); specifically adapted for spawning in lowland reaches of big rivers and their tributaries (Moyle 2002; Quinn 2005). Adults move into rivers and streams from the ocean in the fall or early winter in a sexually mature state and spawn within a few weeks or days upon arrival on the spawning grounds (Moyle 2002). Juveniles emerge from the gravel in late winter or early spring and within a matter of months, migrate downstream to the estuary and the ocean (Moyle 2002; Quinn 2005). This life history strategy allows fall-run Chinook salmon to utilize quality spawning and rearing areas in the valley reaches of rivers, which are often too warm to support juvenile salmonid rearing in the summer (Moyle 2002).

b. Range

The CC Chinook salmon ESU includes all naturally spawned populations of Chinook salmon from rivers and streams south of the Klamath River (exclusive) to the Russian River (inclusive). Seven artificial propagation programs are considered part of the ESU: the Humboldt Fish Action Council (Freshwater Creek), Yager Creek, Redwood Creek, Hollow Tree, Van Arsdale Fish Station, Mattole Salmon Group, and Mad River Hatchery fall-run Chinook hatchery programs.

Only fall-run Chinook salmon currently occur in the CC Chinook salmon ESU. Spring-run stocks no longer occur in the North-Central California Coast Recovery Domain which includes the region between Redwood Creek in Humboldt County and Aptos Creek in Santa Cruz County. However, information indicates that spring-run Chinook salmon existed in the Mad River and the North Fork and Middle Fork of the Eel River (Keter 1995; Myers *et al.* 1998; Moyle 2002).

3. Steelhead

a. Life History

Steelhead probably have the most diverse range of any salmonid life history strategies (Quinn 2005). There are two basic steelhead life history patterns, winter-run and summer-run (Quinn 2005, Moyle 2002). Winter-run steelhead enter rivers and streams from December to March in a sexually mature state and spawn in tributaries of mainstem rivers, often ascending long distances (Moyle 2002). Summer steelhead (also known as spring-run steelhead) enter rivers in a sexually immature state during receding flows in spring, and migrate to headwater reaches of tributary streams where they hold in deep pools until spawning the following winter or spring (Moyle 2002). Spawning for all runs generally takes place in the late winter or early spring. Eggs hatch in 3 to 4 weeks and fry emerge from the gravel 2 to 3 weeks later (Moyle 2002). Juveniles spend 1 to 4 years in freshwater before migrating to estuaries and the ocean where they spend 1 to 3 years before returning to freshwater to spawn. Another life history diversity of steelhead is the "half pounder." Half pounder steelhead are sexually immature steelhead that spend about 3 months in estuaries or the ocean before returning to lower river reaches on a feeding run (Moyle 2002). Half pounders then return to the ocean where they spend 1 to 3 years before returning to freshwater to spawn. Unlike Pacific salmon, steelhead are iteroparous, or capable of spawning more than once before death (Busby *et al.* 1996). However, it is rare for steelhead to spawn more than twice before dying; most that do so are females (Busby *et al.* 1996). Some steelhead "residualize," becoming resident trout and never adopting the anadromous life history.

b. Range

The NC steelhead DPS includes all naturally spawned populations of steelhead in California coastal river basins from Redwood Creek (inclusive) southward to the Russian River (exclusive). Two artificial propagation programs are considered part of the DPS: the Yager Creek Hatchery and the North Fork Gualala River Hatchery (Gualala River Steelhead Project).

The CCC steelhead DPS includes all naturally spawned anadromous *O. mykiss* (steelhead) populations below natural and manmade impassable barriers in California streams from the Russian River (inclusive) to Aptos Creek (inclusive), and the drainages of San Francisco, San Pablo, and Suisun Bays eastward to Chipps Island at the confluence of the Sacramento and San Joaquin Rivers. Tributary streams to Suisun Marsh including Suisun Creek, Green Valley Creek, and an unnamed tributary to Cordelia Slough (commonly referred to as Red Top Creek), excluding the Sacramento-San Joaquin River Basin, as well as two artificial propagation programs: the Don Clausen Fish Hatchery, and Kingfisher Flat Hatchery/ Scott Creek (Monterey Bay Salmon and Trout Project) steelhead hatchery programs.

The S-CCC steelhead DPS includes all naturally spawned anadromous populations of *O. mykiss* in coastal river basins from the Pajaro River in Monterey County southward to but not including the Santa Maria River in San Luis Obispo County.

B. Factors Responsible for the Decline of All Species (ESU or DPS Scale)

The factors that have caused declines in the salmonid ESUs/DPSs are similar. These factors include habitat loss due to dam building, degradation of freshwater habitats due to a variety of agricultural and forestry practices, water diversions, urbanization, mining, and severe recent flood events, which are exacerbated by land use practices (Good *et al.* 2005). Sedimentation and loss of spawning gravels associated with poor forestry practices and road building are particularly acute problems that can reduce the productivity of salmonid populations. Nonnative Sacramento pikeminnow (*Ptychocheilus grandis*) occupy the Eel River basin and prey on juvenile salmonids (Good *et al.* 2005) and compete for the same resources. Droughts and unfavorable ocean conditions in the late 1980s and early 1990s were identified as further likely causes of decline (Good *et al.* 2005).

1. <u>Timber Harvest</u>

Timber harvest and associated activities occur over a large portion of the range of the affected species. Timber harvest has caused widespread increases in sediment delivery to channels through both increased landsliding and surface erosion from harvest units and log decks. Much of the largest riparian vegetation has been removed, reducing future sources of LWD needed to form and maintain stream habitat that salmonids depend on during various life stages.

In the smaller streams, recruited wood usually cannot be washed away, so logs remain in place and act as check-dams that store sediment eroded from hillsides (Reid 1998). Sediment storage in smaller streams can persist for decades (Nakamura and Swanson 1993).

In fish-bearing streams, woody debris is important for storing sediment, halting debris flows, and decreasing downstream flood peaks, and its role as a habitat element becomes directly relevant for Pacific salmon species (Reid 1998). LWD alters the longitudinal profile and reduces the local gradient of the channel, especially when log dams create slack pools above or plunge pools below them, or when they are sites of sediment accumulation (Swanston 1991).

Cumulatively, the increased sediment delivery and reduced woody debris supply have led to widespread impacts to stream habitats and salmonids. These impacts include reduced spawning habitat quality, loss of pool habitat for adult holding and juvenile rearing, loss of velocity refugia, and increases in the levels and duration of turbidity which reduce the ability of juvenile fish to feed and, in some cases, may cause physical harm by abrading the gills of individual fish. These changes in habitat have led to widespread decreases in the carrying capacity of streams that support salmonids.

2. Road Construction

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

The delivery of sediment to streams can be generally considered as either chronically delivered, or more episodic in nature. Chronic delivery refers to surface erosion that occurs from rain splash and overland flow. More episodic delivery, on the order of every few years, occurs in the form of mass wasting events, or landslides, that deliver large volumes of sediment during large storm events.

Construction of road networks can also greatly accelerate erosion rates within a watershed (Haupt 1959; Swanson and Dyrness 1975; Swanston and Swanson 1976; Reid and Dunne 1984; Hagans and Weaver 1987). Once constructed, existing road networks are a chronic source of sediment to streams (Swanston 1991) and are generally considered the main cause of accelerated surface erosion in forests across the western United States (Harr and Nichols 1993). Processes initiated or affected by roads include landslides, surface erosion, secondary surface erosion (landslide scars exposed to rainsplash), and gullying. Roads and related ditch networks are often connected to streams via surface flow paths, providing a direct conduit for sediment. Where roads and ditches are maintained periodically by blading, the amount of sediment delivered continuously to streams may temporarily increase as bare soil is exposed and ditch roughness features which store and route sediment and also armor the ditch are removed. Hagans and Weaver (1987) found that fluvial hillslope erosion associated with roads in the lower portions of the Redwood Creek watershed produced about as much sediment as landslide erosion between 1954 and 1980. In the Mattole River watershed, the Mattole Salmon Group (1997) found that roads, including logging haul roads and skid trails, were the source of 76% of all erosion problems mapped in the watershed. This does suggest that, overall, roads are a primary source of sediment in managed watersheds.

Road surface erosion is particularly affected by traffic, which increases sediment yields substantially (Reid and Dunne 1984). Other important factors that affect road surface erosion include condition of the road surface, timing of when the roads are used in relation to rainfall, road prism moisture content, location of the road relative to watercourses, methods used to construct the road, and steepness on which the road is located.

3. Hatcheries

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 and 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 the subsequent hybridization of hatchery and wild fish. Artificial propagation threatens the genetic integrity and diversity that protects overall productivity against changes in environment (61 FR 56138, October 31, 1996). The potential adverse impacts of artificial propagation programs are well documented (Waples 1991; Waples 1999; National Research Council 1995).

4. Water Diversions and Habitat Blockages

Stream-flow diversions are common throughout the species' ranges. Unscreened diversions for agricultural, domestic and industrial uses are a significant factor for salmonid declines in many basins. Reduced stream-flows due to diversions reduce the amount of habitat available to salmonids and can degrade water quality, such as causing water temperatures to elevate more easily. Reductions in the water quantity will reduce the carrying capacity of the affected stream reach. Where warm return flows enter the stream, fish may seek reaches with cooler water, thus increasing competitive pressures in other areas.

Habitat blockages have occurred in relation to road construction as discussed previously. However, hydropower, flood control, and water supply dams of different municipal and private entities, have permanently blocked or hindered salmonid access to historical spawning and rearing grounds. The percentage of habitat lost blocked by dams is likely greatest for steelhead because steelhead were more extensively distributed upstream than Chinook or coho salmon. As a result of migrational barriers, salmon and steelhead populations have been confined to lower elevation mainstems that historically only were used for migration and rearing. Population abundances have declined in many streams due to decreased quantity, quality, and spatial distribution of spawning and rearing habitat (Lindley *et al.* 2007). Higher temperatures at these lower elevations during late-summer and fall are also a major stressor to adult and juvenile salmonids.

5. Predation

Predation was not believed to play a major role in the decline of salmon populations; however, it may have had substantial impacts at local levels. For example, Higgins *et al.* (1992) and CDFG (1994) reported that Sacramento River pikeminnow have been found in the Eel River basin and are considered a major threat to native salmonids. Furthermore, populations of California sea lions and Pacific harbor seals, known predators of salmonids which occur in most estuaries and rivers where salmonid runs occur on the West Coast, have increased to historical levels because harvest of these animals has been prohibited by the Marine Mammal Protection Act of 1972 (Fresh 1997). However, salmonids appear to be a minor component of the diet of marine mammals (Scheffer and Sperry 1931; Jameson and Kenyon 1977; Graybill 1981; Brown and Mate 1983; Roffe and Mate 1984; Hanson 1993). In the final rule listing the SONCC coho salmon ESU (62 FR 24588, May 6, 1997), for example, NMFS indicated that it was unlikely that pinniped predation was a significant factor in the decline of coho salmon on the west coast, although they may be a threat to existing depressed local populations. NMFS (1997) determined that although pinniped predation did not cause the decline of salmonid populations, predation may preclude recovery of these populations in localized areas where they co-occur with salmonids (especially where salmonids concentrate or passage may be constricted). Specific areas where pinniped predation may preclude recovery cannot be determined without extensive studies.

6. Disease

Relative to effects of overfishing, habitat degradation, and hatchery practices, disease is not believed to have been a major cause in the decline of salmon populations. However, disease may have substantial impacts in some areas and may limit recovery of local salmon populations. Although naturally occurring, many of the disease issues salmon and steelhead currently face have been exacerbated by human-induced environmental factors such as water regulation (damming and diverting) and habitat alteration.

Salmonids are exposed to numerous bacterial, protozoan, viral, and parasitic organisms in spawning and rearing areas, hatcheries, migratory routes, and the marine environment. However, disease outbreaks result only when the complex interaction among host, pathogen, and environment is altered. Natural populations of salmonids have co-evolved with pathogens that are endemic to the areas salmonids inhabit and have developed levels of resistance to them. In general, diseases do not cause significant mortality in native salmonid stocks in natural habitats

(Bryant 1994; Shapovalov and Taft 1954); however, our understanding of mortality caused by pathogens in the wild is limited by the difficulty in determining the proximate and ultimate causes of death (*e.g.* when fish weakened by disease are consumed by predators). Within the last few decades, the introduction and prevalence of disease into wild stocks has become an increasing concern.

7. Commercial and Recreational Fisheries

Salmon and steelhead once supported important tribal, commercial, and recreation fisheries. Over-utilization including harvest for commercial and recreational fisheries has been identified by NMFS as a significant factor in their decline. The proportion of harvest taken by sport and commercial harvesters has varied over the years according to abundance and social and economic priorities. Steelhead are rarely caught in the ocean fisheries. Ocean salmon fisheries are managed by NMFS to achieve Federal conservation goals for west coast salmon in the Pacific Coast Salmon Fishery Management Plan (FMP). The goals specify numbers of adults that must be allowed to spawn annually, or maximum allowable adult harvest rates. The key stocks in California are Klamath River fall-run Chinook salmon and Sacramento River fall-run Chinook salmon. In addition to the FMP goals, salmon fisheries must meet requirements developed through NMFS' intra-agency section 7 consultations.

In addition to the reduction in numbers of spawners, ocean salmon fisheries may reduce the viability of Chinook salmon populations through negative effects on demographics. The capture of immature fish by ocean fisheries results in a reduction in the proportion of a cohort that spawns as older, larger fish.

The commercial and recreational ocean fisheries for salmon were closed in 2008 due to record low returns of Sacramento River fall-run Chinook, and were extended through the 2009-2010 fishing season. The only exception to the 2009-2010 closure was a ten-day recreational ocean salmon season along the northern California coast targeting Klamath River fall-run Chinook, which was a result of the number of projected spawners surpassing conservation goals. The 2008-2010 restrictions on the commercial and recreational fisheries have decreased incidental take of listed salmonids. With the slight increase in the projected Sacramento River Chinook Salmon escapement, there is a very limited commercial and recreational fishery in 2010-2011.

8. Climate Change

Climate change is likely to have a negative impact on salmonids throughout the Pacific Northwest due to large reductions in available freshwater habitat (Battin *et al.* 2007). Widespread declines in springtime snow water equivalent (SWE), which is the amount of water contained in the snowpack, have occurred in much of the North American West since the 1920s, especially since mid-century (Knowles and Cayan 2004; Mote 2006). This decrease in SWE can be largely attributed to a general warming trend in the western United States since the early 1900s (Mote *et al.* 2005; Regonda *et al.* 2005; Mote 2006), even though there have been modest upward precipitation trends in the western United States since the early 1900s (Hamlet *et al.* 2005). The largest decreases in SWE are taking place at low to mid elevations (Mote 2006; Van Kirk and Naman 2008) because the warming trend overwhelms the effects of increased precipitation (Hamlet *et al.* 2005; Mote *et al.* 2005; Mote 2006). These climactic changes have resulted in earlier onsets of springtime snowmelt and streamflow across western North America (Hamlet and Lettenmaier 1999; Regonda *et al.* 2005; Stewart *et al.* 2004), as well as lower flows in the summer (Hamlet and Lettenmaier 1999; Stewart *et al.* 2004).

The projected runoff-timing trends over the course of the twenty first century are most pronounced in the Pacific Northwest, Sierra Nevada, and Rocky Mountain regions, where the eventual temporal centroid of streamflow (*i.e.,* peak streamflow) change amounts to 20 to 40 days in many streams (Stewart *et al.* 2004). Although climate models diverge with respect to future trends in precipitation, there is widespread agreement that the trend toward lower SWE and earlier snowmelt will continue (Zhu *et al.* 2005; Vicuna *et al.* 2007). Thus, availability of water resources under future climate scenarios is expected to be most limited during the late summer (Gleick and Chalecki 1999; Miles *et al.* 2000). A one-month advance in timing centroid of streamflow would also increase the length of the summer drought that characterizes much of western North America, with important consequences for water supply, ecosystem, and wildfire management (Stewart *et al.* 2004). These changes in peak streamflow timing and snowpack will negatively impact salmonid populations due to habitat loss associated with lower water flows, higher stream temperatures, and increased human demand for water resources.

The global effects of climate change on river systems and salmon are often superimposed upon the local effects of logging, water utilization, harvesting, hatchery interactions, and development within river systems (Bradford and Irvine 2000; Mayer 2008; Van Kirk and Naman 2008). For example, total water withdrawal in California, Idaho, Oregon and Washington increased 82 percent between 1950 and 2000, with irrigation accounting for nearly half of this increase (MacKichan 1951; Hutson *et al.* 2004), while during the same period climate change was taking place.

9. Ocean Conditions

Variability in ocean productivity has been shown to affect fisheries production both positively and negatively (Chavez *et al.* 2003). Beamish and Bouillion (1993) showed a strong correlation between North Pacific salmon production and marine environmental factors from 1925 to 1989. Beamish *et al.* (1997a) noted decadal-scale changes in the production of Fraser River sockeye salmon that they attributed to changes in the productivity of the marine environment. Warm ocean regimes are characterized by lower ocean productivity (Behrenfeld *et al.* 2006; Wells *et al.* 2006), which may affect salmon by limiting the availability of nutrients regulating the food supply, thereby increasing competition for food (Beamish and Mahnken 2001). Data from across the range of coho salmon on the coast of California and Oregon reveal there was a 72 percent decline in returning adults in 2007-08 compared to the same cohort in 2004-05 (MacFarlane *et al.* 2008). The Wells Ocean Productivity Index, an accurate measure of Central California ocean productivity, revealed poor conditions during the spring and summer of 2006, when juvenile coho salmon and Chinook salmon from the 2004-05 spawn entered the ocean (McFarlane *et al.* 2008). Data gathered by NMFS suggests that strong upwelling in the spring of 2007 may have resulted in better ocean conditions for the 2007 coho salmon cohort (NMFS 2008). The quick response of salmonid populations to changes in ocean conditions (MacFarlane *et al.* 2008) strongly suggests that density dependent mortality of salmonids is a mechanism at work in the ocean (Beamish *et al.* 1997b; Levin *et al.* 2001; Greene and Beechie 2004).

10. Marine Derived Nutrients

Marine-derived nutrients (MDN) are nutrients that are accumulated in the biomass of salmonids while they are in the ocean and are then transferred to their freshwater spawning sites where the salmon die. The return of salmonids to rivers makes a significant contribution to the flora and fauna of both terrestrial and riverine ecosystems (Gresh *et al.* 2000), and has been shown to be vital for the growth of juvenile salmonids (Bilby *et al.* 1996, 1998). Evidence of the role of MDN and energy in ecosystems suggests this deficit may result in an ecosystem failure contributing to the downward spiral of salmonid abundance (Bilby *et al.* 1996). Reduction of MDN to watersheds is a consequence of the past century of decline in salmon abundance (Gresh *et al.* 2000).

C. Viability of the ESUs/DPS

1. Viability Assessment

a. Coho salmon

(1) Population size. The most recent status review concluded SONCC and CCC coho salmon populations "...continue to be depressed relative to historical numbers, and [there are] strong indications that breeding groups have been lost from a significant percentage of streams within their historical range (Good *et al.* 2005)." Since 2005, population estimates within the majority of SONCC and CCC range have continued to steadily decline with some populations experiencing small population dynamics. The Shasta River and Mattole River populations had only a few returning adults in the 2009-2010 season, leaving this cohort at high risk of extinction. The reduced abundance contributes significantly to long-term risk of extinction, and is likely to contribute to short-term risk of extinction in the foreseeable future. On June 28, 2005, NMFS changed the ESA designation of the CCC ESU from threatened to endangered (70 FR 37160). NMFS concludes that these ESUs fall far short of McElhany's 'default' goal of historic population numbers and distribution and are therefore not viable in regards to the population size VSP parameter.

(2) Population productivity. Populations of SONCC and CCC coho salmon have declined substantially from historic levels. The current impaired productivity level contributes significantly to long-term risk of extinction and may contribute to short-term risk of extinction in the foreseeable future. As productivity does not appear sufficient to maintain viable abundances in many SONCC and CCC coho salmon populations, NMFS concludes these ESUs are not viable in regards to the population productivity VSP parameter.

(3) Spatial structure. Low levels of observed presence in historically occupied SONCC coho streams (32 to 56 percent from 1986 to 2000) indicate continued low abundance in the California portion of the SONCC coho salmon ESU. Presence of CCC coho declined from 72 percent in 1987 to less than 50 percent in the mid-1990s. Recent information for SONCC and CCC coho salmon indicates that their distribution within their ESUs has been reduced and fragmented, as evidenced by an increasing number of previously occupied streams from which they are now absent (NMFS 2001). However, extant populations can still be found in all major river basins within the ESUs (70 FR 37160, June 28, 2005).

Reduced presence in historically occupied streams indicates coho salmon's current spatial structure contributes significantly to long-term risk of extinction but does not in itself constitute a danger of extinction in the near future. As the 'default' historic spatial processes described by McElhany *et al.* (2000) have likely not been preserved, due to the habitat fragmentation described above, NMFS concludes these ESUs are not viable in regards to the spatial structure VSP parameter.

(4) Diversity. Genetic variability is important because differing genetic traits favor a population being able to survive and reproduce under changing environmental conditions. With regard to the SONCC and CCC coho salmon ESUs, human activities (including construction of migration barriers) have eliminated portions of some coho salmon populations from the ESUs. In addition, runs of coho salmon within many river systems are now composed largely of hatchery fish further reducing genetic variability. NMFS concludes the current diversity in these ESUs are much reduced compared to historic levels, so by McElhany's criteria they are not viable in regards to the diversity VSP parameter.

b. Chinook salmon

(1) Population size. The most recent status review found continued evidence of: (1) low population sizes relative to historical abundance, (2) mixed trends in the few time series of abundance indices available for analysis, and (3) low abundances and potential extirpations of populations in the southern part of the CC Chinook salmon ESU (Good *et al.* 2005). The reduced abundance contributes significantly to long-term risk of extinction, and is likely to contribute to short-term risk of extinction in the foreseeable future. NMFS concludes this ESU falls far short of McElhany's 'default' goal of historic population numbers and distribution and is therefore not viable in regards to the population size VSP parameter.

(2) Population Productivity. Populations of CC Chinook salmon have declined substantially from historic levels. The reduced growth rate and productivity of populations indicates its current impaired productivity level which contributes significantly to long-term risk of extinction and may contribute to short-term risk of extinction in the foreseeable future. As productivity does not appear sufficient to maintain viable abundances in many CC Chinook salmon populations, NMFS concludes this ESU is not viable in regards to the population productivity VSP parameter.

(3) Spatial Structure. The current reduced spatial structure contributes significantly to long-term risk of extinction but does not in itself constitute a danger of extinction in the near future (Good *et al.* 2005). However, Good *et al.* (2005) found that "reduction in geographic distribution, particularly for spring-run Chinook [salmon], and for basins in the southern portion of the ESU, continues to present substantial risk." As the 'default' historic spatial processes described by McElhany *et al.* (2000) have likely not been preserved, due to the reduction in geographic distribution, NMFS concludes this ESU is not viable in regards to the spatial structure VSP parameter.

(4) Diversity. As of 2005, Bjorkstedt *et al.* concluded "most recent and ongoing artificial propagation efforts in the CC Chinook ESU are small in scale and restricted to supplementing depressed populations with progeny of local broodstock (2005)." The low hatchery production observed in the ESU is less likely to mask trends in ESU population structure and pose risks to ESU diversity than if hatchery production were higher, making hatchery production less of a concern for this ESU than others. The BRT did have concerns with respect to diversity that were based largely on the loss of spring-run Chinook salmon in the Eel River basin and elsewhere in the ESU, and to a lesser degree on the potential loss of diversity concurrent with low abundance or extirpation of populations in the southern portion of the ESU (Good *et al.* 2005). NMFS concludes the current diversity in this ESU is much reduced compared to historic levels, so by McElhany's criteria it is not viable in regards to the diversity VSP parameter.

c. Steelhead

(1) Population size. Reviewers participating in the most recent status review determined population abundances were low relative to historical estimates, and that summer-run steelhead abundance was very low (Good *et al.* 2005). Regarding abundance, reviewers concluded "Although there are older data for several of the larger river systems that imply run sizes became much reduced since the early twentieth century, there are no recent data suggesting much of an improvement" (Good *et al.* 2005). The reduced abundance contributes significantly to long-term risk of extinction, and may contribute to short-term risk of extinction in the foreseeable future. NMFS concludes these DPSs falls far short of McElhany's 'default' goal of historic population numbers and distribution and are therefore not viable in regards to the population size VSP parameter.

(2) Population productivity. Populations of NC, CCC, and S-CCC steelhead have declined substantially from historic levels. Reduced growth rate and productivity indicates the DPSs' current impaired productivity level contributes significantly to long-term risk of extinction and may contribute to short-term risk of extinction in the foreseeable future. As productivity does not appear sufficient to maintain viable abundances in many steelhead populations, NMFS concludes these DPSs are not viable in regards to the population productivity VSP parameter.

(3) Spatial structure. Reduced spatial structure and connectivity within the steelhead DPSs is not the primary factor contributing to risk of extinction, but there is some concern that it may add risk, in combination with other factors. Blockages to fish passage exist on several major rivers in the DPSs and on numerous small tributaries (Good *et al.* 2005). These blockages degrade the spatial structure and connectivity of populations within the DPSs. As the 'default' historic spatial processes described by McElhany *et al.* (2000) have likely not been preserved, NMFS concludes these DPSs are not viable in regards to the spatial structure VSP parameter.

(4) Diversity. Millions of steelhead from outside their natal DPSs have been stocked into rivers many times since the 1970s. Bjorkstedt *et al.* (2005) documented many releases of this kind, and many of these releases occurred over multiple years. Additionally, the abundance of summer-run steelhead was considered "very low" in 1996 (Good *et al.* 2005), indicating an important part of the life history diversity in these DPSs may be at risk. NMFS concludes the current diversity in these DPSs is much reduced compared to historic levels, so by McElhany's criteria, they are not viable in regards to the diversity VSP parameter. In addition, the genetic integrity of the DPSs may have been compromised by hatchery introductions.

e. Summary

(1) Coho salmon. The SONCC coho salmon ESU is not currently viable and is likely to become in danger of extinction in the near future (Good *et al.* 2005). NMFS believes CCC coho salmon ESU is currently not viable and is in danger of extinction (Good *et al.* 2005).

(2) Chinook salmon. The CC Chinook salmon ESU is currently not viable. Status reviews have had difficulty assessing the risk of extinction for the ESU. However, there is special concern due to the more precipitous declines in distribution and abundance in spring-run Chinook salmon. Many of the risk factors are particularly acute in the southern portion of the ESU and are compounded by uncertainty stemming from the general lack of population monitoring in California (Good *et al.* 2005).

(3) Steelhead. The NC steelhead DPS is not viable; however, extinction risk has not been identified in status reviews. The CCC steelhead DPS is not viable and was originally determined to be in danger of extinction (Busby *et al.* 1996) with the most recent status update unable to make a determination of change in status since that time (Good *et al.* 2005). The S-CCC steelhead DPS is currently not viable and was originally determined to be in danger of extinction (Busby *et al.* 1996). The most recent status update was split on whether the DPS is in danger of extinction or currently not endangered but likely to become so in the foreseeable future (Good *et al.* 2005).

D. Description and Current Condition of Critical Habitats

1. Critical Habitat Description

This opinion analyzes the effects of the Project on critical habitat for SONCC coho salmon, CCC coho salmon, CC Chinook salmon, NC steelhead, CCC steelhead, and S-CCC steelhead.

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

a. Coho Salmon

Coho salmon critical habitat consists of: "the water, substrate, and adjacent riparian zone [in an ESU] . . . [below] longstanding, naturally impassable barriers (*i.e.*, natural waterfalls in existence for at least several hundred years)" (64 FR 24049, May 5, 1999). NMFS has excluded from coho salmon critical habitat designation all tribal lands in northern California and areas that are above certain dams which block access to historic habitats of listed salmonids. Critical habitat corresponds to all the water, river bed and bank areas, and riparian areas within the ESU boundaries except as noted above. Waterways include estuarine areas and tributaries. Adjacent riparian area is 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, May 5, 1999). In other words, riparian areas are those areas that produce physical, biological, and chemical features that help to create biologically productive stream habitat for salmonids. PCEs for coho salmon critical habitat include: juvenile summer and winter rearing areas, juvenile migration corridors, areas for growth and development to adulthood, adult migration corridors, and spawning areas (64 FR 24049, May 5, 1999). The current condition of critical habitat for SONCC coho salmon is discussed below in the *Conservation Value of the Critical Habitat* section.

b. Chinook salmon and Steelhead

NMFS designated critical habitat for seven of the ESUs/DPSs of Pacific salmon and steelhead, including CC Chinook salmon, NC, CCC, and S-CCC steelhead in September 2005 (70 FR 52488, September 2, 2005). The method and criteria used to define critical habitat focused on identifying the biological or physical constituent elements of habitat that are essential to the conservation of the species. The aggregated physical and biological PCEs resulted from a list of specific PCEs necessary for conservation of the listed species and included all the biological and physical attributes necessary for productive systems supporting the completion of all salmonid life history stages. These specific PCEs were identified as: Freshwater spawning sites; Freshwater rearing sites; Freshwater migration corridors; Estuarine areas; Nearshore marine areas; and Offshore marine areas. Habitat areas within the geographic range of the ESU/DPSs having these attributes and occupied by the species were considered for designation. Steelhead critical habitat was designated throughout the watersheds occupied by the ESU/DPSs. In general, the extent of critical habitat conforms to the known distribution of NC, CCC, and S-CCC steelhead in streams, rivers, lagoons and estuaries (NMFS 2005, 70 FR 52488). In some cases, streams containing steelhead were not designated because the economic benefit of exclusion outweighed the benefits of designation. Native American lands and U.S. Department of Defense lands were also excluded.

c. *Conservation Value of Critical Habitat*

The essential habitat types of designated critical habitat for SONCC and CCC coho salmon and PCEs of designated critical habitat for NC, CCC, and S-CCC steelhead and CC Chinook salmon are those accessible freshwater habitat areas that support spawning, incubation and rearing, migratory corridors free of obstruction or excessive predation, and estuarine areas with good water quality and that are free of excessive predation. Timber harvest and associated activities, road construction, urbanization and increased impervious surfaces, migration barriers, water diversions, and large dams throughout a large portion of the freshwater range of the ESUs and DPSs continue to result in habitat degradation, reduction of spawning and rearing habitats, and reduction of stream flows. The result of these continuing land management practices in many locations has limited reproductive success, reduced rearing habitat quality and quantity, and caused migration barriers to both juveniles and adults. These factors likely limit the conservation value (*i.e.*, limiting the numbers of salmonids that can be supported) of designated critical habitat within freshwater habitats at the ESU/DPS scale.

Although watershed restoration activities have improved freshwater critical habitat conditions in isolated areas, reduced habitat complexity, poor water quality, and reduced habitat availability as a result of continuing land management practices continue to persist in many locations.

2. Condition of Critical Habitat

As part of the critical habitat designation process, NMFS convened Critical Habitat Analytical Review Teams (CHARTs) for steelhead and Chinook salmon. These CHARTs determined the conservation value of Hydrologic Subareas (HSAs) of watersheds under consideration. A CHART was not convened for coho salmon, because critical habitat had already been designated in 1999. NMFS determined the condition of coho salmon critical habitat based on other, readily available information.

a. Coho Salmon

The condition of SONCC and 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: logging, agricultural and mining activities, urbanization, stream channelization, dams, wetland loss, and water withdrawals for irrigation. All of these factors were identified when SONCC and CCC coho salmon were listed as threatened under the ESA, and they all continue to affect this ESU. However, efforts to improve coho salmon critical habitat have been widespread and are expected to benefit the ESUs.

b. Chinook Salmon

For CC Chinook salmon, the CHART identified 45 occupied HSAs within the freshwater and estuarine range of the ESU. Eight HSAs were rated low in conservation value, 14 were rated medium, and 27 were rated high in conservation value (NMFS 2005). Within the ESU, CHART ratings and economic benefits analysis resulted in the designation of critical habitat with essential features for spawning, rearing and migration in approximately 1634 miles of occupied habitat. NMFS believes the status of CC Chinook salmon critical habitat in the 45 HSAs has not changed substantially since the 2005 assessment.

c. Steelhead

For NC steelhead, the CHART identified 50 occupied HSAs within the freshwater and estuarine range of the DPS. Nine HSAs were rated low in conservation value, 14 were rated medium, and 27 were rated high in conservation value (NMFS 2005). Within the DPS, the CHART ratings and economic benefits analysis resulted in designation of critical habitat with essential features for spawning, rearing and migration in approximately 3,148 miles of occupied stream habitat. NMFS believes the status of NC steelhead critical habitat in the 50 HSAs has not changed substantially since the 2005 assessment.

For the CCC steelhead the CHART identified 46 occupied HSAs within the freshwater and estuarine range of the ESU. Within the DPS, the CHART ratings and economic benefits analysis resulted in designation of critical habitat with essential features for spawning, rearing and migration in approximately 1,832 miles of stream habitat, and 442 square miles of estuarine habitat.

For the S-CCC steelhead the CHART identified 30 occupied HSAs within the freshwater and estuarine range of the ESU. Six HSAs were rated low in conservation value, 11 were rated medium, and 13 were rated high in conservation value. Essential features for spawning, rearing, and migration are contained in approximately 1,251 miles of occupied stream habitat within the HSAs.

c. Summary

Although watershed restoration activities have improved freshwater critical habitat conditions in isolated areas, reduced habitat complexity, poor water quality, and reduced habitat availability as a result of continuing land management practices continue to persist in many locations and are likely limiting the conservation value of designated critical habitat within these freshwater habitats at the ESU scale.

V. ENVIRONMENTAL BASELINE

The environmental baseline is the current status of species and critical habitat in the action area based on analysis of the effects of past and ongoing human and natural factors. 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 impacts of State or private actions which are contemporaneous with the consultation in process (50 CFR 402.02).

The action area includes all coastal anadromous California streams from Del Norte County at the Oregon/California border south to 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 has been broken into the four geographic areas- North Coast, North Central Coast, San Francisco Bay, and Central Coast (Figure 2).

The action area encompasses approximately 26,693 square miles of the central and northern California Coast Range. Native vegetation varies from old growth redwood (*Sequoia sempervirens*) forest along the lower drainages to Douglas fir (*Pseudotsuga menziesii*) intermixed with hardwoods, 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 feet. Mean rainfall amounts range from nine to 125 inches. Extreme rain events do occur, with over 240 inches being recorded over parts of the action area during 1982-83. 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 extensive road systems 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.

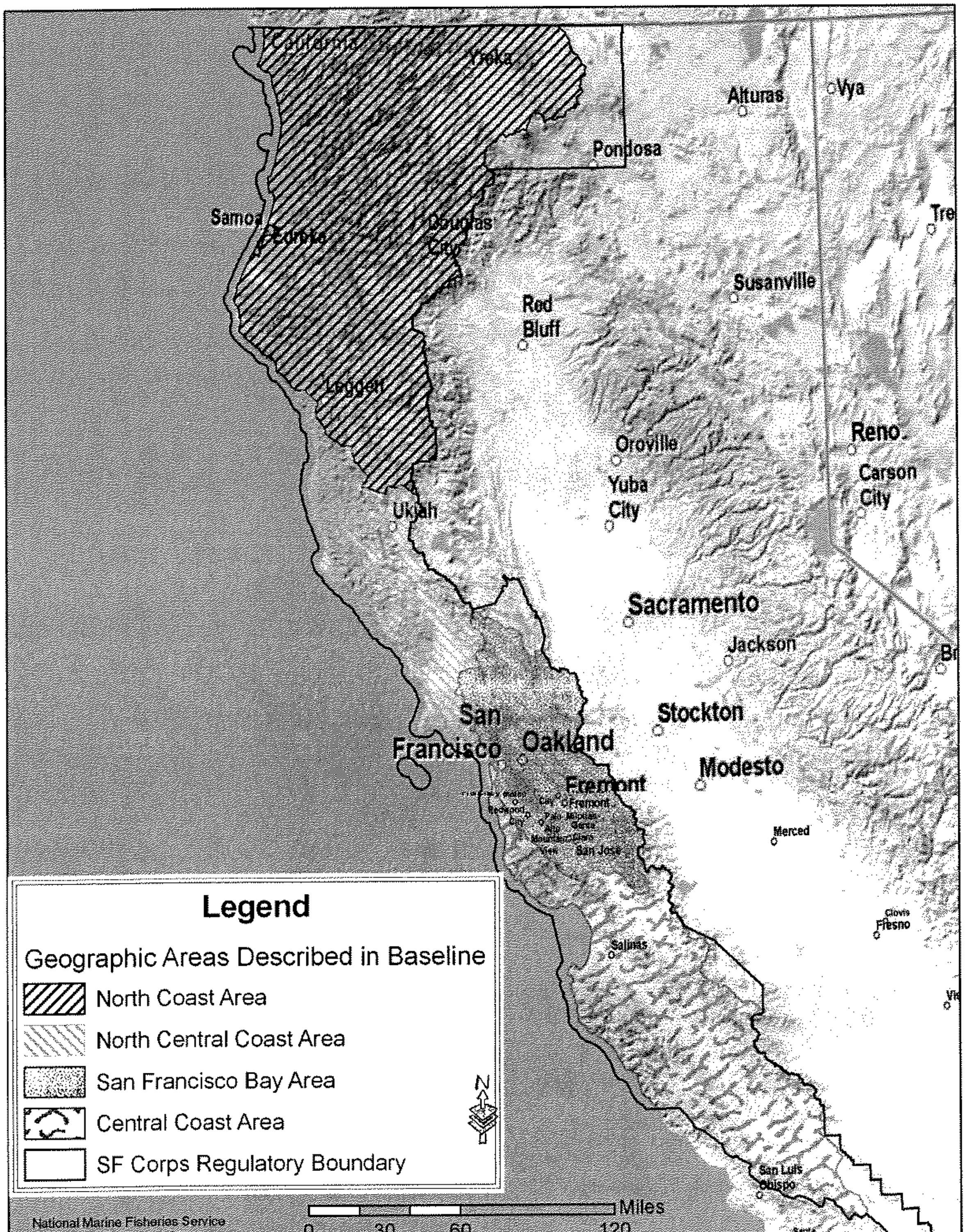

Figure 2. The geographic areas within the RGP action area

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 (Figure 2), the ESUs and watersheds present within each area, specific recent information on the status of salmon and 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 watershed.

Information in this section is broken down into the following geographic areas: North Coast Area, North Central Coast Area, San Francisco Bay Area, and the Central Coast Area. Information for the North Coast Area is organized by river system as that area is dominated by rivers so large that multiple watersheds are found within each river system. The other three areas do not contain river systems that large. The discussion of information from the North Central Coast, San Francisco Bay, and Central Coast areas are organized by hydrologic unit codes (HUCs). A few HUCs in these areas contain one river system, but most contain several small systems.

1. <u>North Coast Area</u>

This area includes all coastal streams entering the Pacific Ocean from Oregon/California Border south to Bear Harbor in Mendocino County. This area includes portions of the following counties: Del Norte, Siskiyou, Humboldt, Trinity, and Mendocino. The area includes the following USGS 4th field HUCs: Upper Klamath, Lower Klamath, Shasta, Scott, Smith, Salmon, Trinity, South Fork Trinity, Mad-Redwood, Lower Eel, South Fork Eel, Middle Fork Eel, and Upper Eel. Urban development within the North Coast Area is found primarily on the estuaries of the larger streams, though there are some small towns and rural residences throughout the area. Forestry is the dominant land-use throughout the area; there is some agriculture. The area includes the California portion of the SONCC coho salmon ESU, the northern portion of the CC Chinook salmon ESU, and the northern portion of the NC steelhead DPS, and contains designated critical habitat for all three species. As previously noted, NMFS excluded habitat above longstanding barriers from the SONCC coho salmon critical habitat designation, including areas above Iron Gate Dam (Klamath River), Dwinnell Dam (Shasta River), Lewiston Dam (Trinity River), and Scott Dam (Eel River).

a. Smith River

There is a paucity of information with regard to salmon and steelhead populations in the Smith River and trend information is very limited. CDFG (1965) estimated escapement of Chinook salmon for Smith River drainage at approximately 15,000 fish annually. The best information regarding coho salmon abundance and trends was collected during Chinook salmon spawning surveys on an index reach of the West Branch of Mill Creek by Jim Waldvogel, Sea Grant Advisor for Del Norte County (NMFS 2003). The number of adult coho salmon trapped ranged between two (1981, 1990) and 28 (1985) fish annually, with a 23 year average of 11. No negative or positive trend is apparent from these data. Despite minimal data, NMFS suspects anadromous salmonid populations within the Smith River drainage have likely experienced declines similar to other northern California/southern Oregon coastal watersheds.

Habitat conditions in the Smith River basin have been degraded by high timber harvest rates, mostly from redwood harvest on private lands in the coastal sections. Timber harvest in riparian areas has reduced the recruitment potential for LWD for decades or centuries (USFS 1995). Early logging, prior to more recent forest practice rules, removed much of the streamside vegetation, particularly along larger, more accessible channels. In many cases, regeneration within these areas is now dominated by hardwoods. Hardwood dominance has the dual effect of not providing adequately-sized wood to adjacent channels while suppressing conifer regeneration. The lack of conifer-derived woody debris is likely to persist and perhaps worsen as existing instream wood decays or is transported downstream and the adjacent stands are not capable of providing adequate replacements.

The legacy of mining roads and open pits and shafts that operated in the 1850s-1950s is still very evident in the landscapes of the North Fork Smith subbasin and in the Hardscrabble, Myrtle, Patrick, and Shelly watersheds. Many of these mining features are potential chronic sources of sediment since revegetation, and restoration is difficult due to the inherent harsh soil conditions of these areas. Hydraulic mining activity was intensive in low gradient reaches of several tributaries, significantly altering stream channel characteristics and impacting fish habitat. Currently, the lower river is being mined for aggregate material and is the primary aggregate source in the Del Norte county. Removal of gravel has likely altered spawning habitat in some areas.

A widespread and aging road network continues to present a sediment hazard to channels in the Smith River basin. Additionally, hillslope landslides from timber harvest and other activities in the watershed (*e.g.*, mining) provide additional sediment. While some information suggests that the upper portions of the Smith River may be able to transport much of the sediment, lower reaches may be vulnerable to the accumulation of this sediment. The Smith River basin is not currently listed as water quality impaired under section 303(d) of the Clean Water Act.

b. Klamath and Trinity Rivers

The Klamath River once supported diverse, abundant anadromous fish runs thought to number in the millions. Now, all of the anadromous fish species inhabiting the Klamath River are in a state of serious decline (Higgins *et al.* 1992), especially those species or stocks which depend on summer freshwater aquatic habitat, such as coho salmon, steelhead, or spring Chinook salmon.

In the Klamath River, poor water quality conditions during the summer season have been recognized as a major contributing factor to the decline of anadromous fish runs (Bartholow 1995). The main causative factor behind the poor water quality conditions in the mainstem Klamath River is the large scale water impoundment and diversion projects above Iron Gate Dam (Klamath) and Lewiston Dam (Trinity). Average annual runoff below Iron Gate Dam has declined by more than 370,000 acre-feet since inception of the Bureau of Reclamation's Klamath Project (National Research Council 2003), while up to 53 percent of the Trinity River flow has been annually diverted into the Sacramento River (DOI 2000). The large volume of water diverted from each of these basins significantly affects downstream flow levels and aquatic habitat. After analyzing both pre- and post-Klamath Project hydrologic records, Hecht and Kamman (1996) concluded that variability and timing of mean, minimum, and maximum flows changed significantly after construction of the project. Project operations tend to increase flows in October and November, and decrease flows in the late spring and summer as measured throughout the Klamath mainstem. Low summer flow volumes within the Klamath River can increase daily maximum water temperatures during critical summer months by slowing flow transit rates and increasing thermal loading when compared to higher flow levels (Deas and Orlob 1999). Moreover, further heating the already-warm, nutrient-rich water released from Iron Gate Dam typically results in poor water quality conditions (*e.g.*, low dissolved oxygen, increased algal blooms) in the Klamath River between the dam and Seiad Valley.

Lower summer flows emanating from the Klamath Project (*i.e.*, released at Iron Gate Dam) are exacerbated by diminished inflow from many of the major tributaries to the middle Klamath River. The Shasta and Scott rivers historically supported strong populations of Chinook salmon, coho salmon, and summer-run steelhead (KRBFTF 1991). However, seasonal withdrawals for agriculture in the spring and summer months can drop stream flows by more than 100 cubic feet per second (cfs) over a 24 hour period, potentially stranding large numbers of rearing juvenile salmon and steelhead. Federal, State and local agencies are currently working with landowners in the Scott and Shasta drainages to implement minimum instream flow levels sufficient to conserve salmon and steelhead habitat.

The Klamath and Trinity rivers both contain numerous instream barriers which preclude salmon and steelhead migration into much of their historic range. Iron Gate Dam and Lewiston Dam block migratory access to the headwaters of the Klamath and Trinity rivers, respectively, while numerous smaller dams, diversions, and road crossings either block or impede adult and juvenile migration within many smaller tributaries.

Much of the middle reach of the Klamath River basin (*i.e.*, between the confluence of the Trinity River and Iron Gate Dam) and Trinity River basin is under Federal ownership and not managed for intensive timber harvest. However, the lower Klamath basin below the Trinity confluence is largely under private ownership and categorized as industrial timberland. In general, surveys in this area indicate low amounts of LWD, and the existing size of LWD tends to be small, primarily 1-2 foot diameter pieces. Further, due to past logging practices and development along streams, many riparian zones tend to be dominated by alder, willow, and younger conifers

(Simpson 2002). Given the current vegetation age structure and past logging history along streams, recruitment of adequately sized woody debris to many of the stream reaches is not likely to occur for several decades. Furthermore, hillslope erosion resulting from timber harvest and road building dominates many of the tributary subbasins of the lower Klamath. For example, harvesting over a 50-year period in Hunter Creek was estimated to be responsible for 51 percent of the observed shallow landsliding volume not attributed to road-related activities (Simpson Resource Company 2002). Both the Klamath River (nutrients, organic enrichment/low dissolved oxygen, and temperature) and Trinity River (sedimentation/siltation) have been listed under section 303(d) of the Clean Water Act as water quality limited (CSWRCB 2003).

c. Mad River and Redwood Creek

The Mad River and Redwood Creek watersheds have endured a long legacy of watershed disturbance. Streamside vegetation removal, channel modifications, and instream gravel extraction dating back several decades, combined with intensive upslope activities such as timber harvest and road construction, have had a significant influence on the condition of both watersheds.

Habitat surveys within the Mad River watershed detail the low amount and small size of existing LWD (primarily 1-2 foot diameter pieces). Further, due to past logging practices and development along streams, many riparian zones tend to be dominated by alder, willow, and younger conifers (Simpson Resource Company 2002). Given the current vegetation age structure and past logging history along streams, recruitment of adequately-sized woody debris to many Mad River tributaries is not likely to occur for several decades.

Furthermore, both the Mad River and Redwood Creek watersheds are section 303(d) listed for turbidity and sedimentation due to silviculture, resource extraction, and nonpoint sources (CSWRCB 2003). A principal contributor of fine sediment is hydrologically connected road segments. Simpson Resource Company (2002) estimated that the average extent of hydrologically connected roads in the lower Mad River and associated tributaries is 30 percent. For Green Diamond (previously Simpson) roads within this area, this value equates to approximately 130 miles of roads that are hydrologically connected and capable of delivering road-generated sediment to the stream network. Further exacerbating the problem, severe mass wasting occurs throughout much of the watershed and is also a principal determinant of aquatic habitat condition. Deep-seated landslides also contribute large amounts of sediment to the mainstem Mad River and tributaries.

The steelhead population in the Mad River watershed is at risk from adverse hatchery effects. NMFS specifically identified the past practices of the Mad River Hatchery as potentially damaging to NC steelhead. CDFG out-planted non-indigenous Mad River Hatchery brood stocks to other streams within the DPS, and attempted to cultivate a run of non-indigenous summer steelhead within the Mad River. CDFG ended these practices in 1996. The current operation of the Mad River Hatchery has been identified as having potentially harmful effects to wild salmon populations as well.

The Redwood Creek watershed, although naturally prone to extensive storm-induced erosional events, has also experienced accelerated erosion due to land management activities (Redwood National State Parks 2002). Increased mass wasting and fluvial erosion have overwhelmed the stream channel's ability to efficiently move the delivered sediment, filling deep pools and depositing silt in spawning gravels used by salmonids. The Environmental Protection Agency (EPA) estimates that on average, approximately 4,750 tons of sediment per square mile are produced from the Redwood Creek watershed (EPA 1998). The EPA also estimated that 60 percent of this sediment is controllable (*i.e.,* discharges and depositions resulting from human activities that can influence water quality and can be reasonably controlled) and must be eliminated to meet instream targets. Much observed erosion is associated with an extensive road network (7.3 miles per miles squared) on private lands, improperly designed and maintained roads and skid trails, and timber harvesting. Accelerated erosion from land use practices and other causes are impacting the migration, spawning, reproduction, and early development of cold water anadromous fish such as coho salmon, Chinook salmon, and steelhead.

d. Eel River

Fishery data indicate depressed or declining abundance trends for NC steelhead, CC Chinook and SONCC coho salmon, yet observational data indicate natural populations still persist in the Eel River, albeit at low levels. 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). Bear, Jordan, and Stitz creeks, tributaries of the lower Eel River, have also been listed by the California Department of Forestry as cumulatively affected for sediment problems. 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. Up to 160,000 acre feet (219 cfs average) of water have been diverted upstream of the 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).

Intensive timber extraction within the lower Eel and Van Duzen watersheds has caused chronic erosion in certain areas due to the highly erodible soils common throughout the two watersheds. An extensive study of sediment discharge within the Eel River watershed (Brown and Ritter

1971) determined that the suspended sediment discharge increases downstream, unlike most rivers. The average annual suspended sediment load is 10,000 tons per square mile (Brown and Ritter 1971), which is one of the highest sediment yields in the world. As discussed previously, high levels of suspended sediment can impact salmonid populations by degrading essential freshwater habitat as well as harming individual fish health and modifying behavior.

The South Fork Eel River provides suitable habitat for Chinook salmon, coho salmon and steelhead. Existing conditions indicate that the South Fork Eel River has limited rearing habitat due to elevated water temperatures. Cool water seeps, thermal stratification, and habitat complexity all play critical roles in sustaining micro-habitat for juvenile and adult salmonids. Spawning habitat is present and actively used, as indicated by redd observations in the Cooks Valley area. Fishery data indicate that individual natural populations of anadromous salmonids persist at low levels in the South Fork Eel River. The Van Duzen River watershed reflects a long legacy of upstream and upslope impacts coupled with the effects of continued instream disturbances. Much of the available salmonid habitat within the Van Duzen watershed is currently degraded by high levels of sediment, low pool density, high water temperatures, and low instream cover levels. The Van Duzen River has been listed under section 303(d) of the Clean Water Act as water quality limited due to sediment problems (CSWRCB 2003).

The importance of the mainstem Van Duzen for spawning is likely to increase because of recent landslides that occurred in Grizzly Creek, an important spawning tributary. The large landslides will likely adversely affect spawning and rearing conditions in Grizzly Creek for a number of years into the future.

e. Mattole River

Although several factors have contributed to the decline of anadromous salmonid populations in the Mattole River drainage, habitat loss and modification are major determinants of their current status (FEMAT 1993). Large-scale changes to the Mattole River occurred in response to the 1955 and 1964 floods, which coincided with peak years of logging and road building in the basin. The Mattole watershed has the second highest erosion rate in northern California, second only to the Eel River (Griggs and Hein 1980), and is, thus highly sensitive to human induced disturbances within upper reaches of the watershed.

Logging practices in the Mattole River watershed were identified as the "specific critical habitat problem" in a status review by Myers *et al.* (1998). There were an estimated 3,310 miles of active and abandoned roads in the Mattole River watershed (Perala *et al.* 1993), and the combined effects of these roads may be the single largest source of fine sediment delivered to the Mattole River. Estuary habitat, a crucial link in the lifecycle of Pacific salmonids, has been reduced by excessive sedimentation, which has also resulted in higher water temperatures and adverse impacts to food resources. Likewise, elevated summer water temperatures within the mainstem, as well as many tributaries, are also a primary limiting factor for salmonids rearing in the Mattole River. The Mattole River has been listed under section 303(d) of the Clean Water Act as water quality limited due to temperature, turbidity, and sedimentation (CSWRCB 2003).

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 four ESUs/DPSs (CCC coho salmon, CC Chinook, NC steelhead, and CCC steelhead) and five USGS 4th 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 storms (*e.g.*, 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).

This HUC is within the CCC coho salmon ESU, CC Chinook salmon ESU, and the NC steelhead DPS. Salmonid abundance has declined throughout the HUC. Steelhead are widespread yet reduced in abundance, and coho and Chinook 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, CC Chinook 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's 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 the California State Water Resources Control Board (CSWRCB), 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 1999a). 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, CC Chinook 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 (Jahn 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. 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 *et al.* 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 (Cox 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 (Ketcham 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. 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. However, this stream has experienced a recent reduction in coho salmon population (Sendak 2010; NMFS 2010). 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 (Ketcham 2003).

3. <u>San Francisco Bay Area</u>

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 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 4th 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 has 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). 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: 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 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. Central Coast Area

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 4th 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.

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 1999b). 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.

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. 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. Cholame Creek 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.

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 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 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.

VI. EFFECTS OF THE PROPOSED ACTION

A. Insignificant, Discountable or Wholly Beneficial Effects

Of the eight proposed restoration project types, riparian habitat restoration and streamflow augmentation are not expected to result in adverse effects to listed species. In addition, these two project types are expected to result in habitat improvements that will benefit listed species and their critical habitats. The benefits of riparian habitat restoration will take longer to realize, but should increase stream shading, provide future LWD, and contribute to properly functioning conditions for the riparian ecosystem. Streamflow augmentation enhances rearing and spawning habitats, as well as improves access to these habitats. The specific effects of these restoration types are discussed below.

1. <u>Riparian Habitat Restoration</u>

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 provide hydraulic diversity and structural complexity to the stream channel, 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 salmon, especially coho and steelhead that rear for extended periods in freshwater.

Riparian habitat restoration techniques as outlined within the Restoration Manual are not likely to adversely affect listed salmonids or their habitat. All vegetation planting or removal (in the case of exotic species) 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 establishment 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 increase stream shading and instream cover habitat for rearing juveniles, moderate stream temperatures, and improve 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 reduced nitrogen, phosphorous, and sediment loading into the stream environment (Line *et al.* 2000; Brenner and Brenner 1998). Further, Owens *et al.* (1996) found that stream fencing has proven to be an effective means of maintaining appropriate levels of sediment in the streambed. 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.

2. Streamflow Augmentation

Leasing water and implementing water conservation measures will wholly benefit listed salmonids by keeping flow in the stream where salmonids can continue to rear and migrate. Increasing instream flow levels by diminishing out-of-channel diversions will enhance juvenile salmonid access to suitable rearing and spawning habitat, especially during the summer and early fall when flows are lowest. Installing water measuring devices will likely result in discountable or insignificant effects to listed species because these activities typically occur in diversion ditches where increased mobilization of sediment is unlikely to reach the stream channel.

3. <u>All Other Activities</u>

The remaining six proposed project types may adversely affect listed species; however, they also produce effects, such as habitat disturbance from heavy equipment operation, riparian vegetation disturbance, chemical contamination, and reduced benthic macroinvertebrate production, that are not likely to adversely affect listed species or their critical habitats. These effects are expected to be insignificant or discountable as explained further below.

a. Noise, Motion, and Vibration Disturbance from Heavy Equipment Operation

Noise, motion, and vibration produced by heavy equipment operation is expected at most instream restoration sites. However, the use of equipment primarily outside the active channel, and the infrequent temporary, short term use of heavy equipment in the wetted channel to construct cofferdams, is only expected to result in insignificant adverse effects to listed fish species. Listed salmonids will be able to avoid interaction with instream machinery by temporarily relocating either upstream or downstream into suitable habitat adjacent the worksite, In addition, the minimum distance between instream project sites and the maximum number of instream projects under the proposed RGP would further reduce the potential aggregated effects of heavy equipment disturbance on listed salmonids

b. Disturbance to Riparian Vegetation

Most proposed fisheries restoration actions are expected to avoid disturbing riparian vegetation through the proposed avoidance and minimization measures. In general, the restorative nature of these projects is to improve habitat conditions for salmonids, and thus, riparian vegetation damage is expected to be avoided, as best possible. However, there may be limited situations where avoidance is not possible.

In the rare event that streamside riparian vegetation needs to be removed, the loss of riparian vegetation is expected to be small, and limited to mostly shrubs and an occasional tree. Most riparian vegetation impacts are expected to be willows and other shrubs, which are generally easier to recover or reestablish. In addition, the revegetation of disturbed riparian areas is expected to further minimize the small, temporary loss of vegetation. Therefore, NMFS anticipates only an insignificant loss of riparian habitat and function within the action area to result from the proposed restoration activities.

c. Chemical Contamination from Equipment Fluids

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, all fisheries restoration projects will include the measures outlined in the sections entitled, *Measures to Minimize Disturbance From Instream Construction* and *Measures to Minimize Degradation of Water Quality* within Part IX of the Restoration Manual, which address and minimize pollution risk from equipment operation. Therefore, water quality degradation from toxic chemicals associated with the habitat restoration projects is discountable and insignificant.

d. Reduced Benthic Macroinvertebrate Community

Benthic (*i.e.*, bottom dwelling) aquatic macroinvertebrates may be temporarily lost or their abundance reduced when stream habitat is dewatered (Cushman 1985) up to 300 contiguous feet. Effects to aquatic macroinvertebrates resulting from stream flow diversions and dewatering will be temporary because instream construction activities occur only during the low flow season, and rapid recolonization (about one to two months) of disturbed areas by macroinvertebrates is expected following rewatering (Cushman 1985, Thomas 1985, Harvey 1986). 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 resulting from dewatering activities is not expected to adversely affect coho salmon, Chinook salmon, and steelhead.

B. Adverse Effects to Listed Species

The purpose of this section is to identify the direct and indirect adverse effects of the proposed action on the listed species and their designated critical habitat. The species and their designated critical habitat 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 all three listed salmonids, while other sites may be located in streams where only steelhead are present.

Individual restoration projects authorized through the five-year RGP that require instream activities will be implemented annually during the low flow period between June 15 and November 1. 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 avoidance and minimization measures that will be utilized during implementation.

Implementing individual restoration projects during the summer low-flow period will avoid emigrating coho salmon, Chinook salmon, and steelhead smolts and will minimize exposure to immigrating Chinook salmon and coho salmon adults at all habitat restoration project sites. The total number of projects and the location of individual projects authorized through the RGP annually will vary from year to year depending on various factors, including funding and scheduling. If funding and project implementation remains consistent with the past several years, the total number of projects expected to be implemented each year should range between 100 and 150 (Table 2). Implementation of restoration projects authorized through the previous RGP have been widely dispersed throughout the action area annually (CDFG 2010, 2009, 2008, 2007, 2006; Collins 2005, 2004).

Except for riparian habitat restoration and streamflow augmentation, all proposed restoration types are expected to result in incidental adverse effects to listed species. Despite the different scope, size, intensity, and location of these proposed restoration actions, the potential adverse effects to listed salmonids all result from dewatering, fish relocation, and increased sediment. The dewatering, fish relocation, and structural placement activities will result in direct effects to listed salmonids, where a small percentage of individuals are expected to be injured or killed. The effects from increased sediment mobilization into streams are usually indirect effects, where the effects to habitat may affect individual listed species after the project is implemented.

1. Dewatering

Although all project types include the possibility of dewatering, not all individual project sites will need to be dewatered. Based on the monitoring data, up to 17 percent of Grant Program restoration projects implemented each year in the action area required dewatering. When dewatering is necessary, only a small reach of stream at each project site will be dewatered for in-stream construction activities. Dewatering encompasses placing temporary barriers, such as a cofferdam, to hydrologically isolate the work area, re-routing streamflow around the dewatered area, pumping water out of the isolated work area, relocating fish from the work area (discussed separately), and restoring the project site upon project completion. The length of contiguous stream reach that will be dewatered for most projects is expected to be less than 300 feet and no greater than 500 feet for any one project site.

Table 2. Number and percentage of Grant Program projects that required dewatering each year (CDFG 2010, 2009, 2008, 2007, 2006; Collins 2005).

Year	**# Dewatering Sites***	**# Ongoing or Completed Projects**	**Percentage of Projects that Involved Dewatering**
2009	8	101	8%
2008	17	120	14%
2007	19	147	13%
2006	19	136	14%
2005	25	149	17%
2004	19	143	13%
* Based on number of fish relocation sites			

a. Exposure

Because the proposed dewatering occurs during the low flow period, the species and life stages most likely to be exposed to potential effects of dewatering are juvenile coho salmon and juvenile steelhead. Most juvenile Chinook salmon would be avoided since the timing of the instream activities occur after they have migrated to the ocean. A few juvenile Chinook salmon, especially with a stream-type life history diversity, as well as adult summer steelhead and half-pounder steelhead, may also be exposed where these individuals are present at or near the proposed project sites, although past relocation results suggest the chances of encountering these species and life stages is very low (Flosi 2010). No adult or half-pounder steelhead have been found in a dewatered area. Although one adult Chinook salmon was found in a dewatered area permitted under the previous RGP, the Chinook salmon was outside of the range of the CCC Chinook salmon ESU (CDFG 2009). Dewatering is expected to occur mostly during the first half of the instream construction window (*e.g.*, to accommodate for the necessary construction time needed), and therefore should avoid impacting adult Chinook and coho salmon. Dewatering that occurs in the latter half of the instream construction window or in the range of summer steelhead or half pounders, may expose adult Chinook salmon, early incoming coho salmon, summer steelheads, and half pounders to temporary harassment or displacement (Table 3). However, adult salmonids and half-pounders are not likely to be exposed because adults will avoid the construction area and dewatering is very rarely done so late in the low flow season.

Table 3. Life stages and species in the action area that may be exposed to dewatering and fish relocation.

Action	Life Stage	Species	Estimated Number Exposed per site	Rationale
Temporary barrier placement	Juvenile	NC Steelhead CCC Steelhead S-CCC Steelhead	Low	Most juveniles will avoid active construction area
		SONCC Coho CCC Coho	Low	Most juveniles will avoid active construction area
Fish relocation	Juvenile	NC Steelhead CCC Steelhead S-CCC Steelhead	0-4000	Based on monitoring record
		SONCC Coho CCC Coho	0-200	Based on monitoring record
		CCC Chinook	0-2	Based on monitoring record
Dewatering	Juvenile	NC Steelhead CCC Steelhead S-CCC Steelhead SONCC Coho CCC Coho	Low	Most fish will be relocated

b. Response

The effects of dewatering result from the placement of the temporary barriers, the trapping of individuals in the isolated area, and the diversion of streamflow. Fish relocation and ground disturbance effects are discussed further in sections B and C below. Rearing juvenile coho salmon, steelhead, and to a much lesser extent, juvenile stream-type Chinook salmon could be killed or injured if crushed during placement of the temporary barriers, such as cofferdams, though direct mortality is expected to be minimal due to evasiveness of most juveniles. Stream flow diversions could harm salmonids by concentrating or stranding them in residual wetted areas (Cushman 1985) before they are relocated, or causing them to move to adjacent areas of poor habitat (Clothier 1953; Clothier 1954; Kraft 1972; Campbell and Scott 1984). Salmonids, especially juveniles since they are not as visible as adults, that are not caught during the relocation efforts would be killed from either construction activities or desiccation.

Changes in flow are anticipated to occur within and downstream of project sites during dewatering activities. These fluctuations in flow, outside of dewatered areas, 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.

Dewatering may result in the temporary loss of rearing habitat for juvenile salmonids. The extent of temporary loss of juvenile rearing habitat should be minimal because habitat at the restoration sites is typically degraded and the dewatered reaches are expected to be each no more than 300 contiguous feet or 500 total feet per site. These sites will be restored prior to project completion, and should be enhanced by the restoration project.

Effects associated with dewatering activities will be minimized due to the multiple minimization measures that will be utilized as described in the section entitled, *Measures to Minimize Impacts to Aquatic Habitat and Species During Dewatering of Projects* within Part IX of the Restoration Manual. Juvenile coho salmon, steelhead and stream-type Chinook salmon that avoid capture in the project work area will die during dewatering activities. NMFS expects that the number of coho salmon, Chinook salmon, or steelhead that will be killed as a result of barrier placement and stranding during site dewatering activities is very low, likely less than 1% of the total number of salmonids isolated in the dewatered area. The low number of juveniles expected to be injured or killed as a result of dewatering is based on the low percentage of projects that require dewatering (*i.e.*, generally only up to 17%), the avoidance behavior of juveniles in the active construction area, the small area affected during dewatering at each site, the low number of juveniles in the typically degraded habitat conditions common to proposed restoration sites, and the low numbers of juvenile salmonids expected to be present within each project site after relocation activities. A summary table of the dewatering effects to salmonids is provided below.

Table 4. Summary of effects from dewatering.

Action	Life Stage	Species	Response
Temporary barrier placement	Juvenile	NC Steelhead CCC Steelhead S-CCC Steelhead SONCC Coho CCC Coho	Injury or death from being crushed
Dewatering	Juvenile	NC Steelhead CCC Steelhead S-CCC Steelhead SONCC Coho CCC Coho	Desiccation (Death)

2. Fish Relocation Activities

All project sites that require dewatering will include efforts to relocate fish. CDFG personnel (or designated agents) capture and relocate fish (and amphibians) away from the restoration project work site to minimize adverse effects of dewatering to listed 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.

a. Exposure:

Because fish relocation is required when dewatering, the species and life stages most likely to be exposed to potential effects of fish relocation are juvenile coho salmon and steelhead. Most juvenile Chinook salmon will be avoided since the timing of instream activities occur after they have emigrated from streams. However, a few juvenile Chinook salmon, especially with a stream-type life history diversity, may also be exposed where these individuals are stranded within the dewatering area (Table 3).

b. Response:

Fish relocation activities may injure or kill rearing juvenile coho salmon and steelhead because these individuals are most likely to be present in the project sites. 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, most impacts from electrofishing occur at the time of sampling.

Most of the stress and death from handling result from differences in water temperature between the stream and the temporary holding containers, dissolved oxygen conditions, the amount of time that fish are held out of the water, and physical injury. Handling-related stress increases rapidly if water temperature exceeds 18°C or dissolved oxygen is below saturation. Since fish relocation activities will be conducted by CDFG personnel and/or designated qualified fisheries biologists following both CDFG and NMFS electrofishing guidelines, direct effects to, and mortality of, juvenile coho salmon and/or steelhead during capture will be greatly minimized.

Although sites selected for relocating fish will likely 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, which can increase 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 habitat and lower fish densities. As each fish moves, competition remains either localized to a small area or quickly diminishes as fish disperse.

Fish relocation activities are expected to minimize individual project impacts to juvenile coho salmon and steelhead by removing them from restoration project sites where they would have experienced high rates of injury and mortality. Fish relocation activities are anticipated to only affect a small number of rearing juvenile coho salmon and/or steelhead within a small stream reach at and near the restoration project site and relocation release site(s). Rearing juvenile coho salmon and/or steelhead present in the immediate project work area will be subject to disturbance, capture, relocation, and related short-term effects. Most of the take associated with fish relocation activities is anticipated to be non-lethal, however, a very low number of rearing juvenile (mostly YOY) coho salmon and/or steelhead captured may become injured or die. In addition, the number of fish affected by increased competition is not expected to be significant at most fish relocation sites, based upon the suspected low number of relocated fish inhabiting the small project areas.

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 Restoration Manual. NMFS expects that fish relocation activities associated with implementation of individual restoration projects will not significantly reduce the number of returning listed salmonid adults. Fish relocation activities will occur during the summer low-flow period after emigrating smolts have left the restoration project sites and before adult fish travel upstream. Therefore, the majority of listed salmonids that will be captured during relocation activities will be age-0 coho and juvenile steelhead parr of various ages.

Although most unintentional mortalities of coho salmon and/or steelhead during fish relocation activities will occur almost exclusively at the YOY stage, there is a potential of unintentional mortality of a one or two year old fish.

Since 2004, data on fish relocation activities associated with habitat restoration projects authorized under the previous RGP, show that most mortality rates associated with individual fish relocation sites are well below three percent and the mean annual mortality rates are below one percent for either coho salmon or steelhead (Collins 2004, 2005; CDFG 2006, 2007, 2008, 2009, 2010). In addition, all fish relocation activities associated with RGP 12 restoration projects since 2004 have had only up to 15 steelhead injured and up to 26[6] steelhead killed each year. Likewise, the maximum number of coho salmon injured or killed each year from all fish relocation activities associated with RGP 12 restoration projects was 3 and 11, respectively.

Table 4. Summary of effects from fish relocation activities

Action	**Life Stage**	**Species**	**Response**
Capturing (electrofishing, seining, dip netting)	Juvenile Juvenile	NC Steelhead CCC Steelhead S-CCC Steelhead	<3% of captured fish will be injured or killed at each dewatered site.
		SONCC Coho CCC Coho	<3% of captured fish will be injured or killed at each dewatered site.
		CCC Chinook	<3% of captured fish will be injured or killed at each dewatered site.

[6] Data excludes steelhead that are not federally listed.

3. Structural Placement

Most of the proposed restoration project types include the potential for placement of structures in the stream channel. These structural placements can vary in their size and extent, depending on their restoration objective. Most structural placements are discrete where only a localized area will be affected. The salmonids exposed to such structural placements are the same juvenile species that would be exposed to dewatering effects. Where structural placements are small and discrete, salmonids are expected to avoid the active construction area and thus will not be crushed. When structural placements are large or cover a large area, such as gravel augmentation, some juvenile salmonids may be injured or killed. However, the number of juveniles injured or killed is expected to be no more than the number of individuals that will be killed by desiccation after the reach is dewatered without such structural placement. Fish relocation is expected to remove most salmonids. In essence, juvenile fish that are not relocated will be killed by either dewatering or structural placement.

4. Increased Mobilization of Sediment within the Stream Channel

The proposed restoration project types involve various degrees of earth disturbance. Inherent with earth disturbance is the potential to increase background suspended sediment loads for a short period during and following project completion.

All project types involving ground disturbance in or adjacent to streams are expected to increase turbidity and suspended sediment levels within the project work site and downstream areas. Therefore, instream habitat improvement, instream barrier modification for fish passage improvement, stream bank stabilization, fish passage improvements at stream crossings, and upslope watershed restoration[7] may result in increased mobilization of sediment into streams. Although riparian restoration may involve ground disturbance adjacent to streams, the magnitude and intensity of this ground disturbance is expected to be small and isolated to the riparian area.

[7] Although road restoration projects may entail culvert replacement or removal, the resulting sediment effect is expected to be significantly smaller when compared to a typical fish passage improvement project. Road restoration projects typically deal with upslope road networks located high within the watershed drainage network. As a result, typical road crossings in these upslope areas largely occur in higher gradient, first or second order stream channels and feature small (*e.g.*, less than 4-foot diameter) culverts. In contrast, fish passage projects funded through the Program typically focus limited restoration funding on high-priority fish passage issues located on third or fourth order stream networks that, when completed, will re-establish fish access to large expanses of upstream habitat. In effect, both the size and gradient of upslope channels and culverts largely limit downstream sediment impacts during road decommissioning projects. Small, high gradient stream channels typically transport sediment downstream more efficiently (and therefore store less upstream of the culvert) than lower gradient, higher order stream reaches where flow and channel morphology favor sediment deposition. Furthermore, the comparative size of these upslope road culverts (16-48 inch diameter) likely limit the volume of any sediment wedge that can develop upstream of the structure. Because of these unique characteristics common to culverts typically found on upslope roads, NMFS anticipates individual culvert projects that are part of a larger road decommissioning project will not approach an effect level similar to larger fish passage projects, and thus are not considered when computing maximum project density per watershed (as detailed in the section titled "Sideboards, Minimization Measures, and Best Management Practices" within the Proposed Action).

Fish screen projects are not expected to release appreciable sediment into the aquatic environment.

a. Exposure

In general, sediment related impacts are expected during the summer construction season (June 15-November 1), as well as during peak-flow winter storm events when remaining loose sediment is mobilized. During summer construction, the species and life stages most likely to be exposed to potential effects of increased sediment mobilization are juvenile coho salmon and juvenile steelhead. As loose sediment is mobilized by higher winter flows, adult Chinook salmon, coho salmon, and steelhead may also be exposed to increased turbidity. The increased mobilization of sediment is not likely to degrade spawning gravel because project related sediment mobilization should be minimal, is expected to affect only a short distance downstream, and should be easily displaced by either higher fall/winter flows or redd building. In the winter, the high flows will carry excess fine sediment downstream to point bars and areas with slower water velocities. Because redds are built where water velocities are higher, the minimally increased sediment mobilization is not expected to smother existing redds. Therefore, salmonid eggs and alevin are not expected to be exposed to the negligible increase in sediment on redds. 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.

b. Response

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). Erosion and runoff during precipitation and snowmelt will increase the supply of sediment to streams. Heavy equipment operation in upland and riparian areas increases soil compaction, which can increase runoff during precipitation. High runoff can then, in turn, increase the frequency and duration of high stream flows in construction areas. Higher stream flows increase stream energy that can scour stream bottoms and transport greater sediment loads farther downstream than would otherwise occur.

Sediment may affect 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) and holding habitat for adults. Excessive fine sediment can interfere with development and emergence of salmonids (Chapman 1988). Upland erosion and sediment delivery can increase substrate embeddedness. These factors make it harder for fish to excavate redds, and decrease redd aeration (Cederholm *et al.* 1997). High levels of fine sediment in streambeds can also reduce the abundance of food for juvenile salmonids (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 coffer dam. 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 can result from increased turbidity (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 restoration activities, especially with implementation of the proposed avoidance and minimization measures.

Yet, research investigating the effects of sediment concentration on 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 that 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 severe physiological stress or death resulting from suspended sediment exposure has also focused on concentrations much higher than those typically found in streams subjected to minor/moderate sediment input (reviewed by Newcombe and MacDonald (1991) and Bozek and Young (1994)).

In contrast, the lower concentrations of sediment and turbidity expected from the proposed restoration activities are unlikely to be severe enough to cause injury or death of listed juvenile coho salmon and/or steelhead. Instead, the anticipated low levels of turbidity and suspended sediment resulting from instream restoration projects will likely result in only temporary behavioral effects. Recent monitoring of newly replaced culverts8 within the action area detailed a range in turbidity changes downstream of newly replaced culverts following winter storm events (Humboldt County 2002, 2003 and 2004). During the first winter following construction, turbidity rates (NTU) downstream of newly replaced culverts increased an average of 19% when compared to measurements directly above the culvert. However, the range of increases within the eleven monitored culverts was large (n=11; range 123% to -21%). Monitoring results from one and two year-old culverts were much less variable (n=11; range:12% to -9%), with an

8 When compared to other instream restoration projects (e.g., bank stabilization, instream structure placement, etc.), culvert replacement/upgrade projects typically entail a higher degree of instream construction and excavation, and by extension greater sediment effects. Thus, we have chosen to focus on culvert projects as a "worst case" scenario when analyzing potential sediment effects from instream projects.

average increase in downstream turbidity of 1%. Although the culvert monitoring results show decreasing sediment effects as projects age from year one to year 3, a more important consideration is that most measurements fell within levels that were likely to only cause slight behavioral changes [*e.g.*, increased gill flaring (Berg and Northcote 1985), elevated cough frequency (Servizi and Marten 1992), and avoidance behavior (Sigler *et al.* 1984)]. Turbidity levels necessary to impair feeding are likely in the 100-150 NTU range (Harvey and White 2008; Gregory and Northcote 2003). However, only one of the Humboldt County measurements exceeded 100 NTU (NF Anker Creek, year one), whereas the majority (81%) of downstream readings were less than 20 NTU. Importantly, proposed minimization measures, some of which were not included in the culvert work analyzed above, will likely ensure that future sediment effects from fish passage projects will be less than those discussed above. Therefore, the small pulses of moderately turbid water expected from the proposed instream restoration projects will likely cause only minor physiological and behavioral effects, such as dispersing salmonids from established territories, potentially increasing interspecific and intraspecific competition, as well as predation risk for the small number of affected fish.

Upslope watershed restoration activities, such as road decommissioning and upgrading, are expected to mobilize sediment through ripping and recontouring. However, these activities are generally higher up in the watersheds where the adjacent streams are typically first or second order, and are typically not fish bearing. Sediment mobilization will be minimized through road outsloping, reseeding and mulching disturbed areas, and other erosion control measures. These erosion control measures should prevent a majority of the sediment from reaching fish bearing streams. In addition, road projects funded by the Grant Program indicate that the subject roads already pose sediment problems for salmonids, and are in need of upgrading, repair, or decommissioning. Therefore, upslope road work (*e.g.*, road decommissioning), when implemented with the proposed erosion control measures, may result in about the same volume of sediment introduced into streams prior to road work in the short term.

Upslope restoration activities, in the long term, should result in reduced sediment volume than unimproved roads. Road upgrading and decommissioning activities have been documented to reduce road-related erosion (Madej 2001; Switalski *et al.* 2004; McCaffery *et al.* 2007) and landslide risk (Switalski *et al.* 2004). Road decommissioning studies in the Redwood Creek watershed, Humboldt County, have found that treated roads, on average, contributed only 25% of the sediment volume produced from untreated roads (Madej 2001). Vegetation, in particular, when reestablished on decommissioned roads, leads to reduced fine sediment in adjacent streams (McCaffery *et al.* 2008). The amount of fine sediment mobilized from highly revegetated decommissioned roads can be at levels that existed prior to the road construction (McCaffery *et al.* 2008).

NMFS does not expect sediment effects to accumulate at downstream restoration sites within a given watershed. Sediment effects generated by each individual project will likely impact only the immediate footprint of the project site and up to approximately 1500 feet of channel downstream of the site. Studies of sediment effects from culvert construction determined that the level of sediment accumulation within the streambed returned to control levels between 358 to 1,442 meters downstream of the culvert (LaChance *et al.* 2008). Because of the multiple measures to minimize sediment mobilization, such as the removal of at least 80% of an upstream sediment wedge behind culverts or channel stabilization structures, downstream sediment effects from the proposed restoration projects are expected to extend downstream for a distance consistent with the low end of the range presented by LaChance *et al.* (2008). The proposed 1500-foot buffer between instream projects is likely large enough to preclude sediment effects from accumulating at downstream project sites, and is consistent with the 500 meter buffer recommended by LaChance *et al.* (2008). Furthermore, the temporal and spatial scale at which project activities are expected to occur will also likely preclude significant additive sediment related effects. Assuming projects will continue to be funded and implemented similar to the past several years, NMFS expects that individual restoration projects sites will occur over a broad spatial scale each year. In other words, restoration projects occurring in close proximity to other projects during a given restoration season is unlikely, thus diminishing the chance that project effects would combine. Finally, effects to instream habitat and fish are expected to be short-term, since most project-related sediment will likely mobilize during the initial high-flow event the following winter season. Subsequent sediment mobilization may occur following the next two winter seasons, but generally should subside to baseline conditions by the third year as found in other studies, such as Klein *et al.* 2006, and suggested by the Humboldt County data (Humboldt County 2004).

C. Effects to Critical Habitat

1. Adverse effects to PCEs

The Critical Habitat designation for salmonid species includes several Primary Constituent Elements (PCEs) which will be affected under the proposed action. These PCEs include spawning, rearing, and migration habitats.

Juvenile rearing sites require cover and cool water temperatures during the summer low flow period. Over wintering juvenile salmonids require refugia sites to escape during high flows in the winter. Effects to rearing habitat will primarily occur as a result of dewatering the channel and increasing sediment input during instream activities. Loss of rearing sites can occur through dewatering habitat and the filling of pools with fine sediment. However, these adverse effects are expected to be temporary and of short duration. The activities described in the proposed action will increase quality of rearing habitat over the long term. Rearing habitat will be improved by adding complexity that will increase pool formation, cover structures, and velocity refugia.

As explained above, spawning habitat is not likely to be adversely affected by the temporary increase in fine sediment resulting from proposed activities. Spawning habitat is located where water velocities are higher, where mobilized fine sediment is not likely to settle. Where limited settling does occur in spawning habitat, the minimally increased sediment is not expected to degrade spawning habitat. Any adverse effects associated with increased sediment are expected to be temporary and of short duration. Activities described in the proposed action will improve the quality of spawning habitat over the long term. Spawning habitat will be improved by reducing the amount of sediment that enters the stream in the long term through various types of erosion control. Additionally, gravel augmentation, described in the proposed action will increase the amount of spawning habitat available.

Migratory habitat is essential for juvenile salmonids outmigrating to the ocean as well as adults returning to their natal spawning grounds. Migratory habitat may be affected during the temporary re-routing of the channel during project implementation, however a migratory corridor will be maintained at all times. The proposed action will have long term beneficial effects to migratory habitat. Activities adding complexity to habitat will increase the number of pools, providing resting areas for adults, and the removal of barriers will increase access to habitat.

Not only will adverse effects be limited in duration, but the sideboards proposed will limit the magnitude of the effects. It is expected that sediment effects will remain minor and not accumulate by implementing sideboards that limit the number of, and distance between sediment producing activities. The temporary and limited adverse effects to critical habitat are not likely to rise to a level that would appreciably diminish the value of critical habitat in the action area.

2. Beneficial Effects to the PCEs

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 Restoration Manual provides design guidance and construction techniques that facilitate proper design and construction of restoration projects. Properly constructed stream restoration projects will increase available habitat, habitat complexity, stabilize channels and streambanks, increase spawning gravels, decrease sedimentation, and increase shade and cover for salmonids. Since 2004, the percentage of implemented projects rated as either good or excellent ranged between 71 to 96%, with an average of 87% (Collins 2005; CDFG 2006, 2007, 2008, 2009, 2010). NMFS assumes similar or improved success rates during the next five years of the program. Therefore, most of the proposed restoration actions should continue to be effectively implemented, and thus enhance existing habitat conditions at the project sites.

Habitat restoration projects that are authorized through the RGP will be designed and implemented consistent with the techniques and minimization measures presented in the Restoration Manual to maximize the benefits of each project while minimizing effects to salmonids. Most restoration projects are for the purpose of restoring degraded salmonid habitat and are intended to improve instream cover, pool habitat, spawning gravels, and flow levels; remove barriers to fish passage; and reduce or eliminate erosion and sedimentation impacts. Others prevent fish injury or death, such as diversion screening projects. Although some habitat restoration projects may cause small losses to the juvenile life history stage of listed salmonids in the project areas during construction, all of these projects are anticipated to improve salmonid habitat and salmonid survival over the long-term.

a. Instream Habitat Improvements

Instream habitat structures and improvement projects will provide escape from predators 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.

Placement of LWD into streams can result in the creation of pools that influence the distribution and abundance of juvenile salmonids (Beechie and Sibley 1997; Spalding *et al.* 1995). LWD influences the channel form, retention of organic matter and biological community composition. In small (<10 m bankfull width) and intermediate (10-20 m bankfull width) streams, LWD contributes channel stabilization, energy dissipation and sediment storage (Cederholm *et al.* 1997). Presence and abundance of LWD is correlated with growth, abundance and survival of juvenile salmonids (Spalding *et al.* 1995; Fausch and Northcote 1992). The size of LWD is important for habitat creation (Fausch and Northcote 1992).

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 likely to be authorized under the proposed RGP direct flow away from unstable banks and provide armor (a hard point) to protect the toe of the slope from further erosion. Successfully reducing streambank erosion will offset the increased sediment mobilization into streams from other restoration actions authorized under the proposed RGP. Boulder faces in the deflector structures have the added benefit of providing invertebrate habitat, and space between boulders provides juvenile salmonid escape cover.

The various weir structures can also be used to replace the need to annually build gravel push up dams. Once these weir structures are installed and working properly, construction equipment entering and modify the channel would no longer be needed prior to the irrigation season. The benefits of reducing or eliminating equipment operation during the early spring reduces the possibility of crushing salmon and steelhead redds and young salmonids.

b. 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.

c. Stream Bank Stabilization

Stream bank stabilization projects will reduce sedimentation from watershed and bank erosion, decrease turbidity levels, and improve water quality for salmonids over the long-term. Reducing sediment delivery to the stream environment 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, and minimizing the loss of quality and quantity of pools from excessive sediment deposition. Successful implementation of stream bank stabilization projects will offset the increased sediment delivery into streams from other restoration actions authorized under the proposed RGP. In addition, the various proposed streambank restoration activities are likely to enhance native riparian forests or communities, provide increased cover (large wood, boulders, vegetation, and bank protection structures) and a long-term source of all sizes of instream wood.

d. Fish Passage Improvement at Stream Crossings

Thousands of dilapidated stream crossings exist on roadways 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 (Six Rivers National Forest Watershed Interaction Team 1999). 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 or 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). For example, salmonid fry often disperse downstream from headwater spawning sites. Additional movements can occur as intraspecific competition for resources causes the additional dispersal of subordinate individuals (Chapman 1966; Everest and Chapman 1972; Hearn 1987). Juvenile salmonids may also move in response to growth or simply because environmental conditions such as water depth or velocity are no longer suitable (Edmundson *et al.* 1968; Leider *et al.* 1986; Lau 1994; Kahler *et al.* 2001).

In a recent study with coho salmon and steelhead in streams in the state of Washington, 28 to 60 percent of the salmonids moved during the summer within the study streams and 14 to 36 percent of them moved more than once (Kahler *et al.* 2001). Upstream movement of juvenile salmonids was predominate (Kahler *et al.* 2001). However, in streams with more step-pool/cascade channel types there was less upstream movement and more movement further downstream (Kahler *et al.* 2001). The movement of over 60 percent of tagged coho salmon in a study in Prairie Creek, California, also illustrates that coho salmon do not rear exclusively in the habitat that they were initially tagged (Bell 2001).

Reestablishing the linkages between mainstem migratory habitat and headwater spawning/rearing habitat will help to 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.

e. 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 resulting from these activities include rehabilitated hydrologic function, reduced risk of washouts and landslides, and reduced 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 any increases in peak flows caused by roads and reducing increases in the drainage network caused by roads.

f. 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.

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 and NMFS, 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.

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 avoided, and fish are able to migrate through stream systems at the normal time of year.

VII. CUMULATIVE EFFECTS

NMFS must consider both the "effects of the action" and the cumulative effects of other activities in determining whether the action is likely to jeopardize the continued existence of the salmonid ESUs and DPSs considered in this opinion or result in the destruction or adverse modification their designated critical habitat. Under the ESA, cumulative effects include the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the action area. Listed salmonid species may be affected by numerous future non-federal activities, including timber harvest, road construction, residential development, and agriculture, etc., which are described in the *Environmental Baseline* section. A search of upcoming timber harvest plans on the CalFire website confirms that timber harvesting is expected to continue in the next five years (http://www.fire.ca.gov/ResourceManagement/THPStatusUpload/THPStatusTable.html). NMFS assumes these activities, and similar resultant effects, on listed salmonids species will continue through the five year period of this opinion.

VIII. INTEGRATION AND SYNTHESIS

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 within the action area are relatively more abundant and better distributed than CCC coho salmon, both the presence-absence and trend data available suggest that many SONCC coho salmon populations in the larger basins (*e.g.*, Eel and Klamath) continue to decline. Available information 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 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.

The most recent Chinook salmon status review found continued evidence of low population sizes relative to historical abundance. Although mixed abundance trends within some larger watersheds of northern California (*e.g.*, Klamath HUC) may suggest some populations are persisting, the low abundance, low productivity, and potential extirpations of populations in the southern part of the CC Chinook salmon ESU are of concern. The reduced abundance contributes significantly to long-term risk of extinction, and is likely to contribute to short-term risk of extinction in the foreseeable future. Thus, NMFS concludes the CC Chinook salmon ESU falls far short of historic population numbers and distribution, and is therefore not viable in regards to the population size VSP parameter. The ESU's geographic distribution has been moderately reduced, but especially for southern populations in general, and spring-run Chinook populations in particular. Based on the above information, recent status reviews and available information indicate CC Chinook 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 their ability to provide for long-term salmonid conservation, has also been degraded from conditions known to support viable salmonid populations. Intensive land and stream manipulation during the past century (*e.g.*, logging, agricultural/livestock development, mining, urbanization, and river dams/diversion) has modified and eliminated much of the historic 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 proposed action are for the purpose of restoring anadromous salmonid habitat, small amounts of take of listed salmonids will likely result from fish relocation activities and the temporary effects of sediment mobilization, modified hydrology, and other minor impacts. NMFS anticipates only small numbers of juvenile salmon and/or steelhead may be adversely affected at each individual restoration project work site. Adverse effects to listed salmonids at these sites are primarily expected to be in the form of short-term behavioral effects with minimal mortality. Salmonids present during project construction may be disturbed, displaced, injured or killed by project activities, and salmonids present in the project work area will be subject to capture, relocation, and related stresses. Most unintentional mortalities of salmon and/or steelhead during fish relocation activities and dewatering will occur exclusively at the juvenile stage. Short-term impacts to salmonid habitat from restoration activities will be minimal and localized at each project site. The duration and magnitude of direct effects to listed salmonids and to designated critical habitat associated with implementation of individual restoration projects will be significantly minimized due to the multiple minimization measures that will be utilized during implementation. NMFS anticipates the effects of individual restoration projects will not reduce the number of returning listed salmonid adults. The temporal and spatial limits (*i.e.* sideboards) included in the proposed action will preclude significant additive effects.

NMFS has determined these effects are not likely to appreciably reduce the numbers, distribution or reproduction of salmon and/or steelhead within each watershed where restoration projects occur. This is based on the Grant Program's numeric limit per year and per watershed, the low percentage of projects that result in direct effects to salmonids, the low mortality rates associated with fish relocation activities, and the minor short-term effects resulting from increased turbidity levels. 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 associated with a small percentage of projects implemented annually, NMFS anticipates most projects implemented annually will provide long-term improvements to salmonid habitat. NMFS also anticipates that the additive beneficial effects to salmonid habitat over the five-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. Restored habitat resulting from restoration projects should improve adult spawning success, juvenile survival, and smolt outmigration, which will in turn lead to improved abundance, productivity, spatial structure, and diversity within the watershed population. As individual population viability improves, so will the viability of the ESU's improve as well.

IX. CONCLUSION

After reviewing the best available scientific and commercial information; the current status of SONCC coho salmon, CCC coho salmon, CCC Chinook salmon, NC steelhead, CCC steelhead, and S-CCC steelhead; the current status and value of their critical habitats; the environmental baseline for the action area; the effects of the proposed restoration projects; and the cumulative effects; it is NMFS's opinion that the proposed project is not likely to: (1) jeopardize the continued existence of SONCC coho salmon, CCC coho salmon, CCC Chinook salmon, NC steelhead, CCC steelhead, and S-CCC steelhead and (2) destroy or adversely modify designated critical habitat for the SONCC coho salmon, CCC coho salmon, CCC Chinook salmon, NC steelhead, CCC steelhead, and S-CCC steelhead.

X. 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 intended as part of the agency action is not considered to be prohibited taking under the ESA provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are nondiscretionary, and must be undertaken by the Corps so that they become binding conditions of any grant or permit issued to CDFG for the exemption in section 7(o)(2) to apply. The Corps has a continuing duty to regulate the activity covered by this incidental take statement. If the Corps (1) fails to assume and implement the terms and conditions or (2) fails to require CDFG 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 CDFG 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

NMFS expects the proposed project will result in incidental take of listed SONCC coho salmon, CCC coho salmon, CC Chinook salmon, NC steelhead, CCC steelhead, and S-CCC steelhead during the 5 year permit. Juvenile coho salmon, steelhead and to a lesser extent stream-type juvenile Chinook salmon will be harmed, harassed, injured, or killed from the dewatering and fish relocating activities at the project sites. Specifically, incidental take is expected to be in the form of injury or mortality due to handling during capture and relocation or mortality during dewatering. Mortality from relocation activities is expected to be no more than three percent of juvenile salmonids inhabiting each individual project action area.

Despite recent monitoring data, NMFS cannot quantify the number of fish from each federally listed species expected to be taken during dewatering, structural placement, and fish relocating because of the uncertainty in the scope, location, and to a certain extent the number of the restoration sites; the varying population size of each species; and the annual variation in the timing of migration, spawning, and individual habitat use in the action area. In instances where the amount of take is difficult to quantify, NMFS can use the extent of take as a surrogate. Therefore, NMFS estimates that all juvenile coho salmon, steelhead and Chinook salmon in the areas to be dewatered will be exposed to relocation, structural placement, or dewatering. A small number (less than 3 % of the fish in each area) will be injured or killed during capture for relocation efforts. A small number of fish will avoid capture. These fish will be exposed to dewatering and construction activities at the project site and will be injured or killed. The total extent of take is limited at each project site to no more than 500 lineal feet of stream channel and to the maximum annual number of instream projects conducted under the proposed RGP in each of the following HUC 10 watershed sizes:

Square mile of HUC 10 watershed	Maximum number of instream projects per year Watersheds outside of CCC coho salmon ESU
<50	2
51-100	3
101-150	4
151-250	5
251-350	6
351-500	9
>500	12

Dam removal projects, fish ladder projects[9], fish hatchery/fish stocking projects, watershed stewardship training, salmon in the classroom, projects involving obstruction blasting (with explosives) or pile driving, and projects that would dewater or disturb more than 500 feet of contiguous stream reach were not analyzed in this opinion. These projects will require separate section 7 consultations to determine impacts to listed salmonids.

B. Effect of the Take

In the accompanying opinion, NMFS determined that this level of anticipated take is not likely to result in jeopardy to the SONCC coho salmon, CCC coho salmon, CC Chinook salmon, NC steelhead, CCC steelhead, and S-CCC steelhead, and is not likely to destroy or adversely modify their designated critical habitats.

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, CC Chinook salmon, NC steelhead, CCC steelhead or S-CCC steelhead:

1. Measures shall be taken to minimize harm and mortality to listed salmonids resulting from fish relocation, dewatering, or instream construction activities.

2. Measures shall be taken to ensure that individual restoration projects authorized annually through the RGP will minimize take of listed salmonids, monitor and report take of listed salmonids, and to obtain specific project information to better assess the effects and benefits of salmonid restoration projects authorized through the RGP.

[9] Small fish ladders associated with road crossings may be included in this consultation if NMFS or CDFG engineers believes those features improve the stability and function of the crossing.

D. Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the ESA, the Corps and the permittee (CDFG) 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 fish relocation, dewatering, or instream construction activities:

    a. Fish relocation data must be provided annually as described in Term and Condition 4c below. Any injuries or mortality from a fish relocation site that exceeds 3%[10] of a listed species shall be reported to the nearest NMFS office within 48 hours.

2. The following terms and conditions implement Reasonable and Prudent Measure 2, which states that measures shall be taken to ensure that individual restoration projects authorized annually through the RGP will minimize take of listed salmonids, monitor and report take of listed salmonids, and to obtain specific project information to better account for the effects and benefits of salmonid restoration projects authorized through the RGP.

    a. The Corps and/or CDFG shall provide NMFS annual notification of projects that are authorized through the RGP. The notification shall be submitted at least 14 days prior to project implementation and must contain specific project information (name of project, type of project, location of project including:, creek, HUC-10 [5th field] watershed, city or town, and county). The annual notification shall be submitted to the following NMFS offices:

    National Marine Fisheries Service
    North Central Coast Office Supervisor
    Protected Resources Division
    777 Sonoma Avenue, Room 325
    Santa Rosa, California 95404

    National Marine Fisheries Service
    Northern California Office Supervisor
    1655 Heindon Road
    Arcata, California 95521

    b. In order to monitor the impact to, and to track incidental take of listed salmonids, the Corps and/or CDFG must annually submit to NMFS a report of the previous year's restoration activities. The annual report shall include a summary of the specific type and location of each project, stratified by individual project, 5th field HUC and affected species and ESU/DPS. The report shall include the

10 Only when injury or mortality exceeds 5 individuals of the affected species, to minimize the need to report when only a small number of listed species are injured or killed from a small total capture size.

following project-specific summaries, stratified at the individual project, 5th field HUC and ESU level:

- A summary detailing fish relocation activities, including the number and species of fish relocated and the number and species injured or killed. Any capture, injury, or mortality of adult salmonids or half-pounder steelhead will be noted in the monitoring data and report. Any injuries or mortality from a fish relocation site that exceeds 3.0 % of the affected listed species shall have an explanation describing why.

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

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

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

- The distance (miles) of road decommissioned.

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

This report shall be submitted annually by March 1 to the following NMFS offices:

National Marine Fisheries Service
North Central Coast Office Supervisor
Protected Resources Division
777 Sonoma Avenue, Room 325
Santa Rosa, California 95404

National Marine Fisheries Service
Northern California Office Supervisor
1655 Heindon Road
Arcata, California 95521

XI. REINITIATION NOTICE

This concludes formal consultation on the actions outlined in the proposed CDFG salmonid habitat restoration RGP. 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.

XII. CONSERVATION RECOMMENDATIONS

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

1. The Corps and/ or CDFG should ensure that disturbed and compacted areas will be revegetated with native plant species at the earliest dormant window (late fall through end of winter) following completion of each RGP authorized project. The plant species used should be specific to the project vicinity or the region of the state where the project is located, and comprise a diverse community structure (plantings should include both woody and herbaceous species). Plant at a minimum ratio of 3 plantings to 1 removed woody plant. Unless otherwise specified, the standard for success is 80 percent survival of plantings or 80 percent ground cover for broadcast planting of seed after a period of 3 years. Revegetation sites will be monitored yearly in spring or fall months for three years following completion of the project. All plants that have died will be replaced during the next planting cycle (generally the fall or early spring) and monitored for a period of three years after planting.

2. The Corps and/ or CDFG should incorporate project data into a format compatible with the CDFG/NMFS/Pacific Fisheries Management Council Geographic Information System (GIS) database, ultimately allowing scanned project-specific reports and documents to be linked graphically within the GIS database.

3. The Corps and/or CDFG should make reports, assessments, and surveys more readily accessible to the public via their website (*e.g.*, Grant Program website and/or Calfish.org) so that information from Grant Program projects can be more readily utilized by interested parties to advance recovery of listed salmonids.

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

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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 "Essential Fish Habitat" (EFH) descriptions in Federal fishery management plans 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 described in Appendix A, Amendment 14 to the Pacific Coast Salmon Fishery Management Plan. The Corps' administration of the implementation of fisheries restoration activities on private and public lands will affect streams within the regulatory jurisdiction of Corps' San Francisco District in the San Benito, San Luis Obispo, Monterey, Santa Cruz, San Mateo, Santa Clara, San Francisco, Alameda, Contra Costa, Solano, Napa, Marin, Sonoma, Mendocino, Humboldt, Del Norte, Shasta, Siskiyou, Trinity, Glen, and Lake counties, California, which have been designated EFH for salmon.

Only species managed under a Federal fishery management plan are covered under the MSFCMA. Coho and Chinook salmon are managed under Federal fishery management plans, whereas steelhead are not managed. Therefore, these EFH Conservation Recommendations address only coho and Chinook salmon and do not address steelhead. Pacific groundfish and coastal pelagics will not be affected by the proposed action and are not considered in this consultation.

I. LIFE HISTORY AND HABITAT REQUIREMENTS

Detailed information on the life history and habitat requirements for coho and Chinook salmon is available in the Status of the Species section of the accompanying biological opinion, as well as NMFS status reviews of west coast salmon from Washington, Oregon, and California (Weitkamp *et al.* 1995; Meyers *et al.* 1998; NMFS 2001, 2003; Good *et al.* 2005). In addition, the associated biological opinion for the proposed action summarizes the life history and habitat requirements for coho and Chinook salmon.

II. PROPOSED ACTION

The proposed action will authorize the placement of fill material into the waters of the United States to annually implement multiple salmonid habitat restoration projects under the CDFG's Fisheries Restoration Grant Program for five years. This action will apply to portions of the following counties within coastal counties that are within the regulatory jurisdictional boundaries of the Corps' San Francisco District: San Benito, San Luis Obispo, Monterey, Santa Cruz, San Mateo, Santa Clara, San Francisco, Alameda, Contra

Costa, Solano, Napa, Marin, Sonoma, Mendocino, Humboldt, Del Norte, Shasta, Siskiyou, Trinity, Glen, and Lake. 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, instream flow augmentation, and fish screen installation and maintenance. The majority of the actions considered in this BO follow those described in CDFG's *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), NMFS' *Guidelines for Salmonid Passage at Stream Crossings* (NMFS 2000), and NMFS' *Fish Screening Criteria for Anadromous Salmonids* (NMFS 1997).

III. EFFECTS OF THE PROJECT ACTION

EFH will likely be adversely affected by implementation of the Program. As described and analyzed in the accompanying biological opinion, NMFS anticipates some short-term sediment and turbidity will occur up to about 1500 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 500 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 believes the chance of spills is low based on the avoidance and minimization measures to be implemented 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 project implementation. The temporal (construction restricted to the dry portion of the year) and spatial scale (a maximum number of proposed instream projects per HUC 10 watershed per year [Table 1 in the associated biological opinion], separate by at least 1,200 feet per year) at which individual restoration project activities are expected to occur (the entire regulatory jurisdiction of the Corps' San Francisco District – Figure 1 in the biological opinion) in the next five years of the proposed action will likely preclude significant additive effects. Implementation of the proposed restoration activites is expected to improve the function and value of EFH within the County's watersheds; short-term adverse effects will be offset by anticipated long-term benefits.

IV. CONCLUSION

After reviewing the effects of the project, NMFS concludes that the project action, as proposed, will adversely affect the EFH of coho or Chinook salmon within streams currently or historically supporting these species in San Benito, San Luis Obispo, Monterey, Santa Cruz, San Mateo, Santa Clara, San Francisco, Alameda, Contra Costa, Solano, Napa, Marin, Sonoma, Mendocino, Humboldt, Del Norte, Shasta, Siskiyou, Trinity, Glen, and Lake counties.

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 potential adverse effects, NMFS is providing EFH Conservation Recommendations for this proposed project.

NMFS recommends the Corps implement the conservation recommendation in the associated biological opinion regarding the replanting of disturbed riparian vegetation.

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.

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