DEPARTMENT OF THE ARMY

SAN FRANCISCO DISTRICT, U.S. ARMY CORPS OF ENGINEERS
1455 MARKET STREET
SAN FRANCISCO, CALIFORNIA 94103-1398

DEPARTMENT OF THE ARMY PERMIT

PERMITTEE: Patty Forbes, California Department of Fish and Wildlife

REGIONAL GENERAL PERMIT NO. 12 (RGP 12): File No. 2003-279220

ISSUING OFFICE: San Francisco District

NOTE: The term "you" and its derivatives, as used in this permit, means the permittee or any future transferee. The term "this office" refers to the appropriate District or Division office of the Corps of Engineers having jurisdiction over the permitted activity or the appropriate official of that office acting under the authority of the commanding officer.

You are authorized to perform work in accordance with the terms and conditions specified below:

PROJECT DESCRIPTION: This Regional General Permit (RGP) authorizes minor fill discharges of earth, rock, and wood associated with salmonid habitat restoration activities. These activities conform to state law and are implemented consistent with the *California Salmonid Stream Habitat Restoration Manua*l), (Flosi et al., 1998). The most current version of the manual is available at: http://www.dfg.ca.gov/fish/Resources/HabitatManual.asp. General information on the FRGP is available at: https://www.wildlife.ca.gov/Grants/FRGP. The following paragraphs are a descriptive list of the proposed activities as depicted in the project drawings (Figures C-1 to C-39):

a. In-stream habitat improvements: Improvements may include cover structures (divide logs; digger logs; spider logs; and log, root wad and boulder combinations), boulder structures (engineered log jams, boulder weirs; vortex boulder weirs; boulder clusters; and single and opposing boulder wing-deflectors), log structures (log weirs; upsurge weirs; single and opposing log wing-deflectors; and Hewitt ramps), and off-channel or side channel habitat construction. Techniques and practices are identified in Part VII of the *California Salmonid Stream Habitat Restoration Manual.* Techniques for placement of imported spawning gravel are identified on page VII-46 of the *California Salmonid Stream Habitat Restoration Manual*.

b. Unanchored large woody debris: Woody debris may be used to enhance pool formation and improve stream reaches. First through third order streams are generally best suited. Logs selected for placement should have a minimum diameter of 12 inches and a minimum length 1.5 times the mean bankfull width of the stream channel type reach and the deployment site. A root wad should be selected with care and have a minimum root bole diameter of five feet and a minimum length of fifteen feet and at least half the channel type bankfull width. More information can be found on page VII-23 of the *California Salmonid Stream Habitat Restoration Manual*.

c. Fish screens: Screens would be used to prevent entrainment of juvenile salmonids in water diverted for agriculture, power generation, or domestic use, and are needed on both gravity flow and pump diversion systems. Guidelines for functional designs of downstream migrant fish passage facilities at water withdrawal projects are found in Appendix S of the *California Salmonid Stream Habitat Restoration Manual*. The appendix covers structure placement, approach velocity, sweeping velocity, screen openings, and screen construction.

d. Fish passage at stream crossings: Stream crossing projects include activities that provide fish friendly crossings where the crossing width is at least as wide as the active channel, culvert passes are designed to withstand a 100-year storm flow, and crossing bottoms are buried below the streambed. Examples include replacement of barrier stream crossings with bridges, bottomless arch culverts, embedded culverts, or fords. Guidelines for fish passage practices are covered in Part IX of the *California Salmonid Stream Habitat Restoration Manual*. Baffled culvert (Washington baffles and steel ramp baffles), fishways (step and pool, Denil fishway, Alaskan steep pass and back-flooding weirs), and fish ladders are described in Part VII.

e. Fish Passage Improvements: These activities would include removal of obstructions (i.e. small dams, log jams, beaver dams, waterfalls and chutes and landslides). Suitable large woody debris removed from fish passage barriers

that are not used by the project for habitat enhancement shall be left within the riparian zone so as to provide a source for future recruitment of wood into the stream. Logjam barriers are typically less than 10 cubic yards. Guidelines for fish passage improvements are covered in Part VII of the *California Salmonid Stream Habitat Restoration Manual*.

f. Upslope restoration: These activities reduce sediment delivery to anadromous streams including road decommissioning, road upgrading, and storm proofing roads (replacing high risk culverts with bridges, installing culverts to withstand the 100 year flood flow, installing critical dips, installing armored crossings, and removing unstable side-cast and fill materials from steep slopes). Guidelines for upslope restoration practices are covered in Part X of the *California Salmonid Stream Habitat Restoration Manual*.

g. Watershed and stream bank stability activities: These activities would reduce sediment from watershed and stream bank erosion. Examples include slide stabilization, stream bank stabilization, boulder stream bank stabilization structures, log stream bank stabilization structures, tree revetment, native material revetment, mulching, revegetation, willow wall revetment, brush mattress, check-dams, brush check-dams, waterbars, exclusionary fencing. Guidelines for watershed and streambank stability are covered in Part VII of the *California Salmonid Stream Habitat Restoration Manual*.

All habitat improvements shall be carried out in accordance with techniques in the *California Salmonid Stream Habitat Restoration Manual.* Such work is depicted in the general plans and drawings titled "USACE File #2003-279220, RGP12 Fisheries Restoration Grant Program, July 2016, Pages C1-C39," provided as Enclosure 1.

PROJECT LOCATION: The proposed salmonid habitat enhancement projects would be conducted in various streams and rivers throughout the following coastal California Counties: Alameda, Contra Costa, Del Norte, Glenn, Humboldt, Lake, Marin, Mendocino, Monterey, Napa, San Benito, San Francisco, San Luis Obispo (northeast, non-coastal), San Mateo, Santa Clara, Santa Cruz, Siskiyou, Solano, Sonoma, and Trinity. This Regional General Permit (RGP) 12 would apply only to counties that are within the jurisdictional boundaries of the Corps' San Francisco District Regulatory Division.

PERMIT CONDITIONS:

GENERAL CONDITIONS:

1. The time limit for completing the work authorized ends on December 1, 2020.

2. You must maintain the activity authorized by this permit in good condition and in conformance with the terms and conditions of this permit. You are not relieved of this requirement if you abandon the permitted activity, although you may make a good faith transfer to a third party in compliance with General Condition 4 below. Should you wish to cease to maintain the authorized activity or should you desire to abandon it without a good faith transfer, you must obtain a modification of this permit from this office, which may require restoration of the area.

3. If you discover any previously unknown historic or archeological remains while accomplishing the activity authorized by this permit, you must immediately notify this office of what you have found. We will initiate the Federal and State coordination required to determine if the remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.

4. If a conditioned water quality certification has been issued for your project, you must comply with the conditions specified in the certification as special conditions to this permit.

5. You must allow representatives from this office to inspect the authorized activity at any time deemed necessary to ensure that it is being or has been accomplished in accordance with the terms and conditions of your permit.

6. You understand and agree that, if future operations by the United States require the removal, relocation or other alteration of the structure or work authorized herein, or if, in the opinion of the Secretary of the Army or his authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, you will be required, upon due notice from the Corps of Engineers, to remove, relocate, or alter the structural work or obstructions caused thereby, without expense to the United States. No claim shall be

made against the United States on account of any such removal or alteration.

SPECIAL CONDITIONS:

1. To remain exempt from the prohibitions of Section 9 of the Endangered Species Act, the non-discretionary Terms and Conditions for incidental take of federally-listed species shall be fully implemented as stipulated in the Biological Opinions titled, "Endangered Species Act Section 7(a)(2) Biological Opinion, and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the Issuance of a Regional General Permit to the California Department of Fish and Wildlife for Implementation of Anadromous Fish Habitat Restoration Projects under the Fisheries Restoration Grants Program (Corps File No. 2003-279220)," (pages 78-82) dated May 26, 2016, "Programmatic Formal Endangered Species Consultation on the Regional General Permit for California Department of Fish and Wildlife Anadromous Fisheries Restoration Grant Program (Corps Regional General Permit 12; File no. 2003-279220)," (pages 8-18, and 33) dated July 7, 2016, and "Biological Opinion for the California Department of Fish and Wildlife Fisheries Restoration Grant Program Regional General Permit 12 Renewal in San Luis Obispo, Monterey, Santa Cruz, and San Benito Counties, California," (pages 29-30) dated July 28, 2016 (each RGP 12 ESA letter is available at the RGP website: http://www.spn.usace.army.mil/Missions/Regulatory/Regulatory-Overview/Regional-General-Permits/). Project authorization under the RGP is conditional upon compliance with the mandatory terms and conditions associated with incidental take. Failure to comply with the terms and conditions for incidental take, where a take of a federally-listed species occurs, would constitute an unauthorized take and non-compliance with the RGP. The USFWS and NMFS are, however, the authoritative federal agencies for determining compliance with the incidental take statements and for initiating appropriate enforcement actions or penalties under the Endangered Species Act.

a. Dam removal projects (excluding permanent, flashboard, and seasonal dams that are not considered high risk), fish ladder projects, fish hatchery/stocking projects, salmon in the classroom, fish screen installation or monitoring projects, 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 the NMFS BO and will require separate Section 7 consultations to determine impacts to listed salmonids.

2. The USFWS, Arcata Fish and Wildlife Office (AFWO), concurred with the determination that the project was not likely to adversely affect Northern spotted owl (*Strix occcidentalis caurina*) and designated critical habitat for this species. This concurrence was premised, in part, on project work restrictions outlined in their December 21, 2015 concurrence letter (available at the RGP website cited above). These work restrictions are incorporated as special conditions to RGP 12 authorization to ensure unauthorized incidental take of species and loss of critical habitat does not occur. Any projects within the Mendocino County Range Definition for California red-legged frog (AFWO 2009 Range Definition map) must be consulted on individually prior to the completion of the CDFW Negative Declaration for that year. Similarly, projects located within suitable habitat or critical habitat for yellow-billed cuckoo (*Coccyzus americanus*) must be consulted on individually.

3. The Corps initiated consultation with the National Marine Fisheries Service (NMFS) to address project related impacts to Essential Fish Habitat. The conservation recommendations outlined on pages 82-83 of the NMFS BO cited above, shall be fully implemented as stipulated.

4. Projects activities shall be implemented during the summer dry season beginning June 15 and ending on November 1.

5. Location of staging/storage areas for equipment, materials, fuels, lubricants, and solvents, will be located outside of the stream's high water channel and associated riparian area. The number of access routes, number and size of staging areas, and the total area of the work site activity shall be limited to the minimum necessary to complete the restoration action. To avoid contamination of habitat during restoration activities, trash will be contained, removed, and disposed of throughout the project.

6. Any equipment work within the stream channel shall be performed in isolation from the flowing stream. If there

is any flow when the work is done, the contractor shall construct cofferdams upstream and downstream of the excavation site and divert all flow from upstream of the upstream dam to downstream of the downstream dam.

7. The spread or introduction of invasive exotic plants will be avoided to the maximum extent possible.

8. Wildlife encountered during the course of construction, will be allowed to leave the construction area unharmed.

9. Impacts to riparian and wetland vegetation shall be avoided to the maximum extent possible, and shall be restored and enhanced with native vegetation when adverse impacts are unavoidable.

10. For any salmonid habitat restoration projects that would be constructed within the coastal zone, the permittee shall obtain a concurrence from the California Coastal Commission that the project is consistent with the State's certified Coastal Zone Management Program. The permittee shall contact the appropriate California Coastal Commission office to determine the need for a coastal zone permit prior to conducting any work in the coastal zone. Projects occurring in the coastal zone in the San Francisco Bay region must be permitted by the San Francisco Bay Conservation and Development Commission (BCDC).

11. The permittee shall submit to the District Engineer an annual report of the proposed salmonid restoration projects at least 90 days prior to the commencement of work each calendar year. The submitted report shall include the types of activities planned, anticipated dates of commencement and completion, location, and a brief description of the proposed projects. The Corps will have 30 days to verify if the proposed projects are authorized by this RGP. If any of the proposed projects cannot be authorized under the RGP, the Corps will notify the CDFW as soon as the determination is made.

12. An Annual Report on the prior year's projects shall be submitted. This report shall include project locations and implementation status, such as that included in the California Habitat Restoration Project Database (CHRPD).

13. Copies of the annual reports shall be provided to the U. S. Fish and Wildlife Service, and the U. S. National Marine Fisheries Service in accordance with the BO requirements.

FURTHER INFORMATION:

1. Congressional Authorities: You have been authorized to undertake the activity described above pursuant to:

( ) Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. Section 403).
(X) Section 404 of the Clean Water Act (33 U.S.C. Section 1344).
( ) Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972 (33 U.S.C. Section 1413).

2. Limits of this authorization:

a. This permit does not obviate the need to obtain other Federal, State, or local authorizations required by law.

b. This permit does not grant any property rights or exclusive privileges.

c. This permit does not authorize any injury to the property or rights of others.

d. This permit does not authorize interference with any existing or proposed Federal project.

3. Limits of Federal Liability: In issuing this permit, the Federal Government does not assume any liability for the following:

a. Damages to the permitted project or uses thereof as a result of other permitted or unpermitted activities or from natural causes.

b. Damages to the permitted project or uses thereof as a result of current or future activities undertaken by or on behalf of the United States in the public interest.

c. Damages to persons, property, or to other permitted or unpermitted activities or structures caused by the activity authorized by this permit.

d. Design or construction deficiencies associated with the permitted work.

e. Damage claims associated with any future modification, suspension, or revocation of this permit.

4. Reliance on Applicant's Data: The determination of this office that issuance of this permit is not contrary to the public interest was made in reliance on the information you provided.

5. Reevaluation of Permit Decision: This office may reevaluate its decision on this permit at any time the circumstances warrant. Circumstances that could require a reevaluation include, but are not limited to, the following:

a. You fail to comply with the terms and conditions of this permit.

b. The information provided by you in support of your permit application proves to have been false, incomplete, or inaccurate. (See Item 4 above.)

c. Significant new information surfaces which this office did not consider in reaching the original public interest decision.

Such a reevaluation may result in a determination that it is appropriate to use the suspension, modification, and revocation procedures contained in 33 C.F.R. § 325.7 or enforcement procedures such as those contained in 33 C.F.R. §§ 326.4 and 326.5. The referenced enforcement procedures provide for the issuance of an administrative order requiring you to comply with the terms and conditions of your permit and for the initiation of legal action where appropriate. You will be required to pay for any corrective measures ordered by this office, and if you fail to comply with such directive, this office may in certain situations (such as those specified in 33 C.F.R. § 209.170) accomplish the corrective measures by contract or otherwise and bill you for the cost.

6. Extensions: General Condition 1 establishes a time limit for the completion of the activity authorized by this permit. Pursuant to 33 CFR 325.2(e)(2), no regional general permit may be issued for a period of more than five years. RGP 12 renewal may be processed pending inter-agency coordination.

Your signature below, as permittee, indicates that you accept and agree to comply with the terms and conditions of this permit.

Patty Foley — 8-1-2016

(PERMITTEE) (DATE)

This permit becomes effective when the Federal official, designated to act for the Secretary of the Army, has signed below.

[signature] — 1 Aug 2016

John C. Morrow (DATE)
Lieutenant Colonel, U.S. Army
District Commander

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Sacramento Fish and Wildlife Office
2800 Cottage Way, Suite W-2605
Sacramento, California 95825-1846

In Reply Refer to:
08ESMF00-
2016-F-0874

Chief Regulatory Division
Attention: Justin Yee
U.S. Army Corps of Engineers
1455 Market Street 16th Floor
San Francisco, California 94103-1398

JUL 07 2016

Subject: Programmatic Formal Endangered Species Consultation on the Regional General Permit for California Department of Fish and Wildlife Anadromous Fisheries Restoration Grant Program (Corps Regional General Permit 12; File no. 2003-279220)

Dear Aaron O. Allen Ph. D:

This letter is in response to the U.S. Army Corps of Engineers (Corps), November 20, 2015 request for initiation of formal consultation with the U.S. Fish and Wildlife Service (Service) on the proposed California Department of Fish and Wildlife (CDFW) Fisheries Restoration Grant Program (Program) in Alameda, Contra Costa, Lake, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma Counties, California. Your request was received by the Service on November 23, 2015. At issue are the proposed project's effects on federally endangered and threatened species and their critical habitat (Table 1). This response is provided under the authority of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*) (Act), and in accordance with the implementing regulations pertaining to interagency cooperation (50 CFR 402).

Table 1

Species	Listed Status
Amphibians	
California red-legged frog (*Rana draytonii*)	Federally Threatened
California red-legged frog Critical Habitat	
California Tiger Salamander (*Ambystoma californiense*) Sonoma County Distinct Population Segment (DPS)	Federally Endangered
California Tiger Salamander Sonoma County DPS Critical Habitat	
California Tiger Salamander Central California DPS	Federally Threatened
California Tiger Salamander Central California DPS Critical Habitat	
Birds	
Least Bell's vireo (*Vireo bellii pusillus*)	Federally Endangered
Marbled Murrelet (*Brachyramphus marmoratus*)	Federally Threatened
Marbled Murrelet Critical Habitat	
Northern Spotted Owl (*Strix occidentalis caurina*)	Federally Threatened
Northern Spotted Owl Critical Habitat	
Southwestern willow flycatcher (*Empidonax traillii extimus*)	Federally Endangered
Fish	

Tidewater goby (*Eucyclogobius newberryi*)	Federally Endangered
Tidewater goby Critical Habitat	
Invertebrates	
California freshwater shrimp (*Syncaris pacifica*)	Federally Endangered
Reptiles	
San Francisco garter snake (*Thamnophis sirtalis tetratenia*)	Federally Endangered

The federal action on which we are consulting is the issuance of a Clean Water Act Section 404 permit to CDFW for the Fisheries Restoration Grant Program. Pursuant to 50 CFR 402.12(j), you submitted a biological assessment and supplement for our review and requested concurrence with the findings presented therein.

In considering your request, we based our evaluation on the following: (1) The November 20 2015, Corps request for consultation; (2) the 2015 Mitigated Negative Declaration for the Fisheries Restoration Grant Program; (3) the 2010 California Salmonid Stream Habitat Restoration Manual; (4) numerous emails from Fish and Game to the Service; (5) a February 17, 2016 meeting with the Corps and CDFW to discuss implementation of the Program; and (6) other information available to the Service.

In your letter dated November 20, 2015, you requested our concurrence that the proposed authorization is not likely to adversely affect the California red-legged frog or its critical habitat, Sonoma County DPS and threatened Central California DPS of the California tiger salamander, least Bell's vireo, marbled murrelet, northern spotted owl, southwestern willow flycatcher, tidewater goby and California freshwater shrimp. San Francisco garter snake was not initially included in the determination as previously all San Francisco garter snake required independent consultation; however, with the revised approach it was agreed by the Service, Corps and CDFW would be able to include San Francisco garter snake. You reached this conclusion based on the proposed implementation of several measures intended to avoid effects to these species from project activities.

We concur with your determination that the proposed authorization may affect, but is not likely to adversely affect, critical habitat for the California red-legged frog. Our concurrence is based on the following factors:

1. Projects implemented under the proposed authorization will not damage or deteriorate any of the primary constituent elements (aquatic breeding habitat, aquatic non-breeding habitat, upland habitat, and dispersal habitat) of critical habitat as defined in the revised designation (74 FR 51829);

2. Restoration projects implemented under the proposed authorization within critical habitat units will likely improve the quality of California red-legged frog habitat in these areas. This will improve the function and productivity of the critical habitat units for red-legged frogs; and

3. Restoration projects implemented under the proposed authorization will revitalize degraded or impaired aquatic and riparian habitats. This will provide a long-term benefit to California red-legged frog, and result in higher quality habitat in dispersal corridors and core areas.

We concur with your determination that the proposed authorization may affect, but is not likely to adversely affect, the Sonoma County and Central California DPS of the California tiger salamander and their critical habitat. Our concurrence is based on the following factors:

1. Most of the proposed projects will occur in or near streams and riparian corridors;

2. Upslope projects will be limited to road upgrading and decommissioning in areas that are steep, eroding, and often vegetated with trees and shrubs; and

3. California tiger salamanders use ponds and vernal pools for breeding, and existing burrows in grassland habitat refuge. Neither of these habitat types is usually located in proximity to anadromous fish-bearing streams;

4. Projects implemented under the proposed authorization will not damage or deteriorate any of the primary constituent elements (aquatic breeding habitat, upland habitat that contain small mammal burrows or other underground habitat, and dispersal habitat between occupied locations) of critical habitat as defined in the revised designation (70 FR 49380, 76 FR 54386).

We concur with your determination that the proposed authorization may affect, but is not likely to adversely affect, the least Bell's vireo. Our concurrence is based on the following factors:

1. Protocol surveys for least Bell's vireo will be conducted at proposed project sites by a qualified biologist knowledgeable in least Bell's vireo identification and biology;

2. Work will not begin within 0.25 mile of any site with known or potential least Bell's vireo habitat until after September 15; and

3. Willow branches will not be harvested at any site with potential least Bell's vireo habitat between March 1 and September 15.

We concur with your determination that the proposed authorization may affect, but is not likely to adversely affect, the marbled murrelet and northern spotted owl or their critical habitat. Our concurrence is based on the following factors:

1. Qualified biologists will conduct protocol surveys for spotted owls and marbled murrelets at proposed project sites which contain potential habitat;

2. Work will not be conducted within 0.25 mile of any site with known or potential marbled murrelet habitat between November 1 and September 15, or known or potential spotted owl habitat between November 1 and July 31. If protocol surveys determine that nesting spotted owls or marbled murrelets do not occur within 0.25 mile of a specific project site, project activities at that site may commence prior to September 15; and

3. Project activities will not remove or degrade suitable spotted owl or marbled murrelet habitat or their critical habitat.

We concur with your determination that the proposed authorization may affect, but is not likely to adversely affect, the southwestern willow flycatcher. Our concurrence is based on the following factors:

1. All projects within the counties described in this Biological Opinion are outside of the breeding range of southwestern willow flycatcher.

We concur with your determination that the proposed authorization may affect, but is not likely to adversely affect, the Tidewater Goby or its critical habitat. Our concurrence is based on the following factors:

1. No work will be conducted in lagoon habitats or done in a manner than will indirectly adversely affect lagoon habitat.

We do not concur with your determination that the proposed authorization may affect, but is not likely to adversely affect, California red-legged frog and California freshwater shrimp. We believe that the proposed authorization may adversely affect these species. Factors contributing to this determination are the proposed relocation of California freshwater shrimp and California red-legged frogs from project areas and use of heavy equipment in or near shrimp or red-legged frog habitat. The Service believes that these activities may adversely affect them and thereby warrant formal consultation.

The remainder of this document provides our biological opinion on the effects of the proposed project on California red-legged frog, California freshwater shrimp, and San Francisco garter snake.

Consultation History

Date:	Description
November 20, 2015	The Service received a request from the Corps for formal consultation and renewal of the Program.
December 7, 2015	The Service contacted the Corps and requested additional information and informed the Corps the Service would be writing a new Programmatic Biological Opinion as the project had changed significantly from previous iterations.
February 17, 2016	The Service, Corps, and CDFW met to discuss a change in approach requiring project level appendages and coverage of additional species as well as the need for revised mitigation and minimization measures.
March – April, 2016	The Service , CDFW, and Corps exchanged emails to clarify the Description of the Action and the Corps determinations.

Description of the Action

Introduction

The Corps proposes to renew Regional General Permit (RGP) 12 authorizing the CDFW to fund and carry out various salmonid habitat enhancement and restoration. The RGP will have a term of 5 years from the date of authorization. Program activities are proposed annually for various watersheds throughout 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, Trinity, and Ventura counties. The Corps' proposed authorization addressed by this consultation will apply only to Program projects in counties within the regulatory jurisdictional boundaries of the Corps' San Francisco District. Of the resulting geographic area, the Sacramento Fish and Wildlife Office has regulatory purview only over Alameda, Contra Costa, Lake, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma Counties. Therefore, this consultation pertains only to Program projects utilizing the proposed authorization that are executed in Alameda, Contra Costa, Lake, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma Counties.

Administration of this Programmatic Biological Opinion

This programmatic consultation will be implemented upon determination by the Corps that a proposed project that qualifies for authorization under Corps RGP 12 or otherwise meets the suitability criteria set forth in this document as required by the implementing regulations for section 7 of the Act. The Corps will provide the Service with all of the written documentation utilized to formulate its determination. Upon receipt of the appropriate information, the Service will review the material and evaluate whether it is appropriate to append the project to this programmatic biological opinion based on the level of effects, and the avoidance, minimization and compensation measures proposed. The Service, upon review of information provided by the Corps, may determine some projects require separate Section 7 consultation and are not suitable append to this programmatic biological opinion. If the Service does not concur the project is appropriate to be appended to this programmatic biological opinion, the Service will notify the Corps in writing. If the Service does concur it is appropriate to append the project to this programmatic biological opinion and other listed species also will be adversely affected, the proposed action will be appended to this programmatic biological opinion and a biological opinion will be completed for the additional listed species. Both the appendage and the biological opinion will be combined into a single document by the Service that will be issued to the Corps.

The action area of this programmatic biological opinion overlaps with many other mechanisms that authorize incidental take of listed species such as Habitat Conservation Plans or other programmatic biological opinions. The applicant may seek incidental take authorization through one of these other mechanisms for projects that may affect the species, provided the sponsoring agency determines the applicant's project meets the criteria for inclusion under their respective mechanism, and subject to Service guidance and approval. At the Service's discretion, proposed actions that do not meet the suitability criteria may still be appended, if the complete implementation of appropriate additional conservation measures sufficiently reduces the effects of the action or that the project has minimal effects that are consistent with the intent of this programmatic biological opinion.

This programmatic biological opinion is effective for a period of 5 years from the date of its issuance and can be extended if deemed appropriate by both agencies The Service will review this

programmatic consultation, as appropriate, to ensure that its application is consistent with the intended criteria.

Requirements for Appendage to this Programmatic Biological Opinion

1. To be considered for appendage, projects are required to provide at minimum: a project description, action area, environmental baseline, California Natural Diversity Database (CNDDB) records within three miles of the project site, and an official species list (https://ecos.fws.gov/ipac/) for federally listed species. An example standard of information is included in Enclosure 1. The Service may request additional information.

2. Any federally listed species included in this programmatic biological opinion identified as potentially occurring within the action area will be addressed with the minimization measures provided in this Programmatic Biological Opinion. Modification or exclusion of minimization measures that do not reduce the likelihood of take of listed species is permitted with justification.

3. Any federally listed species not included in this programmatic biological opinion identified as potentially occurring within the action area will be addressed with additional avoidance and minimization measures as appropriate. For information and appropriate species specific conservation measures please contact the Coast Bay Division Chief at (916) 414-6623.

4. Any project within critical habitat of federally listed species within the action area will be addressed with all proposed avoidance and minimization measures.

5. The minimization measures provided are not intended to be exhaustive. Should additional measures be required to further reduce the likelihood of take of federally listed species then they will be included in each project's project description.

6. CDFW will provide post construction monitoring, reporting, and tracking on an annual basis.

7. Any encountered federally protected species will be reported to CNDDB and copies of the reporting forms be provided with each end of year report.

Covered Activities

All projects will be carried out in accordance with techniques identified in the California Salmonid Stream Habitat Restoration Manual (available online at www.dfg.ca.gov/fish/resources/habitatmanual.asp). The following descriptions of restoration treatments are summarized from the Restoration Manual; these descriptions are not intended to be exhaustive. For more detailed information on specific project methods the 2010 4th edition California Salmonid Stream Habitat Restoration Manual (Manual) is hereby incorporated by reference. Several Projects were further defined during NMFS consultation and by extension are also incorporated by reference (Enclosure 2). Additional activities deemed appropriate to be included within this programmatic biological opinion may be appended upon Service approval.

1. Electrofishing Surveys (Manual IV-12)

2. Instream Habitat Improvements (Manual VII-24, NMFS Guidance)

3. Fish Passage (Manual VII-47, IX-47, XII, NMFS Guidance)

4. Watershed and Stream Bank Stabilization (VII-62)

5. Upslope Erosion and Sediment Control Guidance (Manual X)

6. Riparian Habitat Restoration (Manual XI)

7. Water Conservation Measures (NMFS Guidance)

Conservation, Avoidance and Minimization Measures

Preconstruction Surveys

1. CDFW or their agent shall survey all work sites for rare plants prior to any ground disturbing activities. Rare plant surveys will be conducted following the "Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities" (CDFW, 2009).

2. If any special status plant species are identified at a work site, CDFW will require one or more of the following protective measures to be implemented before work can proceed:

    a. Fencing to prevent accidental disturbance of rare plants during construction,

    b. On-site monitoring by a Service approved monitor during construction to assure that rare plants are not disturbed, and

    c. Redesign of proposed work to avoid disturbance of rare plants.

3. Plant surveys will also include any host plants for butterflies identified as occurring in the area either in the CNDDB or the official species list. These host plants are included in Enclosure 3. If any host plant species are identified at a work site, CDFW shall require one or more of the following protective measures to be implemented before work can proceed:

    a. Fencing to prevent accidental disturbance of larval host plants during construction,

    b. On-site monitoring by a qualified biologist during construction to assure that larval host plants are not disturbed, and

    c. Redesign of proposed work to avoid disturbance of larval host plants.

4. If it becomes impossible to implement the project at a work site without impacts to larval host plants, then activity at that work site shall not proceed.

5. CDFW will ensure that the grantee or responsible party is aware of these site-specific conditions, and shall inspect the work site before, during, and after completion of the habitat restoration action.

General Measures for Protection of Biological Resources

1. A copy of the programmatic biological opinion, its appendage, and the applicable project enclosures will be kept on site. If the documents are stored electronically, then local versions must be saved on site, and not require network connection to access them.

2. Projects will be timed to avoid impacts to aquatic habitat. The activities carried out in the restoration program typically occur during the summer dry season where flows are low or streams are dry.

    a. Work around streams is restricted to the period of June 15 through November 1 or the first significant rainfall, whichever comes first.

    b. To the extent feasible, upslope work period will be restricted to periods that will minimize effects to federally listed species. Work outside these periods will require Service approval.

    c. The approved work window for individual work sites will be further constrained as necessary to avoid the nesting of birds.

        i. At sites with potential for raptor (including northern spotted owls) and migratory bird nesting, if work is conditioned to start after July 9, potential impacts will be avoided and no surveys will be required.

        ii. At sites that might contain nesting marbled murrelets, the starting date will be September 16 in the absence of surveys. The work window at individual work sites could be advanced if surveys determine that nesting birds will not be impacted.

    d. For restoration work that may affect swallow nesting habitat (such as removal or modification of bridges, culverts or other structures that show evidence of past swallow nesting activities), construction shall occur after August 31 to avoid the swallow nesting period. Suitable nesting habitat shall be netted prior to the breeding season to prevent nesting. Netting shall be installed before any nesting activity begins, generally prior to March 1. Swallows shall be excluded from areas where construction activities cause nest damage or abandonment.

    e. All project activities shall be confined to daylight hours.

3. Projects shall not disturb or dewater more than 500 feet of contiguous stream reach.

4. During all activities at project work sites, all trash that may attract predators shall be properly contained, removed from the work site, and disposed of regularly. Following construction, all trash and construction debris shall be removed from work areas.

5. Staging/storage areas for equipment, materials, fuels, lubricants, and solvents, will be located outside of the stream's high water channel and associated riparian area where it cannot enter the stream channel. Stationary equipment such as motors, pumps, generators, compressors, and welders located within the dry portion of the stream channel or adjacent to the stream, will be positioned over drip-pans. Vehicles will be moved out of the normal high water area of the stream prior to refueling and lubricating. The grantee shall ensure that contamination of habitat does not occur during such operations. Prior to the onset of work, CDFW shall ensure that the grantee has prepared a plan to allow a prompt and effective response to any accidental spills. All workers shall be informed of the importance of preventing spills and of the appropriate measures to take should a spill occur.

6. The number of access routes, number and size of staging areas, and the total area of the work site activity shall be limited to the minimum necessary to complete the restoration action while minimizing riparian disturbance without affecting less stable areas, which may increase the risk of channel instability. Existing roads shall be used to access work sites as much as practicable. These access roads will be clearly identified in the project description.

7. The access and work area limits shall be identified with brightly colored flagging or fencing. Flagging and fencing shall be maintained in good repair for the duration of project activities. All areas beyond the identified work area limits shall not be disturbed.

8. Any construction debris shall be prevented from falling into the stream channel. Any material that does fall into a stream during construction shall be immediately removed in a manner that has minimal impact to the streambed and water quality.

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

10. Any work within the stream channel shall be performed in isolation from the flowing stream and erosion protection measures shall be in place before work begins.

    a. Prior to dewatering, 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 invertebrates shall be determined.

    b. If there is any flow when work will be done, the grantee shall construct coffer dams upstream and downstream of the excavation site and divert all flow from upstream of the upstream dam to downstream of the downstream dam.

    c. No heavy equipment shall operate in the live stream, except as may be necessary to construct coffer dams to divert stream flow and isolate the work site.

    d. Coffer dams may be constructed with clean river run gravel or sand bags, and may be sealed with sheet plastic. Upon project completion, sand bags and any sheet plastic shall be removed from the stream. Clean river run gravel may be left in the stream channel, provided it does not impede stream flow or fish passage, and conforms to natural channel morphology without significant disturbance to natural substrate.

e. Dewatering shall be coordinated with a qualified fisheries biologist to perform fish and wildlife relocation activities.

f. The length of the dewatered stream channel and the duration of the dewatering shall be kept to a minimum.

g. When bypassing stream flow around work area, stream flow below the construction site shall be maintained similar to the unimpeded flow at all times.

h. The work area shall be periodically pumped dry of seepage. Pumps shall be placed in flat areas, away from the stream channel. Pumps shall be secured by tying off to a tree or staked in place to prevent movement by vibration. Pump intakes shall be covered with 0.125 inch mesh to prevent entrainment of fish or amphibians that failed to be removed. Pump intakes shall be periodically checked for impingement of fish or amphibians, and shall be relocated according to the approved measured outlined for each species bellow.

i. If necessary, flow shall be diverted around the work site, either by pump or by gravity flow, the suction end of the intake pipe shall be fitted with fish screens meeting CDFW and NMFS criteria to prevent entrainment or impingement of small fish. Any turbid water pumped from the work site itself to maintain it in a dewatered state shall be disposed of in an upland location where it will not drain directly into any stream channel.

j. Fish shall be excluded from the work area by blocking the stream channel above and below the work area with fine-meshed net or screen. Mesh shall be no greater than 1/8-inch diameter. The bottom edge of the net or screen shall be completely secured to the channel bed to prevent fish from reentering the work area. Exclusion screening shall be placed in areas of low water velocity to minimize fish impingement. Screens shall be regularly checked and cleaned of debris to permit free flow of water.

11. Where the disturbance to construct coffer dams to isolate the work site would be greater than to complete the action (for example, placement of a single boulder cluster), the action shall be carried out without dewatering and fish relocation. Furthermore, measures shall 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 the stream channel provided it does not impede stream flow or fish passage, and conforms to natural channel morphology without significant disturbance to natural substrate.

12. Best management practices associated with fish screens and measures to minimize effects to salmonids associated with fish screen construction, maintenance, and repair are presented below:

a. Screening projects shall only take place on diversions with a capacity of 60 cfs or less. Screening larger diversions shall require separate consultation. Fish screens shall be operated and maintained in compliance with current law, including Fish and

Game Code, and CDFW fish screening criteria. CDFW screening criteria may be referenced on the Internet at: http://www.dfg.ca.gov/fish/Resources/Projects/Engin/Engin_ScreenCriteria.asp.

b. 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.

c. If a screen site is dewatered for repairs or maintenance when targeted fish species are likely to be present, measures shall be taken to minimize harm and mortality to targeted species resulting from fish relocation and dewatering activities. The responsible party shall notify CDFW before the project site is de-watered and streamflow diverted. The notification shall 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 shall implement the dewatering and relocation measures as described in this document to minimize harm and mortality to listed species.

d. 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 shall 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 shall 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.

e. 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 CDFW fish screening criteria. During the diversion season, screens shall 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.

f. 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 shall be identified at stable stream bank locations that minimize riparian disturbance.

g. 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 shall be removed and disposed at a location where it will not re-enter the water course.

h. 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.

i. 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.

j. 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).

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

l. 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 CDFW 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 CDFW-approved sediment control devices are installed and/or abatement procedures are implemented.

13. Any equipment entering the active stream (for example, in the process of installing a coffer dam) shall be preceded by an individual on foot to displace wildlife and prevent them from being crushed.

14. If any non-special status wildlife are encountered during the course of construction, said wildlife shall be allowed to leave the construction area unharmed, and shall be flushed, hazed, or herded in a safe direction away from the project site. "Special status wildlife" is defined as any species that meets the definition of "endangered, rare, or threatened species" in section 15380, article 20 in Title 14 of the California Code of Regulations, also known as the "CEQA Guidelines".

15. Any red tree vole nests encountered at a work site shall be flagged and avoided during construction.

16. For any work sites containing western pond turtles, salamander, foothill yellow- legged frogs, or tailed frogs, the grantee shall provide to the CDFW grant manager for review and approval, a list of the exclusion measures that will be used at their work site to prevent take or injury to any individual pond turtles, salamanders, or frogs that could occur on the site. The grantee shall ensure that the approved exclusion measures are in place prior to construction. Any turtles or frogs found within the exclusion zone shall be moved to a safe location upstream or downstream of the work site, prior to construction.

17. All habitat improvements shall be done in accordance with techniques in the California Salmonid Stream Habitat Restoration Manual.

18. The grantee shall have dependable radio or phone communication on-site to be able to report any accidents or fire that might occur.

19. Installation of bridges, culverts, or other structures shall be done so that water flow is not impaired and upstream and downstream passage of fish is assured at all times. Bottoms of temporary culverts shall be placed at or below stream channel grade.

20. Temporary fill shall be removed in its entirety prior to close of work-window.

California Red-legged Frog

1. Project activities in potential red-legged frog habitat shall be restricted to the period between July 1 and October 15.

2. No electrofishing will be conducted in red-legged frog breeding habitat from November 1 – April 31.

3. At least 15 days prior to the onset of project activities, CDFW shall submit the names(s) and credentials of biologists who would implement the Programmatic Biological Opinion. No project activities shall begin until CDFW has received written approval from the Service that the biologist(s) is qualified to conduct the work.

4. Service approved biologist(s) who handle red-legged frogs shall ensure that their activities do not transmit diseases. To ensure that diseases are not conveyed between work sites by the Service-approved biologist, the fieldwork code of practice developed by the Declining Amphibian Populations Task Force (http://www.fws.gov/ventura/docs/species/protocols/DAFTA.pdf) shall be followed at all times.

5. A CDFW monitoring plan shall be developed to determine the level of incidental take of the red-legged frog associated with the Restoration Program funded activities in the area. The monitoring plan must include a standardized mechanism to report any observations of dead or injured red-legged frog to the appropriate Corps and Service offices.

6. A Service-approved biologist shall survey the project site within two weeks before the onset of activities. If red-legged frogs are found in the project area and these individuals are likely to be killed or injured by work activities, the Service-approved biologist will allow sufficient time to move them from the site before work activities resume. Only Service-approved biologists will participate in activities with the capture, handling, and monitoring of red-legged frogs.

7. Before any project-related activities, the approved biologist must identify appropriate areas to receive red-legged frog adults and tadpoles from the project areas. These areas must be in proximity to the capture site, contain suitable habitat, not be affected by project activities, and be free of exotic predatory species (i.e. bullfrogs, crayfish) to the best of the approved biologist's knowledge.

8. Prior to the onset of project activities, a Service-approved biologist shall conduct a training session for all construction personnel. At a minimum, the training shall include a description of the red-legged frog and its habitat, the importance of the red-legged frog and its habitat, the general measures that are being implemented to conserve the red-legged frog as they relate to the project, and the boundaries within which the project may be accomplished.

Brochures, books and briefings may be used in the training session, provided that a qualified person is on hand to answer any questions.

9. A Service-approved biologist shall be present at the work site until such time as removal of red-legged frogs, instruction of workers, and habitat disturbance has been completed. The Service-approved biologist shall have the authority to halt any action that might result in impacts that exceed the levels anticipated by the Corps and Service during review of the proposed action. If work is stopped, the Corps and the Service shall be notified immediately by the Service-approved biologist or on-site biological monitor.

10. All fueling and maintenance of vehicles and other equipment and staging areas will occur at least 65 feet from any riparian habitat or water body. The Corps and the CDFW will ensure contamination of habitat does not occur during such operations. Prior to the onset of work, the CDFW will ensure that the contractor has prepared a plan to allow a prompt and effective response to any accidental spills. All workers will be informed of the importance of preventing spills and of the appropriate measures to take should a spill occur.
11. If red-legged frogs are found and these individuals are likely to be killed or injured by work activities, the Service-approved biologists must be allowed sufficient time to move them from the site before work activities resume. The Service-approved biologist must relocate the red-legged frogs the shortest distance possible to one of the predetermined areas. The Service-approved biologist must maintain detailed records of any individuals that are moved (e.g., size, coloration, any distinguishing features, photographs (digital preferred) to assist in determining whether translocated animals are returning to the point of capture. Only red-legged frogs that are at risk of injury or death by project activities may be moved.

12. If a work site is to be temporarily dewatered by pumping, intakes shall be completely screened with wire mesh not larger than 0.125 inch to prevent red- legged frogs from entering the pump system. Water shall be released or pumped downstream at an appropriate rate to maintain down stream flows during construction activities and eliminate the possibility of ponded water. Upon completion of construction activities, any barriers to flow shall be removed in a manner that would allow flow to resume with the least disturbance to the substrate.

13. Ponded areas shall be monitored for red-legged frogs that may become entrapped. Any entrapped red-legged frog shall be relocated to a pre- determined receiving area by a Service-approved biologist.

14. A Service-approved biologist will permanently remove from the project area, any individuals of exotic species, such as bullfrogs, centrarchid fishes, and non-native crayfish to the maximum extent possible. The biologist will have the responsibility to ensure that their activities are in compliance with the Fish and Game Code.

15. CDFW will notify the Service of any injuries or mortalities within 24 hours of the incident.

Tidewater Goby

1. No projects will occur within lagoons that may contain tidewater goby or tidewater goby habitat., or that may negatively indirectly impact downstream tidewater goby habitat.

California Freshwater Shrimp

1. Project activities in potential shrimp habitat shall be restricted to the period between July 1 and November 1.

2. A California freshwater shrimp relocation plan will be in place prior to work in any potential habitat identifying location(s) to relocate individuals that may be encountered.

3. At least 15 days prior to the onset of activities, CDFW shall submit the name(s) and credentials of biologists who will conduct activities specified in the following measures to the Service. The grantee shall implement any additional conservation measures requested by CDFW and/or the Service.

    a. CDFW shall be notified at least one week in advance of the date on which work will start in the stream, so that a service-approved biologist can monitor activities at the work site. All work in the stream shall be stopped immediately if it is determined by CDFW that the work has the potential to adversely impact shrimp or its habitat. Work shall not recommence until CDFW is satisfied that there will be no impact on the shrimp.

    b. Where appropriate, a Service-approved biologist will survey each site for shrimp before allowing work to proceed and prior to issuance of a Streambed Alteration Agreement. All overhanging vegetation, undercut banks, and tree roots will be surveyed with a butterfly net or fish net.

    c. Prior to the onset of work at a work site that may contain shrimp, the Service-approved biologist shall conduct a training session for all construction personnel. At a minimum the training shall include a description of the shrimp and its habitat, the importance of the shrimp and its habitat, the general measures that are being implemented to conserve the shrimp as they relate to the work site, and the work site boundaries where construction may occur.

    d. Only Service-approved biologists shall participate in the capture, handling, and monitoring of shrimp. CDFW shall report annually on the number of capture, release and injuries/mortality and agrees to modify capture/release strategy with Service staff as needed to prevent adverse effects.

4. In site locations where shrimp are present, CDFW will require the grantee to implement the mitigation measures listed:

    a. Equipment work shall be performed only in riffle, shallow run, or dry habitats, avoiding low velocity pool and run habitats occupied by shrimp, unless shrimp are relocated according to the protocol described below. "Shallow" run habitat is defined as a run with a maximum water depth, at any point, less than 12 inches, and without undercut banks or vegetation overhanging into the water.

    b. Hand placement of logs or rocks shall be permitted in pool or run habitat in stream reaches where shrimp are known to be present, only if the placement will not adversely affect shrimp or their habitat.

c. Care shall be taken during placement or movement of materials in the stream to prevent any damage to undercut stream banks and to minimize damage to any streamside vegetation. Streamside vegetation overhanging into pools or runs shall not be removed, trimmed, or otherwise modified.

d. No log or rock weirs (including vortex rock weirs), or check dams shall be constructed that would span the full width of the low flow stream channel. Vegetation shall be incorporated with any structures involving rocks or logs to enhance migration potential for shrimp.

e. No dumping of dead trees, yard waste or brush shall occur in shrimp streams, which may result in oxygen depletion of aquatic systems.

5. If in the opinion of the Service-approved biologist, adverse effects to shrimp would be further minimized by moving shrimp away from the project site, the following procedure shall be used:

   a. A second survey shall be conducted within 24 hours of any construction activity and shrimp shall be relocated to the nearest suitable habitat. Shrimp shall be moved while in the net, or placed in buckets containing stream water. Stress and temperature monitoring of shrimp shall be performed by the Service-approved biologist. Numbers of shrimp and any mortalities or injuries shall be identified and recorded. Shrimp habitat is defined as reaches in low elevation (less than 116 m) and low gradient (less than one percent) streams where banks are structurally diverse with undercut banks, exposed fine root systems, overhanging woody debris or overhanging vegetation.

6. A Service-approved CDFW biologist shall be present at the work site until such time as all removal of shrimp, instruction of workers, and habitat disturbance associated with the restoration project have been completed.

7. The Service-approved biologist shall have the authority to halt any action that might result in the loss of any shrimp or its habitat. If work is stopped, the Service-approved biologist shall immediately notify CDFW and the Service.

8. If a work site is temporarily dewatered by pumping, intakes shall be completely screened with wire mesh no larger than 0.2 inch to prevent shrimp from entering the pump system. Water shall be released or pumped downstream at an appropriate rate to maintain downstream flows during construction. Upon completion of construction activities, any barriers to flow shall be removed in a manner that would allow flow with the least disturbance to the substrate.

9. A Service-approved biologist shall permanently remove from within the project work site, any individuals of exotic species, such as bullfrogs, centrarchid fishes, and non-native crayfish, to the maximum extent possible. The grantee shall have the responsibility that such removals are done in compliance with the California Department of Fish and Wildlife.

10. Invasive non-native vegetation that provides shrimp habitat and is removed as a result of Program activities shall be replaced with native vegetation that provides comparable habitat for the shrimp. Re-vegetated sites shall be irrigated as necessary until vegetation is established. Re-vegetated sites shall be monitored until shading and cover achieves 80% of pre-project shading and cover and for a minimum of 5 years.

San Francisco Garter Snake

1. A Service approved biologist will conduct preconstruction surveys and monitor for San Francisco garter snake prior to implementation of project activities. If San Francisco garter snakes are identified at the project site, work will be halted. If the identified animal(s) do not leave the project area of their own volition, the Service and California Department of Fish and Wildlife will be contacted to determine appropriate actions. Only Service-approved biologists will participate in activities associated with the capture, handling, or relocation of San Francisco garter snake.

2. Exclusion fencing shall be established around staging areas and soil stockpile areas. Exclusion fencing shall include escape funnels and the lower edge of the fence shall be buried at least four (4) inches to prevent burrowing animals from tunneling under the fence. Exclusion fence posts will be placed on the inside to prevent snakes from being able to climb into the project site.

3. The Service-approved biologist will conduct daily inspections of the project work area, staging area, and the perimeter of any exclusion fencing prior to the commencement of construction activities. Upon completion equipment or materials may be moved onto the work site and project activities may commence with a Service-approved monitor.

4. The exclusion fencing will remain in operating condition for the duration of the project. The biological monitor shall daily inspect the integrity of the exclusion fencing to ensure there are no gaps, tears or damage. Maintenance of the fencing shall be conducted as needed. Any necessary repairs to the fencing shall be completed within 24 hours of the initial observance of the damage.

5. A Service approved biological monitor will be on-site while all project activities are being conducted. The monitor will walk in front of equipment to ensure San Francisco garter snake are not crushed.

6. Vegetation removed shall be kept within the exclusion fencing or placed into a disposal vehicle and removed from the project site. Vegetation will not be piled on the ground outside fencing unless it is later transferred, piece by piece, under the direct supervision of the Service-approved biologist.

7. Soil will not be stockpiled unless it is on a paved surface or an area where burrows are absent. The Service-approved biologist will approve such locations within the defined work area.

8. If San Francisco garter snake are found on site, the construction contractor shall stop work and contact the Service immediately and allow the San Francisco garter snake to leave on its own volition.

9. Prior to work, all burrows will be flagged and avoided to prevent their collapse.

10. All workers will check stockpiled construction materials, and under equipment to be moved for presence of wildlife sheltering within them prior to use.

11. Any vehicle parked on site for more than 15 minutes will be inspected before it is moved to ensure that San Francisco garter snake have not moved under the vehicle.

12. The Service-approved biological monitor shall have the responsibility and authority of stopping the project if any crews or personnel are not complying with the Biological Opinion.

Action Area

The action area is defined in 50 CFR § 402.02, as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action." For the proposed project, the action area encompasses all anadromous fish-bearing streams to top of bank in: Alameda, Contra Costa, Lake, Marin, Lake, Napa, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma counties; and associated uplands and adjacent wetlands utilized for staging and access.

Analytical Framework for the Jeopardy Determination

In accordance with policy and regulation, the jeopardy analyses in this biological opinion relies on four components: (1) the *Status of the Species*, which evaluates the California red-legged frog, San Francisco garter snake, and California freshwater shrimp range-wide condition, the factors responsible for that condition, and its survival and recovery needs; (2) the *Environmental Baseline*, which evaluates the condition of the California red-legged frog, San Francisco garter snake, and California freshwater shrimp in the action area, the factors responsible for that condition, and the relationship of the action area to the survival and recovery of the California red-legged frog, San Francisco garter snake, and California freshwater shrimp; (3) the *Effects of the Action*, which determines the direct and indirect impacts of the proposed Federal action and the effects of any interrelated or interdependent activities on the California red-legged frog, San Francisco garter snake, and California freshwater shrimp; and (4) *Cumulative Effects*, which evaluates the effects of future, non-Federal activities in the action area on the California red-legged frog, San Francisco garter snake, and California freshwater shrimp.

In accordance with policy and regulation, the jeopardy determination is made by evaluating the effects of the proposed Federal action in the context of the California red-legged frog, San Francisco garter snake, and California freshwater shrimp current status, taking into account any cumulative effects, to determine if implementation of the proposed action is likely to cause an appreciable reduction in the likelihood of both the survival and recovery of the(se) species in the wild.

The jeopardy analysis in this biological opinion places an emphasis on consideration of the range-wide survival and recovery needs of California red-legged frog, San Francisco garter snake, and California freshwater shrimp and the role of the action area in the survival and recovery of California red-legged frog, San Francisco garter snake, and California freshwater shrimp as the context for evaluating the significance of the effects of the proposed Federal action, taken together with cumulative effects, for purposes of making the jeopardy determination.

Status of the Species and Environmental Baseline

For this Programmatic Opinion the Status of the Species will serve as the environmental baseline due to the large area the Program will function in. The appendages to this Programmatic Opinion will detail Project level Environmental Baseline.

California Red-legged Frog

Listing Status

The California red-legged frog was listed as a threatened species on May 23, 1996 (Service 1996). Critical habitat was re-designated for this species on March 17, 2010 (Service 2010). A recovery plan was published for the California red-legged frog on September 12, 2002 (Service 2002).

Description

The California red-legged frog is the largest native frog in the western United States (Wright and Wright 1949), ranging from 1.5 to 5.1 inches in length (Stebbins 2003). The abdomen and hind legs of adults are largely red, while the back is characterized by small black flecks and larger irregular dark blotches with indistinct outlines on a brown, gray, olive, or reddish background. Dorsal spots usually have light centers (Stebbins 2003), and dorsolateral folds are prominent on the back. California red-legged frogs have paired vocal sacs and vocalize in air (Hayes and Krempels 1986). Larvae (tadpoles) range from 0.6 to 3.1 inches in length, and the background color of the body is dark brown and yellow with darker spots (Storer 1925).

Distribution

The historic range of the red-legged frog extended coastally from the vicinity of Elk Creek in Mendocino County, California, and inland from the vicinity of Redding, Shasta County, California, southward to northwestern Baja California, Mexico (Jennings and Hayes 1985; Hayes and Krempels 1986; Fellers 2005). The red-legged frog was historically documented in 46 California counties but the taxon now remains in 238 streams or drainages within 23 counties, representing a loss of 70 percent of its former range (Service 2002). California red-legged frogs are still locally abundant within portions of the San Francisco Bay area and the Central Coast. Within the remaining distribution of the species, only isolated populations have been documented in the Sierra Nevada, northern Coast Range, northern Transverse Ranges, southern Transverse Ranges, and Peninsular Ranges.

Status and Natural History

California red-legged frogs predominately inhabit permanent water sources such as streams, lakes, marshes, natural and man-made ponds, and ephemeral drainages in valley bottoms and foothills up to 4,921 feet in elevation (Jennings and Hayes 1994, Bulger *et al.* 2003, Stebbins 2003). However, California red-legged frogs also have been found in ephemeral creeks and drainages and in ponds that may or may not have riparian vegetation. California red-legged frogs also can be found in disturbed areas such as channelized creeks and drainage ditches in urban and agricultural areas. For example, an adult California red-legged frog was observed in a shallow isolated pool on North Slough Creek in the American Canyon area of Napa County (C. Gaber, PG&E, pers. comm., 2008). This frog location was surrounded by vineyard development. Another adult California red-legged

frog was observed under debris in an unpaved parking lot in a heavily industrial area of Burlingame (P. Kobernus, Coast Ridge Ecology, pers. comm., 2008). This frog was likely utilizing a nearby drainage ditch. Caltrans also has discovered California red-legged frog adults, tadpoles, and egg masses within a storm drainage system within a major cloverleaf intersection of Millbrae Avenue and SR 101 in a heavily developed area of San Mateo County (Caltrans 2007). California red-legged frog has the potential to persist in disturbed areas as long as those locations provide at least one or more of their life history requirements.

California red-legged frogs typically breed between November and April in still or slow-moving water at least 2.5 feet in depth with emergent vegetation, such as cattails, tules or overhanging willows (Hayes and Jennings 1988). There are earlier breeding records from the southern portion of their range (Storer 1925). Female frogs deposit egg masses on emergent vegetation so that the egg mass floats on or near the surface of the water (Hayes and Miyamoto 1984). Individuals occurring in coastal areas are active year-round (Jennings *et al.* 1992), whereas those found in interior sites are normally less active during the cold and dry seasons.

During other parts of the year, habitat includes nearly any area within 1-2 miles of a breeding site that stays moist and cool through the summer (Fellers 2005). According to Fellers (2005), this can include vegetated areas with coyote brush, California blackberry thickets, and root masses associated with willow and California bay trees. Sometimes the non-breeding habitat used by California red-legged frogs is extremely limited in size. For example, non-breeding California red-legged frogs have been found in a 6-foot wide coyote brush thicket growing along a small intermittent creek surrounded by heavily grazed grassland (Fellers 2005). Sheltering habitat for California red-legged frogs is potentially all aquatic, riparian, and upland areas within the range of the species and includes any landscape features that provide cover, such as existing animal burrows, boulders or rocks, organic debris such as downed trees or logs, and industrial debris. Agricultural features such as drains, watering troughs, spring boxes, abandoned structures, or hay stacks may also be used. Incised stream channels with portions narrower and depths greater than 18 inches also may provide important summer sheltering habitat. Accessibility to sheltering habitat is essential for the survival of California red-legged frogs within a watershed, and can be a factor limiting frog population numbers and survival.

California red-legged frogs do not have a distinct breeding migration (Fellers 2005). Adult frogs are often associated with permanent bodies of water. Some frogs remain at breeding sites all year while others disperse. Dispersal distances are typically less than 0.5 mile, with other individuals moving up to 1-2 miles (Fellers 2005). Movements are typically along riparian corridors, but some individuals, especially on rainy nights, move directly from one site to another through normally inhospitable habitats, such as heavily grazed pastures or oak-grassland savannas (Fellers 2005).

In a study of California red-legged frog terrestrial activity in a mesic area of the Santa Cruz Mountains, Bulger *et al.* (2003) categorized terrestrial use as migratory and non-migratory. The latter occurred over one to several days and was associated with precipitation events. Migratory movements were characterized as the movement between aquatic sites and were most often associated with breeding activities. Bulger *et al.* (2003) reported that non-migrating frogs typically stayed within 200 feet of aquatic habitat 90 percent of the time and were most often associated with dense vegetative cover, *i.e.* California blackberry, poison oak and coyote brush. Dispersing frogs in northern Santa Cruz County traveled distances from 0.25-mile to more than 2 miles without apparent regard to topography, vegetation type, or riparian corridors (Bulger *et al.* 2003).

In a study of California red-legged frog terrestrial activity in a xeric environment, Tatarian (2008) noted that 57 percent of frogs fitted with radio transmitters in the Round Valley study area in eastern Contra Costa County stayed at their breeding pools, whereas 43 percent moved into adjacent upland habitat or to other aquatic sites. This study reported a peak of seasonal terrestrial movement occurring in the fall months, with movement commencing with the first 0.2 inch of precipitation. Movements away from the source pools tapered off into spring. Upland movement activities ranged from 3 to 233 feet, averaging 80 feet, and were associated with a variety of refugia including grass thatch, crevices, cow hoof prints, ground squirrel burrows at the bases of trees or rocks, logs, and a downed barn door; others were associated with upland sites lacking refugia (Tatarian 2008). The majority of terrestrial movements lasted from 1-4 days; however, an adult female was reported to remain in upland habitat for 50 days (Tatarian 2008). Uplands closer to aquatic sites were used more often and frog refugia were more commonly associated with areas exhibiting higher object cover (*e.g.*, woody debris, rocks, and vegetative cover). Subterranean cover was not significantly different between occupied upland habitat and non-occupied upland habitat.

California red-legged frogs are often prolific breeders, laying their eggs during or shortly after large rainfall events in late winter and early spring (Hayes and Miyamoto 1984). Egg masses containing 2,000-5,000 eggs are attached to vegetation below the surface and hatch after 6-14 days (Storer 1925, Jennings and Hayes 1994). In coastal lagoons, the most significant mortality factor in the pre-hatching stage is water salinity (Jennings *et al.* 1992). Eggs exposed to salinity levels greater than 4.5 parts per thousand results in 100 percent mortality (Jennings and Hayes 1990). Increased siltation during the breeding season can cause asphyxiation of eggs and small larvae. Larvae undergo metamorphosis 3.5-7 months following hatching and reach sexual maturity at 2-3 years of age (Storer 1925; Wright and Wright 1949; Jennings and Hayes 1985, 1990, 1994). Of the various life stages, larvae probably experience the highest mortality rates, with less than 1 percent of eggs laid reaching metamorphosis (Jennings *et al.* 1992). Sexual maturity normally is reached at 3-4 years of age (Storer 1925; Jennings and Hayes 1985). California red-legged frogs may live 8-10 years (Jennings *et al.* 1992). Populations of California red-legged frogs fluctuate from year to year. When conditions are favorable California red-legged frogs can experience extremely high rates of reproduction and thus produce large numbers of dispersing young and a concomitant increase in the number of occupied sites. In contrast, California red-legged frogs may temporarily disappear from an area when conditions are stressful (*e.g.*, drought).

California red-legged frogs have a diverse diet which changes as they mature. The diet of larval California red-legged frogs is not well studied, but is likely similar to that of other ranid frogs, which feed on algae, diatoms, and detritus by grazing on the surfaces of rocks and vegetation (Fellers 2005; Kupferberg 1996a, 1996b, 1997). Hayes and Tennant (1985) analyzed the diets of California red-legged frogs from Cañada de la Gaviota in Santa Barbara County during the winter of 1981 and found invertebrates (comprising 42 taxa) to be the most common prey item consumed; however, they speculated that this was opportunistic and varied based on prey availability. They ascertained that larger frogs consumed larger prey and were recorded to have preyed on Pacific tree frogs, three-spined stickleback and to a limited extent, California mice, which were abundant at the study site (Hayes and Tennant 1985, Fellers 2005). Although larger vertebrate prey was consumed less frequently, it represented over half of the prey mass eaten by larger frogs suggesting that such prey may play an energetically important role in their diets (Hayes and Tennant 1985). Juvenile and subadult/adult frogs varied in their feeding activity periods; juveniles fed for longer periods throughout the day and night, while subadult/adults fed nocturnally (Hayes and Tennant 1985). Juveniles were significantly less successful at capturing prey and all life history stages exhibited poor

prey discrimination; feeding on several inanimate objects that moved through their field of view (Hayes and Tennant 1985).

Metapopulation and Patch Dynamics

The direction and type of habitat used by dispersing animals is especially important in fragmented environments (Forys and Humphrey 1996). Models of habitat patch geometry predict that individual animals will exit patches at more "permeable" areas (Buechner 1987; Stamps *et al.* 1987). A landscape corridor may increase the patch-edge permeability by extending patch habitat (La Polla and Barrett 1993), and allow individuals to move from one patch to another. The geometric and habitat features that constitute a "corridor" must be determined from the perspective of the animal (Forys and Humphrey 1996).

Because their habitats have been fragmented, many endangered and threatened species exist as metapopulations (Verboom and Apeldom 1990; Verboom *et al.* 1991). A metapopulation is a collection of spatially discrete subpopulations that are connected by the dispersal movements of the individuals (Levins 1970; Hanski 1991). For metapopulations of listed species, a prerequisite to recovery is determining if unoccupied habitat patches are vacant due to the attributes of the habitat patch (food, cover, and patch area) or due to patch context (distance of the patch to other patches and distance of the patch to other features). Subpopulations of patches with higher quality food and cover are more likely to persist because they can support more individuals. Large populations have less of a chance of extinction due to stochastic events (Gilpin and Soule 1986). Similarly, small patches will support fewer individuals, increasing the rate of extinction. Patches that are near occupied patches are more likely to be recolonized when local extinction occurs and may benefit from emigration of individuals via the "rescue" effect (Hanski 1982; Fahrig and Merriam 1985; Gotelli 1991; Holt 1993). For the metapopulation to persist, the rate of patches being colonized must exceed the rate of patches going extinct (Levins 1970). If some subpopulations go extinct regardless of patch context, recovery actions should be placed on patch attributes. Patches could be managed to increase the availability of food and/or cover.

Movements and dispersal corridors likely are critical to California red-legged frog population dynamics, particularly because the animals likely currently persist as metapopulations with disjunct population centers. Movement and dispersal corridors are important for alleviating over-crowding and intraspecific competition, and also they are important for facilitating the recolonization of areas where the animal has been extirpated. Movement between population centers maintains gene flow and reduced genetic isolation. Genetically isolated populations are at greater risk of deleterious genetic effects such as inbreeding, genetic drift, and founder effects. The survival of wildlife species in fragmented habitats may ultimately depend on their ability to move among patches to access necessary resources, retain genetic diversity, and maintain reproductive capacity within populations (Petit *et al.* 1995; Buza *et al.* 2000; Hilty and Merenlender 2004).

Most metapopulation or metapopulation-like models of patchy populations do not directly include the effects of dispersal mortality on population dynamics (Hanski 1994; With and Crist 1995; Lindenmayer and Possingham 1996). Based on these models, it has become a widely held notion that more vagile species have a higher tolerance to habitat loss and fragmentation than less vagile species. But models that include dispersal mortality predict the opposite: more vagile species should be more vulnerable to habitat loss and fragmentation because they are more susceptible to dispersal mortality (Fahrig 1998; Casagrandi and Gatto 1999). This prediction is supported by Gibbs (1998), who examined the presence-absence of five amphibian species across a gradient of habitat loss. He

found that species with low dispersal rates are better able than more vagile species to persist in landscapes with low habitat cover. Gibbs (1998) postulated that the land between habitats serves as a demographic "drain" for many amphibians. Furthermore, Bonnet *et al.* (1999) found that snake species that use frequent long-distance movements have higher mortality rates than do sedentary species.

Threats

Habitat loss, non-native species introduction, and urban encroachment are the primary factors that have adversely affected the red-legged frog throughout its range. Several researchers in central California have noted the decline and eventual local disappearance of California and northern California red-legged frogs (*Rana aurora*) in systems supporting bullfrogs (Jennings and Hayes 1990; Twedt 1993), red swamp crayfish, signal crayfish, and several species of warm water fish including sunfish, goldfish, common carp, and mosquitofish (Moyle 1976, Barry 1992, Hunt 1993, Fisher and Schaffer 1996). This has been attributed to predation, competition, and reproduction interference. Twedt (1993) documented bullfrog predation of juvenile northern California red-legged frogs, and suggested that bullfrogs could prey on subadult northern California red-legged frogs as well. Bullfrogs may also have a competitive advantage over California red-legged frogs. For instance, bullfrogs are larger and possess more generalized food habits (Bury and Whelan 1984). In addition, bullfrogs have an extended breeding season (Storer 1933) during which an individual female can produce as many as 20,000 eggs (Emlen 1977). Furthermore, bullfrog larvae are unpalatable to predatory fish (Kruse and Francis 1977). Bullfrogs also interfere with red-legged frog reproduction. Thus bullfrogs are able to prey upon and out-compete California red-legged frogs, especially in sub-optimal habitat. Both California and northern California red-legged frogs have also been observed in amplexus (mounted on) with both male and female bullfrogs (Jennings and Hayes 1990; Jennings 1993; Twedt 1993).

The urbanization of land within and adjacent to red-legged frog habitat has also adversely affected California red-legged frogs. These declines are attributed to channelization of riparian areas, enclosure of the channels by urban development that blocks red-legged frog dispersal, and the introduction of predatory fishes and bullfrogs.

Diseases may also pose a significant threat though the specific effects of diseases on the California red-legged frog are not known. Pathogens are suspected of causing global amphibian declines (Davidson *et al.* 2003). Chytridiomycosis and ranaviruses are a potential threat to the red-legged frog because these diseases have been found to adversely affect other amphibians, including the listed species (Davidson *et al.* 2003; Lips *et al.* 2003). Non-native species, such as bullfrogs and non-native tiger salamanders that live within the range of the California red-legged frog have been identified as potential carriers of these diseases (Garner *et al.* 2005). Human activities can facilitate the spread of disease by encouraging the further introduction of non-native carriers and by acting as carriers themselves (*i.e.*, contaminated boots or fishing equipment). Human activities can also introduce stress by other means, such as habitat fragmentation, that results in the listed species being more susceptible to the effects of disease. Disease will likely become a growing threat because of the relatively small and fragmented remaining California red-legged frog breeding sites, the many stresses on these sites due to habitat losses and alterations, and the many other potential disease-enhancing anthropogenic changes that have occurred both inside and outside the species' range.

Negative effects to wildlife populations from roads and pavement may extend some distance from the actual road. The phenomenon can result from any of the effects, such as vehicle-related

mortality, habitat degradation, and invasive exotic species. Forman and Deblinger (1998, 2000) described the area affected as the "road effect" zone. Along a 4-lane road in Massachusetts, they determined that this zone extend for an average of approximately 980 feet to either side of the road for an average total zone width of approximately 1,970 feet. They describe the boundaries of this zone as asymmetric and in some areas diminished wildlife use attributed to road effects was detected greater than 0.6 mile from Massachusetts Route 2. The "road-zone" effect can also be subtle. Van der Zande *et al.* (1980) reported that lapwings and black-tailed godwits feeding at 1,575-6,560 feet from roads were disturbed by passing vehicles. The heart rate, metabolic rate and energy expenditure of female bighorn sheep increase near roads (MacArthur *et al.* 1979). Trombulak and Frissell (2000) described another type of "road-zone' effect due to contaminants. Heavy metal concentrations from vehicle exhaust were greatest within 66 feet of roads, but elevated levels of metals in both soil and plants were detected at 660 feet of roads. The "road-zone" apparently varies with habitat type and traffic volume. Based on responses by birds, Forman (2000) estimated the effect zone along primary roads of 1,000 feet in woodlands, 1,197 feet in grasslands, and 2,657 feet in natural lands near urban areas. Along secondary roads with lower traffic volumes, the effect zone was 656 feet. The "road-zone" effect with regard to California red-legged frogs has not been adequately investigated.

The necessity of moving between multiple habitats and breeding ponds means that many amphibian species, such as the California red-legged frog, are especially vulnerable to death and injury due to roads and well-used large paved areas in the landscape. Van Gelder (1973) and Cooke (1995) have examined the effect of roads on amphibians and found that because of their activity patterns, population structure, and preferred habitats, aquatic breeding amphibians are more vulnerable to traffic mortality than some other species. Large, high-volume highways pose a nearly impenetrable barrier to amphibians and result in mortality to individual animals as well as significantly fragmenting habitat. Hels and Buchwald (2001) found that mortality rates for anurans on high traffic roads are higher than on low traffic roads. Vos and Chardon (1998) found a significant negative effect of road density on the occupation probability of ponds by the moor frog (*Rana arvalis*) in the Netherlands. In addition, incidents of very large numbers of road-killed frogs are well documented (*e.g.*, Ashley and Robinson 1996), and studies have shown strong population level effects of traffic density (Carr and Fahrig 2001) and high traffic roads on these amphibians (Van Gelder 1973; Vos and Chardon 1998). Most studies regularly count road kills from slow moving vehicles (Hansen 1982; Rosen and Lowe 1994; Drews 1995; Mallick *et al.* 1998) or by foot (Munguira and Thomas 1992). These studies assume that every victim is observed, which may be true for large conspicuous mammals, but it certainly is not true for small animals, such as the California red-legged frog. Amphibians appear especially vulnerable to traffic mortality because they readily attempt to cross roads, are slow-moving and small, and thus cannot easily be avoided by drivers (Carr and Fahrig 2001).

San Francisco Garter Snake

Refer to the *San Francisco Garter Snake (Thamnophis sirtalis tetrataenia) 5-Year Review: Summary and Evaluation* (Service 2006) for the current Status of the Species.

California Freshwater Shrimp

The California freshwater shrimp was listed as an endangered species on October 31, 1988 (Service 1988). A detailed account of the California freshwater shrimp's taxonomy, biology, and ecology is presented in the *Recovery Plan for the California Freshwater Shrimp* (Service 1998).

The California freshwater shrimp is a decapod crustacean of the family Atyidae. The Atyidae family includes four species in the United States including both members of the genus *Syncaris*. *Syncaris pasadenae*, which inhabited streams of southern California, is presumed extinct leaving *Syncaris pacifica* as the only representative of this genus in the United States. Martin and Wicksten (2004) noted that all individuals of *S. pacifica* examined lacked dorsal rostral teeth, while no individual of *S. pacifica* were without them. According to Eng (1981), adults of *S. pacifica* are generally less than 2 inches in postorbital length (from eye orbit to tip of tail). Based on shrimp collected in October, Eng (1981) described females ranging between 1.26-1.77 inches in length and males from 1.14-1.52 inches in length. California freshwater shrimp coloration is variable. Juvenile and adult male California freshwater shrimp are translucent to nearly transparent (Martin and Wicksten 2004) with small surface and internal color-producing cells (chromatophores) clustered in patterns to disrupt their body outlines. Females are similar in coloration, but have been known to be brown or purple (Eng 1981; Martin and Wicksten 2004). Both sexes can darken or lighten their color, but females have this ability to a larger degree (Service 1998). Undisturbed shrimp move slowly and are virtually invisible on submerged leaf and twig substrates and among fine, exposed, live tree roots along undercut stream banks.

The California freshwater shrimp was likely common in perennial freshwater streams within Marin, Sonoma, and Napa counties. Today, it is found in 23 streams within these counties that can be separated into four general geographic regions: (1) tributary streams in the lower Russian River drainage, (2) coastal streams flowing to the Pacific Ocean, (3) streams draining into Tomales Bay, and (4) streams flowing southward to San Pablo Bay. Many of these streams contain California freshwater shrimp populations that are now isolated from each other.

The California freshwater shrimp has only been found in low elevation (less than 380 feet) and low gradient (generally less than 1 percent) streams (Service 1998). It is generally found in stream reaches where banks are structurally diverse with undercut banks, exposed fine root systems, overhanging woody debris, or overhanging vegetation (Eng 1981; Serpa 1986 and 1991). Excellent habitat conditions for California freshwater shrimp involve streams 12 to 36 inches in depth with live roots along undercut banks that are greater than 6 inches with overhanging stream vegetation and vines (Serpa 1991). Such microhabitats may provide protection from high velocities and sediment loads associated with high stream flows. Where California freshwater shrimp are present in two connecting watercourses, smaller tributaries generally support greater numbers of California freshwater shrimp than their larger receiving streams. With the exception of Yulupa Creek, California freshwater shrimp have not been found in stream reaches with boulder and bedrock bottoms. High velocities and turbulent flows in such reaches may hinder upstream movement of California freshwater shrimp.

Habitat preferences apparently change during late spring and summer months. Eng (1981) rarely found California freshwater shrimp beneath undercut banks in summer; submerged leafy branches were the preferred summer habitat. In Lagunitas Creek in Marin County, the animal was found in a wide variety of trailing, submerged vegetation (Li 1981). Highest concentrations of California freshwater shrimp were observed in reaches with adjacent vegetation comprised of stinging nettles (*Urtica* sp.), grasses, blackberry (*Rubus* sp.), and mint (*Mentha* sp.). None were caught in areas with cattails (*Typha* sp.), cottonwood (*Populus fremontii*), or California laurel (*Umbellularia californica*). Serpa (pers. comm. 1994 cited in Service 1998) noted that populations of California freshwater shrimp were proportionally correlated with the quality of summer habitat provided by trailing terrestrial vegetation. However, during summer low flows, California freshwater shrimp have been found in apparently poor habitat such as isolated pools with minimal cover. In such streams, opaque waters

may allow California freshwater shrimp to escape predation and persist in open pools (Serpa 1991). Further research is needed to determine if both winter and summer habitat needs to be provided within the same location or if California freshwater shrimp can move between areas containing either winter or summer habitat (Service 1998).

The California freshwater shrimp has evolved to survive a range of stream and water temperature conditions characteristic of small, perennial coastal streams. However, no data are available for defining the optimum temperature and stream flow regime for the California freshwater shrimp or the limits it can tolerate. The California freshwater shrimp appears to be able to tolerate warm water temperatures (greater than 73 degrees Fahrenheit) and low flow conditions that are detrimental or fatal to native salmonids. Although largely absent from existing streams, large, complex organic debris dams may have been prevalent in streams supporting California freshwater shrimp populations. These structures may have been important feeding and refugial (resting) sites for the California freshwater shrimp. Such structures are known to collect detrital material (i.e., food) as well as leaf litter, which can be later broken down by microbial activity and invertebrates to finer, detrital material (Triska *et al.* 1982). In addition, debris dams may offer shelter during high flow events and reduce displacement of invertebrates (Covich *et al.* 1991). Some debris dams may break apart during high flow events and allow California freshwater shrimp to disperse periodically and maintain genetic connections among populations.

Following a feeding group classification system by Merritt and Cummins (1978), atyid California freshwater shrimp can be described as collectors feeding upon fine particulate organic matter (Anderson and Cummins 1979; Eng 1981; Goldman and Horne 1983). California freshwater shrimp reach sexual maturity at the end of the second summer, and reproduction appears to occur once a year. Based upon the reproductive physiology and behavior of other freshwater shrimp, the male probably transfers and fixes a sperm sac to the female California freshwater shrimp after her last molt, before autumn. Most adult females in Huichica Creek are bearing eggs by November (Serpa 1991). Females produce approximately 50 to 120 eggs (Hedgpeth 1968; Eng 1981). No information is available on the percentage of larvae that reach reproductive maturity. The California freshwater shrimp does not have life history characteristics that favor quick recovery following disturbances, having low fecundity and a long maturation period.

The California freshwater shrimp has relatively low fecundity, is believed to reproduce only once a year, and requires over one year to reach sexual maturity. Wallace (1990) summarized studies that have shown mollusks to be one of the last taxa to recolonize disturbed stream reaches, whereas insect colonization occurs faster. California freshwater shrimp may be even less adapted to disturbances than mollusks. The California freshwater shrimp has no known resistant or dormant life stage that would allow it to survive a toxic event such as a chemical spill.

Existing California freshwater shrimp distribution in streams is not continuous, and the species often occupies only short reaches of the stream (Service 1998). However, entire streams are considered California freshwater shrimp habitat, because the California freshwater shrimp disperses between areas of good habitat. A population may expand or contract depending upon conditions within streams. For example, long-term drought conditions may have resulted in more discontinuous California freshwater shrimp populations in Huichica Creek (Serpa 1991). A recovery objective for the California freshwater shrimp is the gradual removal of unnatural barriers to California freshwater shrimp dispersal and restoration of natural habitat conditions (Service 1998). These measures are expected to expand California freshwater shrimp distribution beyond its existing range.

To date, Lagunitas Creek is the only shrimp stream with long term population data. According to information from Serpa (2002) shrimp populations in Lagunitas Creek increased from 1994 through 2000 from approximately 1,465 individuals to 4,407 respectively. The increase followed an increase in linear feet of pool habitat within the creek. However, an unpublished paper from Quinlan (2006) reports additional shrimp population data in Lagunitas Creek from 2000 - 2004, in which the number of individuals decreased from approximately 4,400 to 2,100 respectively, which was inversely related to an increase in mean stream width.

In the Huichica Creek watershed, the Napa County Resource Conservation District created the Huichica Creek Land Stewardship group consisting of watershed landowners, local, State, and Federal agencies (including the Service), to develop and implement a long-term conservation plan for the watershed. A major benefit of this effort has been the willingness of many winery operations to participate in this program and their increased awareness of the need to protect aquatic resources, including the California freshwater shrimp. The plan includes measures recommended by the Service to reduce the risk of pesticides entering streams and a standard screen design for water intake structures to prevent take of California freshwater shrimp. In addition, the Natural Resource Protection and Enhancement Plan (Napa County RCD 1993) developed for the watershed recommends use of cover crops to minimize soil erosion and water conservation measures. A reduction in unnatural amounts of fine sediments in Huichica Creek was observed after implementation of the plan's recommendations by landowners (D. Bowker pers. comm. 1994 cited in Service 1998).

A number of restoration projects undertaken by the Bay Institute, through the Students and Teachers Restoring a Watershed (STRAW) program, have been implemented to improve habitat for the shrimp since 1993; these projects have focused on removing exotic vegetation, planting native species, erecting livestock exclusion fencing, and installing cattle bridges (L. Rogers, The Bay Institute, per. comm. 2006). To date, the STRAW project has completed approximately 185 projects restoring over 50,000 linear feet of stream bank. The Service's Partners for Fish and Wildlife program has provided some funding for these restoration efforts; in these instances contracts for the continued management of the properties for the benefit of wildlife are in place, but the contracts will eventually expire and do not represent long term protection (D. Strait, Fish and Wildlife biologist, Service, per. comm. 2006).

Threats to the California freshwater shrimp include viticulture operations, irrigation diversions, sewage, bank protection measures, migration barriers (*e.g.*, culverts, bridge footings/sills, and grade control structures), urban residential/commercial development, and introduced predators (Service 1998). Introduced fish may affect California freshwater shrimp distribution significantly through predation. Carp (*Cyprinus carpio*) occur in Stemple Creek (Serpa 1986), which dislodge and consume invertebrates from plants and silty bottoms through their rooting activities (Moyle 1976). Introduced sunfish (*Lepomis cyanellus*) and mosquitofish (*Gambusia affinis*) are likely California freshwater shrimp predators (Service 1998). Williams (1977) found no coexistence between mosquitofish and atyids in Hawaiian streams. Because of the relatively recent introduction of these fish, the California freshwater shrimp probably has not developed defense mechanisms to reduce their risk of predation. Like the California freshwater shrimp, many introduced fish can persist under relatively poor water quality conditions in the absence of natural predators such as juvenile steelhead (*Oncorhynchus mykiss*).

Effects of the Action

General Effects

Direct effects to adult and juvenile shrimp and to red-legged frog adults, sub-adults, tadpoles, and eggs in the footprint of projects utilizing the proposed authorization would include injury or mortality from being crushed by earth-moving equipment, construction debris, and worker foot traffic. These effects would be reduced by minimizing and clearly demarcating the boundaries of the project areas.

Shrimp and red-legged frog tadpoles may be entrained by pump or water diversion intakes. Screening pump intakes with wire with not greater than 0.2-inch diameter mesh may reduce the potential that shrimp and tadpoles would be caught in the inflow.

Shrimp and red-legged frogs may be killed by predators. If water that is impounded during or after work activities creates favorable habitat for non-native predators, such as bullfrogs, crayfish, and centrarchid fishes, shrimp and red-legged frogs may incur abnormally high rates of predation. Additionally, any time red-legged frogs are concentrated in a small area at unusually high densities, native predators may feed on them opportunistically. This impact can be minimized by avoiding creation of ponded water as a result of project actions such as dewatering the work area.

Trash left during or after project activities could attract predators to work sites, which could, in turn, prey on shrimp and red-legged frogs. For example, raccoons are attracted to trash and also prey opportunistically on both species. This potential impact can be reduced or avoided by careful control of waste products at all work sites.

Accidental spills of hazardous materials or careless fueling or oiling of vehicles or equipment could degrade water quality to a degree where shrimp or red-legged frogs are injured or killed. The potential for this effect to occur can be reduced by thoroughly informing workers of the importance of preventing hazardous materials from entering the environment, locating staging and fueling areas a minimum of 65 feet from riparian areas or other water bodies, and by having an effective spill response plan in place.

Uninformed workers could disturb, injure, or kill shrimp or red-legged frogs. The potential for this effect to occur may be greatly reduced by informing workers of the presence and protected status of this species and the measures that are being implemented to protect it during project activities.

The restoration projects that would utilize the proposed authorization are intended to provide additional habitat for, and increased populations of, steelhead and salmon in the respective project areas. These fish prey on the shrimp and the red-legged frog. The effects of potentially increasing predator populations on the shrimp and red-legged frog cannot be accurately predicted at this time. Shrimp, salmon and steelhead occurred in coastal watersheds prior to the onset of human disturbance. Although we anticipate some predation of shrimp and red-legged frogs by salmonid fishes, this level of predation is not expected to appreciably alter the population structure within the project areas.

While the activities are not specifically addressed individually, they are all within anadromous fish-bearing streams, and the areas around them. The projects are no larger than 500 contiguous feet, and generally short in duration with projects taking place over a short work window during a calendar

is unlikely that several projects would be conducted concurrently in the same location. Additionally, the need to receive individual appendages will ensure that in this rare case the effects of several actions in an area or watershed could be adequately described and additional potential minimization and avoidance measures for federally listed species.

The Corps' proposed authorization would affect a small number of shrimp and red-legged frogs, if any occur in the areas that would be temporarily disturbed by project activities. Due to the small size of the work areas, the temporal nature of the projects, the implementation of the projects in the dry season, and the proposed protective measures, we anticipate that few California red-legged frog, San Francisco garter snake or California freshwater shrimp will be killed or injured during project activities. The areas disturbed by Program projects constitute a small portion of the available shrimp and red-legged frog habitat throughout the Corps' San Francisco District's jurisdiction; additionally, disturbed areas will be restored and planted with native plants. Restoration and enhancement of riparian vegetation and stream complexity in project sites is likely to increase the number and quality of cover sites and the diversity and abundance of prey species for California red-legged frogs, San Francisco garter snake and California freshwater shrimp. The proposed authorization is generally likely to improve the quality of habitat for the red-legged frog in areas affected by projects implemented under the Program.

California Red-Legged Frog

Work activities, including noise and vibration, may cause red-legged frogs to leave the work area. This disturbance may increase the potential for predation and desiccation. Minimizing the area disturbed by project activities may reduce the potential for dispersal resulting from the action. Red-legged frogs are more likely to disperse overland in mesic conditions. Because the CDFW would primarily be executing the proposed projects during the dry season, these uplands impacts are less likely. As long as no substantial rainfall (substantial rainfall = greater than 0.5 inch of rain in a 24-hour period) occurs, California red-legged frogs dispersing through the uplands are unlikely to be at risk. Individuals seeking refuge in the stream are likely to move into adjacent habitat ourside of the Project.

Work in live streams or in floodplains could cause unusually high levels of siltation downstream. This siltation could smother eggs of the red-legged frog and alter the quality of the habitat to the extent that use by individuals of the species is precluded. Implementing best management practices for erosion control and reducing the area to be disturbed to the minimum necessary should decrease the amount of sediment that is washed downstream as a result of project activities.

The Program will not result in the temporary loss of red-legged frog habitat. The restoration projects will provide more stable stream banks, better water quality through decreased erosion and sediment loading, and shelter along stream banks for red-legged frogs. Additionally, many of the projects will improve red-legged frog habitat by creating additional pools and providing a more natural water flow regime by eliminating or altering fish passage barriers. The restoration projects will contribute to the local recovery of the red-legged frog by removing non-native predators such as bullfrogs, which out-compete and ultimately displace red-legged frogs from suitable habitat, and by improving the riparian buffer which will reduce the movement of pesticides into the aquatic environment.

San Francisco Garter Snake

Direct effects to of San Francisco garter snake may include injury or mortality from being crushed by earth moving equipment, construction debris, and worker foot traffic. These impacts would be reduced by minimizing and clearly demarcating the boundaries of the action area and equipment access routes and locating staging areas outside of riparian areas or other water bodies and worker education.

Work activities, including noise and vibration, may harass of San Francisco garter snake by causing them to leave the work area. This disturbance may increase the potential for predation. Minimizing the area disturbed by proposed action activities would reduce the potential for dispersal resulting from the action.

The potential exists for uninformed workers to intentionally or unintentionally harass, injure, harm, or kill a of San Francisco garter snake. The potential for this impact could be greatly reduced by informing workers of the presence and protected status of this species and the measures that are being implemented to protect it during proposed action activities.

Temporary effects from loss of vegetative cover that provides sheltering and foraging habitat for the species would be minimized and compensated for by implementing the proposed restoration actions.

California Freshwater Shrimp

The shrimp adjacent to project sites may be incidentally taken in the form of harm, harassment injury, or mortality as a result of temporary disturbances from project activities. With implementation of the conservation measures, only low levels of injury or mortality of shrimp are anticipated. Injury or mortality to shrimp was not incurred or documented in any of the salmonid or shrimp surveys conducted in the Russian River basin. While the identification of habitat, net capture and release that will be conducted under this Program will result in the low likelihood of injury or mortality to shrimp, it is unreasonable to assume that injury or mortality will never occur. The potential for take in the restoration technique in a project area is higher. In addition, injury to or mortality of shrimp during a dewatering rescue and relocation is more likely due to their fragile size and requirement for an aquatic environment.

Work in live streams or in floodplains could cause unusually high levels of siltation downstream. Although shrimp are usually able to survive in poor water quality conditions, this siltation could alter the quality of the habitat. Siltation also could fill slow-moving pools, reducing the extent or quality of shrimp habitat near the project area. Implementing best management practices for erosion control and reducing the area to be disturbed to the minimum necessary should decrease the amount of sediment that is washed downstream as a result of project activities. Implementation of projects under the Corps' proposed authorization may result in the loss of shrimp habitat. Installation of check dams, rock weirs, log weirs and wing deflectors may prevent shrimp from dispersing along streambanks. The potential for this effect may be reduced by ensuring that project proponents are thoroughly briefed by CDFW on the locations of shrimp streams, by designing projects to match the historical stream ecosystem as closely as possible, and by ensuring that check dams and weirs do not span any creek known to support shrimp.

Many activities in this Program will benefit the California freshwater shrimp. Riparian plantings and cattle exclusion fences will improve habitat quality in California freshwater shrimp streams and their tributaries. Increased riparian cover will increase habitat complexity and root density on streambanks. Riparian vegetation will allow shrimp to disperse more easily and will stabilize water temperatures in the creeks. Exclusionary fencing will reduce cattle impacts to the creek such as overgrazing, streambank trampling, and soil compaction. An increase in sinuosity, side channels, , and an increase in channel complexity will reduce erosion, incision of habitat and sedimentation of downstream reaches. Objectives in the shrimp's recovery plan includes protection of existing populations, removal of threats to these populations, and enhancement of habitat for native aquatic species within the shrimp's historic range. Projects performed under the Restoration Program will aid in the implementation of these recovery objectives.

Cumulative Effects

Cumulative effects include the effects of future State, Tribal, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act. During this consultation, the Service did not identify any future non-federal actions that are reasonably certain to occur in the action area of the proposed project.

Conclusion

After reviewing the current status of California red-legged frog, San Francisco garter snake, and California freshwater shrimp, the environmental baseline for the action area, the effects of the proposed California Department of Fish and Wildlife (CDFW) Fisheries Restoration Grant Program, and the cumulative effects, it is the Service's biological opinion that the California Department of Fish and Wildlife (CDFW) Fisheries Restoration Grant Program, as proposed, is not likely to jeopardize the continued existence of the California red-legged frog, San Francisco garter snake, and California freshwater shrimp. The Service reached this conclusion because the project-related effects to the species, when added to the environmental baseline and analyzed in consideration of all potential cumulative effects, will not rise to the level of precluding recovery or reducing the likelihood of survival of the species based on the following:

1. The Corps and the CDFW have proposed measures to minimize the potential adverse effects of project activities on the California red-legged frog, San Francisco garter snake, and California freshwater shrimp;

2. The persistence of the shrimp and red-legged frog in the affected area would not be diminished by the activities covered under this programmatic consultation;

3. Few, if any, California red-legged frog, San Francisco garter snake, and California freshwater shrimp are likely to be killed or injured during project activities; and

4. The overall quality of California red-legged frog, San Francisco garter snake, and California freshwater shrimp breeding, foraging, and dispersal habitat would be improved as a result of improved water quality, reduced sedimentation, and habitat enhancement associated with Program projects. This improvement would offset any injury or mortality that might result from implementation of Program activities.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act 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. Harass is defined by regulations at 50 CFR 17.3 as an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Harm is defined by the same regulations as an act which actually kills or injures wildlife. Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavior patterns, including breeding, 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 Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are non-discretionary, and must be undertaken by the Corps so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, 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 the applicant 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 must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement [50 CFR §402.14(i)(3)].

Amount or Extent of Take

The amount and extent of take will quantified and exempted with each Appendage of this Programmatic Biological Opinion and is not exempted prior to appendage.

Reasonable and Prudent Measures

The Service has determined that the following reasonable and prudent measure is necessary and appropriate to minimize impacts of incidental take of the California red-legged frog, San Francisco garter snake, and California freshwater shrimp:

1. The Corps will minimize effects to the California red-legged frog, San Francisco garter snake, and California freshwater shrimp and their habitat resulting from project related activities by following this biological opinion and the Programmatic Biological Opinion as modified by the terms and conditions below.

Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, the Corps must ensure compliance with the following terms and conditions, which implement the reasonable and prudent measure described above. These terms and conditions are nondiscretionary.

1. 2010 4th edition California Salmonid Stream Habitat Restoration Manual shall be available and accessible to all grantees;

2. The permittee, CDFW, shall fully implement all the Conservation Measures as described in this biological opinion and the Programmatic Biological Opinion;

3. The permittee, CDFW, shall report all take to not exempted by the appendage to the Biological Opinion to Leif Goude (leif_goude@fws.gov) or Ryan Olah (ryan_olah@fws.gov), at the letterhead address, (916) 414-6659 or by e-mail.

4. CDFW will provide post construction monitoring, reporting, and tracking on an annual basis that will describe all work that was completed and document work areas after construction is complete. All audits of grantees by CDFW will also be provided to the Service.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act 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. The Service recommends the following actions:

1. To avoid transferring disease or pathogens while handling amphibians, the Corps should encourage all applicants to follow the Declining Amphibian Populations Task Force Fieldwork Code of Practice.

2. Sightings of any listed or sensitive animal species should be reported to CDFW's CNDDB. A copy of the reporting form and a topographic map clearly marked with the location the animals were observed should also be provided to the Service

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

REINITIATION—CLOSING STATEMENT

This concludes formal consultation on the California Department of Fish and Wildlife Fisheries Restoration Grant Program. As provided in 50 CFR §402.16, reinitiation of formal consultation is required and shall be requested by the Federal agency or by the Service where discretionary Federal agency involvement or control over the action has been retained or is authorized by law and:

(a) If the amount or extent of taking specified in the incidental take statement is exceeded;

(b) If new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered;

(c) If the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the biological opinion; or

(d) If a new species is listed or critical habitat designated that may be affected by the identified action.

If you have any questions regarding this biological opinion, please contact Leif Goude (leif_goude@fws.gov) or Ryan Olah (ryan_olah@fws.gov), at the letterhead address, (916) 414-6659 or by e-mail.

Sincerely,

Jennifer M. Norris
Field Supervisor

Enclosures:

cc:
Karen Carpio, California Department of Fish and Wildlife, Sacramento California

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Butterfly Host Plants

Mission blue butterfly (*Icaricia icarioides missionensis*)	Endangered	
Silver Bush Lupine (*Lupinus albifrons*)		March - June
San Bruno elfin butterfly (*Callophrys mossii bayensis*)	Endangered	
stonecrop (*Sedum spathulifolium*)		April - July
Callippe silverspot butterfly (*Speyeria callippe callippe*)	Endangered	
Johnny jump up (*Viola pedunculata*)		February - April
Myrtle's silverspot (*Speyeria zerene myrtleae*)	Endangered	
hookedspur violet (*Viola adunca*)		April - August
Bay checkerspot butterfly (*Euphydryas editha bayensis*)	Threatened	
native plantain (*Plantago erecta*)		March - April

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ventura Fish and Wildlife Office
2493 Portola Road, Suite B
Ventura, California 93003

IN REPLY REFER TO:
08EVEN00-2016-F-0093

July 28, 2016

Holly Costa, Acting Chief, Regulatory Division
Department of the Army
San Francisco District, Corps of Engineers
1455 Market Street
San Francisco, California 94103

Subject: Biological Opinion for the California Department of Fish and Wildlife Fisheries Restoration Grant Program Regional General Permit 12 Renewal in San Luis Obispo, Monterey, Santa Cruz, and San Benito Counties, California

Dear Ms. Costa:

This document transmits the U.S. Fish and Wildlife Service's (Service) biological opinion based on our review of the San Francisco District of the U.S. Army Corps of Engineers (Corps) proposed renewal of a Regional General Permit (RGP), authorizing projects funded by the California Department of Fish and Wildlife's (CDFW) Fisheries Restoration Grant Program (Program), and its effects on the federally threatened California red-legged frog (*Rana draytonii*) and its designated critical habitat. We received your November 20, 2015 request for consultation on November 23, 2015. Your request and our response are made in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.).

You have also requested our concurrence that the proposed project may affect, but is not likely to adversely affect the federally endangered least Bell's vireo (*Vireo bellii pusillus*) and tidewater goby (*Eucyclogobius newberryi*), the federally threatened marbled murrelet (*Brachyramphus marmoratus*), and their respective designated critical habitats; however, based on communication between the Corps, CDFW, and Service staff, the Corps will withdraw the tidewater goby from the current consultation and will request a separate consultation if any program projects are determined to affect tidewater gobies in the future (J. Yee, Corps, in litt. 2016). In addition, least Bell's vireo critical habitat does not occur within the area covered under this consultation and will not be addressed further.

We have based this biological opinion on information that accompanied your November 20, 2015, request for consultation, including the associated attachments, proposed changes, and communications between the Corps, CDFW, and Service staff. We can make a record of this consultation available at the Ventura Fish and Wildlife Office (VFWO).

The current authorization would include Program activities in various locations for 5 years. This biological opinion addresses listed species and their habitats within the jurisdictional area of the

North Coast Division of the VFWO and the San Francisco District of the Corps. This area includes portions of San Luis Obispo, Monterey, Santa Cruz, and San Benito Counties. Species within other parts of the Program area included in the consultation request that do not pertain to these jurisdictional areas are the federally endangered California freshwater shrimp (*Syncaris pacifica*) and southwestern willow flycatcher (*Empidonax traillii extimus*), and the federally threatened northern spotted owl (*Strix occidentalis caurina*). Effects to these species will be addressed by the appropriate field offices or geographical divisions.

Informal Consultation for Least Bell's Vireo and Marbled Murrelet

Least Bell's Vireo
The California Natural Diversity Database (CNDDB) shows least Bell's vireo occurrences in Monterey, San Benito, and San Luis Obispo Counties, with the majority of occurrences noted along the Salinas River (CNDDB 2016a). Although there are records of least Bell's vireo in the counties covered under this consultation, this species is known to be primarily concentrated in southern California (CNDDB 2016a, Service 2006).

Impacts to the species have the potential to occur if riparian vegetation occurs during the spring and summer, or if disturbance occurs within a 0.25-mile radius of known or potential habitat. Removal of riparian vegetation during project activities typically does not occur; however, is minimal if it does. Harvesting of willow branches for revegetation at restoration sites may disturb existing vireo habitat, and noise from heavy equipment has the potential to cause nesting birds to abandon nests; however, project-related impacts are anticipated to be temporary and will be minimized to avoid adverse effects to the species. Project activities would not degrade existing habitat appreciably, and many projects would include restoration of riparian corridors

We concur with your determination that the proposed authorization may affect, but is not likely to adversely affect the least Bell's vireo and its habitat. Our concurrence is based on least Bell's vireos being relatively uncommon in the project counties and the low likelihood of disturbance to least Bell's vireos with implementation of the following measures:

1. Work will not be conducted within 0.25 mile of any site with known or potential habitat for the Least Bell's Vireo between March 1 and September 15.

2. Harvest of willow branches at any site with potential habitat for the least Bell's vireo will not occur between March 1 and September 15.

3. The work window at individual work sites may be modified, if protocol surveys determine that nesting birds do not occur within 0.25 miles of the site during the breeding season.

4. The Corps will ensure that the grantee or responsible party is aware of this site-specific condition, and will inspect the work site before, during, and after completion of the action item.

5. If for some reason these mitigation measures cannot be implemented or the project actions proposed at a specific work site cannot be modified to prevent or avoid potential impacts to least Bell's vireo or their habitat, then activity at that work site will be discontinued.

Marbled Murrelet

In the VFWO's area of jurisdiction, marbled murrelets and designated critical habitat are present in project areas within Santa Cruz County. Project areas may be located within or near marbled murrelet breeding habitat; however, marbled murrelets nest in old-growth forests and projects will not remove, degrade, or downgrade suitable marbled murrelet breeding habitat. Effects to marbled murrelets from project activities would likely be limited to noise disturbances during the breeding season if activities are conducted from March to August. Noise from heavy equipment has the potential to cause nesting birds to abandon nests. Limiting this type of work (e.g. culvert removal or placement of large woody debris) to the fall and winter months would reduce the potential adverse effects.

We concur with your determination that the proposed authorization may affect, but is not likely to adversely affect the marbled murrelet and designated critical habitat. Our concurrence is based on the low likelihood of disturbance to marbled murrelets and critical habitat and implementation of the following measures:

1. Restoration work in areas considered by the VFWO will not be conducted within 0.25 mile of occupied or un-surveyed suitable marbled murrelet habitat between March 24 and September 15.

2. The work window at individual work sites near suitable habitat may be modified if protocol surveys determine that habitat quality is low and occupancy is very unlikely.

3. If these mitigation measures cannot be implemented or the project actions proposed at a specific work site cannot be modified to prevent or avoid potential adverse effects to marbled murrelet or their habitat, then activity at that work site will be discontinued.

4. For projects contained in streams and watersheds included in a Habitat Conservation Plan, the mitigation measures contained within those Habitat Conservation Plans will be followed.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

The purpose of the project is to restore anadromous fisheries habitat in non-tidal reaches of rivers and streams, improve watershed conditions affecting salmonid streams, and improve the survival, growth, migration, and reproduction of anadromous fish. The CDFW, through the

Program, uses funds mandated to restore degraded anadromous fish habitat in coastal streams for a variety of salmonid habitat restoration projects. Restoration projects must be consistent with procedures found in CDFW's California Salmonid Stream Habitat Restoration Manual, Third Edition (Flosi et al. 1998).

The Program supports a variety of projects from sediment reduction to watershed education throughout coastal California. Projects selected for funding have 2 years to implement the projects, and most of the habitat restoration activities take place during the dry summer season. The majority of this funding is awarded for habitat restoration projects that improve overhead cover, spawning gravels, and pool habitat; reduce or eliminate erosion and sedimentation impacts; screen diversions, and remove barriers to fish passage. Funds are also awarded for indirect habitat restoration activities.

Description of Proposed Activities

Habitat restoration activities and practices, covered in more detail below, include fish passage projects, bank stabilization treatments, upslope road decommissioning or repair, and replacement or modification of culverts that are barriers to fish passage.

Proposed structures would provide predator escape and resting cover, increase spawning habitat, improve upstream and downstream migration corridors, improve pool to riffle ratios, and add habitat complexity and diversity. Some structures would be designed to reduce sedimentation, protect unstable banks, stabilize existing slides, provide shade, and create scour pools. Drawings are included as Attachment C.

The following habitat restoration activities conform with State laws and would be implemented consistent with the California Salmonid Stream Habitat Restoration Manual (Flosi et al., 1998). Detailed descriptions of these restoration activities can be found in that manual.

1. Instream habitat improvements may include cover structures, boulder structures and log structures.

2. Unanchored large woody debris may be used to enhance pool formation and improve stream reaches.

3. Fish screens would be used to prevent entrainment of juvenile salmonids in water diverted for agriculture, power generation, or domestic use, and are needed on both gravity flow and pump diversion systems.

4. Fish passage at stream crossings include activities to provide fish crossings where the crossing width is at least as wide as the active channel, with culvert passes designed to withstand a 100-year storm flow, and crossing bottoms buried below the streambed. Examples include replacement of barrier stream crossings with bridges, bottomless arch culverts, embedded culverts, and/or fords.

5. Fish passage improvements include removal of obstructions such as log jams, beaver dams, waterfalls and chutes and landslides. Suitable large woody debris removed from fish passage barriers that are not used by the project for habitat enhancement would be left within the riparian zone to provide a source for future recruitment of wood into the stream. Logjam barriers are typically less than 10 cubic yards.

6. Upslope restoration activities would be performed to reduce sediment delivery to anadromous streams. Activities include road decommissioning, road upgrading, and storm-proofing roads. Storm-proofing roads involves replacing high risk culverts with bridges, installing critical dips, installing armored crossings, and removing unstable side cast and fill materials from steep slopes.

7. Watershed and streambank stability activities would reduce sediment from watershed and stream bank erosion. Examples of these activities include slide stabilization, stream bank stabilization, boulder and log stream bank stabilization structures, tree revetment, native material revetment, mulching, revegetation, willow wall revetment, brush mattress, checkdams, brush checkdams, waterbars, and exclusionary fencing.

The following project types have been subsequently proposed and added to the overall project description (National Marine Fisheries Service 2015).

8. Off-channel/side channel projects for juvenile salmonid survival and rearing would reconnect existing and naturally formed side channel habitats, improve hydrologic connections, create new side- or off-channel habitats, and reconnect still water floodplain features using large woody debris or boulder structures.

9. Engineered logjams and complex wood jams may be used to recreate pool-forming features in riverine channels. These would generally be larger in structure and scale than wood placement projects identified in the California Salmonid Stream Habitat Restoration Manual.

10. Removal of small dams to improve fish passage may include removal of small permanent, flashboard, and seasonal dams that are not considered high risk. These projects may require the use of heavy equipment.

11. Water conservation projects to provide more efficient use of water extracted from stream systems to increase flows to benefit aquatic species may include off-channel water storage, changes in the timing or source of water supply, moving points of diversion, irrigation ditch lining and/or piping, stock-water systems, and agricultural tailwater recovery/management systems.

Program projects vary in size based on locations and the nature of projects. Projects implemented or proposed in the Program area in the past have, for example included

enhancement activities along 5 miles of the Carmel River in Monterey County (CDFW 2013); installation, operations, and maintenance of a stream flow gage in the Big Sur River, Monterey County (CDFW 2014); and treatment of salmonid rearing and refuge habitat along 0.57 mile along lower Scotts Creek in Santa Cruz County (CDFW 2016).

General Protective Measures for Biological Resources

These general measures are outlined in the application for the Department of the Army permit for the CDFW Fisheries Restoration Grant Program (CDFW 2015a) and the Mitigated Negative Declaration for the proposed project (CDFW 2015b)

1. All habitat improvements would be carried out in accordance with techniques in the California Salmonid Stream Habitat Restoration Manual (Flosi et al., 1998).

2. To avoid impacts to aquatic habitat, the activities undertaken in the restoration program typically occur during the summer dry season. This is generally between June 15 and November 1 or the first rainfall.

3. Location of staging/storage areas for equipment, materials, fuels, lubricants, and solvents, will be located outside of the stream's high water channel and associated riparian area. The number of access routes, number and size of staging areas, and the total area of the work site activity will be limited to the minimum necessary to complete the restoration action. To avoid contamination of habitat during restoration activities, trash will be contained, removed, and disposed of throughout the project.

4. Any equipment work within the stream channel will be performed in isolation from the flowing stream. If there is any flow when the work is done, the contractor will construct coffer dams upstream and downstream of the excavation site and divert all flow from upstream of the upstream dam to downstream of the downstream dam.

5. If it is necessary to divert flow around the work site either by pump or by gravity flow, the suction end of the intake pipe will be fitted with fish screens meeting CDFW and the National Oceanic and Atmospheric Administration criteria to prevent entrainment or impingement of small fish. Any turbid water pumped from the work site itself to maintain it in a dewatered state will be disposed of in an upland location where it will not drain directly into any stream channel.

6. For minor actions, where the disturbance to construct coffer dams to isolate the work site would be greater than to complete the action (for example, placement of a single boulder cluster), then measures will be put in place immediately downstream of the work site to capture suspended sediment.

7. The spread or introduction of invasive exotic plants will be avoided to the maximum extent possible.

8. Wildlife encountered during the course of construction, will be allowed to leave the construction area unharmed.

9. Work sites containing turtle or amphibian species will use exclusion measures to prevent impacts to any individuals that could occur on the site.

10. Ground-disturbance that has the potential to affect cultural resources will be avoided through implementation of mitigation measures, including completing cultural resource surveys, fencing, on-site monitoring, and redesigning proposed work to avoid disturbance of cultural resources.

11. All equipment operators will be trained in the procedures to be taken should an accident occur. Prior to the onset of work, CDFW will ensure the grantee has prepared a Spill Prevention/Response plan to help avoid spills and allow a prompt and effective response should an accidental spill occur. All workers will be informed of the importance of preventing spills. Operators will have spill clean-up supplies on site and be knowledgeable in their proper deployment.

12. All staging, fueling, and maintenance of vehicles and other equipment will occur at least 65 feet from any riparian habitat or water body. Fuel absorbent mats will be placed under pumps while fueling. The Corps and CDFW will ensure contamination of habitat does not occur during such operations.

13. To control erosion during and after project implementation, CDFW will implement best management practices, as identified by the appropriate Regional Water Quality Control Board.

14. If CDFW determines that turbidity/siltation levels resulting from an activity or activities constitute a threat to aquatic life, all activities associated with the turbidity/siltation will cease until effective CDFW approved sediment control devices are installed and/or abatement procedures are implemented.

Protective Measures for California Red-Legged Frog

The following measures are proposed to minimize project-related effects to California red-legged frog (CDFW 2015b).

1. Project activities in potential California red-legged frog habitat will be restricted to the period between July 1 and October 15. The work window at individual work sites may be modified, if protocol surveys determine that this species is not present and is not likely to be present during construction.

2. At least 15 days prior to the onset of project activities, CDFW will submit the names(s) and credentials of biologists who would conduct activities specified in the following

measures. No project activities will begin until CDFW has received written approval from the Service that the biologist(s) is qualified to conduct the work.

3. Service-approved biologist(s) who handle California red-legged frogs will ensure that their activities do not transmit diseases. To ensure that diseases are not conveyed between work sites by the Service-approved biologist, the fieldwork code of practice developed by the Declining Amphibian Populations Task Force (Appendix A) will be followed at all times.

4. A CDFW monitoring plan will be developed to determine the level of impacts to the California red-legged frog associated with Program funded activities in the area. The monitoring plan will include a standardized mechanism to report any observations of dead or injured California red-legged frog to the appropriate Corps and Service offices.

5. A Service-approved biologist will survey the project site at least 2 weeks before the onset of activities. If California red-legged frogs are found in the project area and these individuals are likely to be killed or injured by work activities, the Service-approved biologist will allow sufficient time to move them from the site before work activities resume. Only Service-approved biologists will conduct capture, handling, and monitoring activities for California red-legged frogs.

6. Before any project-related activities, the approved biologist must identify appropriate areas to receive California red-legged frog adults and tadpoles from the project areas. These areas must be in proximity to the capture site, contain suitable habitat not affected by project activities, and be free of exotic predatory species, i.e. bullfrogs (*Rana catesbiana*), nonnative crayfish (*Procambarus* spp., *Pacifastacus* spp., etc.) to the best of the approved biologist's knowledge.

7. Prior to the onset of project activities, a Service-approved biologist will conduct a training session for all construction personnel. At a minimum, the training will include a description of the California red-legged frog and its habitat, the importance of the California red-legged frog and its habitat, the general measures being implemented to conserve the California red-legged frog as they relate to the project, and the boundaries within which the project may be accomplished. Brochures, books and briefings may be used in the training session, provided that a qualified person is on hand to answer any questions.

8. A Service-approved biologist will be present at the work site until removal of California red-legged frogs, instruction of workers, and habitat disturbance has been completed. The Service-approved biologist will have the authority to halt any action that might result in impacts that exceed the levels anticipated by the Corps and Service during review of the proposed action. If work is stopped, the Service-approved biologist or on-site biological monitor will notify the Corps and the Service immediately.

9. If California red-legged frogs are found and these individuals are likely to be killed or injured by work activities, the Service-approved biologists must be allowed sufficient time to move them from the site before work activities resume. The Service-approved biologist will relocate the California red-legged frogs the shortest distance possible to one of the predetermined areas. The Service-approved biologist will maintain detailed records of any individuals that are moved (e.g., size, coloration, any distinguishing features, photographs (digital preferred) to assist in determining whether translocated animals are returning to the point of capture. Only California red-legged frogs at risk of injury or death by project activities may be moved.

10. If a work site is to be temporarily dewatered by pumping, intakes will be completely screened with wire mesh not larger than 0.125 inch to prevent California red-legged frogs from entering the pump system. Water will be released or pumped downstream at an appropriate rate to maintain downstream flows during construction activities and eliminate the possibility of ponded water. Upon completion of construction activities, any barriers to flow will be removed in a manner that would allow flow to resume with the lease disturbance to the substrate.

11. Ponded areas will be monitored for California red-legged frogs that may become trapped. Any trapped California red-legged frog will be relocated to a pre-determined receiving area by a Service-approved biologist.

12. A Service-approved biologist will permanently remove from the project area, any individuals of exotic species, such as bullfrogs, centrarchid fishes, and non-native crayfish to the maximum extent possible. The biologist will have the responsibility to ensure that their activities are in compliance with the California Fish and Game Code.

13. The CDFW or Corps will report any observation of effects to California red-legged frogs associated with the implementation of Program projects in accordance with RGP12. The Service and the Corps must review the circumstances surrounding the incident to determine whether any patterns of repeated authorized or unauthorized activities are occurring that may indicate that additional protective measures are required. If, after completion of the review, the Corps and the Service agree that additional protective measures are required and can be implemented within the existing scope of the action, the Corps must require the CDFW to implement the agreed-upon measures within a reasonable time frame; if the corrective actions cannot be implemented with the scope of the existing action, the Corps and Service will determine whether re-initiation of consultation is appropriate.

14. During all activities at project work sites, all trash that may attract predators will be properly contained, removed from the work site, and disposed of regularly. Following construction, all trash and construction debris will be removed from work areas.

15. If these mitigation measures cannot be implemented or the project activities proposed at a specific work site cannot be modified to prevent or avoid potential impacts to California red-legged frog or its habitat, then project activity at that work site will be discontinued.

ANALYTICAL FRAMEWORK FOR THE JEOPARDY AND ADVERSE MODIFICATION DETERMINATIONS

Jeopardy Determination

Section 7(a)(2) of the Endangered Species Act requires that Federal agencies ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of listed species. "Jeopardize the continued existence of" means "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 CFR 402.02).

The jeopardy analysis in this biological opinion relies on four components: (1) the Status of the Species, which describes the range-wide condition of the California red-legged frog, the factors responsible for that condition, and its survival and recovery needs; (2) the Environmental Baseline, which analyzes the condition of the California red-legged frog in the action area, the factors responsible for that condition, and the relationship of the action area to the survival and recovery of the California red-legged frog; (3) the Effects of the Action, which determines the direct and indirect impacts of the proposed Federal action and the effects of any interrelated or interdependent activities on the California red-legged frog; and (4) the Cumulative Effects, which evaluates the effects of future, non-Federal activities, that are reasonably certain to occur in the action area, on the California red-legged frog.

In accordance with policy and regulation, the jeopardy determination is made by evaluating the effects of the proposed Federal action in the context of the current status of the California red-legged frog, taking into account any cumulative effects, to determine if implementation of the proposed action is likely to reduce appreciably the likelihood of both the survival and recovery of the California red-legged frog in the wild by reducing the reproduction, numbers, and distribution of that species.

Adverse Modification Determination

Section 7(a)(2) of the Endangered Species Act requires that Federal agencies ensure that any action they authorize, fund, or carry out is not likely to result in the destruction or adverse modification of designated critical habitat. A final rule revising the definition of "destruction or adverse modification of critical habitat" was published on February 11, 2016 (81 FR 7214). The revised definition states: "Destruction or adverse modification means a direct or indirect alteration that appreciably diminishes the value of critical habitat for the conservation of a listed species. Such alterations may include, but are not limited to, those that alter the physical or biological features essential to the conservation of a species or that preclude or significantly delay development of such features."

The revised "destruction or adverse modification" definition focuses on how Federal actions affect the quantity and quality of the physical or biological features[1] in the designated critical habitat for a listed species and, especially in the case of unoccupied habitat, on any impacts to the critical habitat itself. Specifically, the Service will generally conclude that a Federal action is likely to "destroy or adversely modify" designated critical habitat if the action results in an alteration of the quantity or quality of the essential physical or biological features of designated critical habitat, or that precludes or significantly delays the capacity of that habitat to develop those features over time, and if the effect of the alteration is to appreciably diminish the value of critical habitat for the conservation of the species.

The Service may consider other kinds of impacts to designated critical habitat. For example, some areas that are currently in a degraded condition may have been designated as critical habitat for their potential to develop or improve and eventually provide the needed ecological functions to support species' recovery. Under these circumstances, the Service generally concludes that an action is likely to "destroy or adversely modify" the designated critical habitat if the action alters it to prevent it from improving over time relative to its pre-action condition. The "destruction or adverse modification" definition applies to all physical or biological features; as described in the proposed revision to the current definition of "physical or biological features" (50 CFR 424.12), "[f]eatures may include habitat characteristics that support ephemeral or dynamic habitat conditions" (79 FR 27066).

The adverse modification analysis in this biological opinion relies on four components: (1) the Status of Critical Habitat, which describes the range-wide condition of designated critical habitat for the California red-legged frog in terms of the essential physical or biological features, the factors responsible for that condition, and the intended recovery function of the critical habitat overall; (2) the Environmental Baseline, which analyzes the condition of the critical habitat in the action area, the factors responsible for that condition, and the recovery role of the critical habitat in the action area; (3) the Effects of the Action, which determines the direct and indirect impacts of the proposed Federal action and the effects of any interrelated and interdependent activities on the essential physical and biological features and how that will influence the recovery role of the affected critical habitat units; and (4) Cumulative Effects, which evaluates the effects of future non-Federal activities, that are reasonably certain to occur in the action area, on the essential physical and biological features and how that will influence the recovery role of affected critical habitat units.

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1 The critical habitat rule for California red-legged frog uses the term "primary constituent elements" (PCEs) to describe the "physical or biological features" (PBFs) as used in the revised definition of "destruction or adverse modification of critical habitat." For this biological opinion, PCEs and PBFs are considered synonymous.

STATUS OF THE SPECIES AND ITS CRITICAL HABITAT

The California red-legged frog was federally listed as threatened on May 23, 1996 (Service 1996). The Service published a recovery plan in 2002 (Service 2002). Critical habitat was designated in 2010 (Service 2010a).

The California red-legged frog was once recognized as two conspecific subspecies, *Rana aurora aurora* and *Rana aurora draytonii*. Recent genetic analysis of the *Rana aurora/draytonii* complex has concluded that the two *Rana aurora* subspecies are in fact separate species (Shaffer et al. 2004, Frost et al. 2006, as cited in Service 2009); this change in nomenclature was acknowledged in the final rule for revised designation of critical habitat for the California red-legged frog (Service 2010a).

The California red-legged frog is the largest native frog in the western United States, ranging from 1.5 to 5.1 inches in length. The abdomen and hind legs of adults are largely red; the back is characterized by small black flecks and larger, irregular dark blotches with indistinct outlines on a brown, gray, olive, or reddish background color. Dorsal spots usually have light centers, and dorsolateral folds are prominent on the back. Tadpoles range from 0.6 to 3.1 inches in length and are dark brown and yellow with dark spots.

California red-legged frogs spend most of their lives in and near sheltered backwaters of ponds, marshes, springs, streams, and reservoirs. Deep pools with dense stands of overhanging willows and an intermixed fringe of cattails are considered optimal habitat. Eggs, larvae, transformed juveniles, and adults also have been found in ephemeral creeks and drainages and in ponds that do not have riparian vegetation. Accessibility to sheltering habitat is essential for the survival of California red-legged frogs within a watershed, and can be a factor limiting population numbers and distribution. Some California red-legged frogs have moved long distances overland between water sources during winter rains. Adult California red-legged frogs have been documented to move more than 2 miles in northern Santa Cruz County "without apparent regard to topography, vegetation type, or riparian corridors" (Bulger et al. 2003). Most of these overland movements occur at night. In another study conducted at the Point Reyes National Seashore and Golden Gate National Recreation Area in Marin County, radio tagged frogs often moved in a straight line between breeding and upland habitats up to 1.7 miles, again with no apparent regard to topography. Some of these frogs remained at breeding ponds all year, while others moved to non-breeding areas, even when the breeding sites retained water (Fellers and Kleeman 2007).

California red-legged frogs breed from November through March with earlier breeding records occurring in southern localities. California red-legged frogs are often prolific breeders, typically laying their eggs during or shortly after large rainfall events in late winter and early spring. Female California red-legged frogs deposit egg masses on emergent vegetation so that the masses float on the surface of the water. Egg masses contain about 2,000 to 5,000 moderate-sized (0.08 to 0.11 inch in diameter), dark reddish-brown eggs. Embryos hatch 6 to 14 days after fertilization. Larvae generally undergo metamorphosis 3.5 to 7 months after hatching, but some larvae overwinter and metamorphose after up to 13 months (Fellers et al. 2001). Tadpoles

probably experience the highest mortality rates of all life stages, with less than 1 percent of eggs laid reaching metamorphosis. Sexual maturity normally is reached at 3 to 4 years of age. California red-legged frogs may live 8 to 12 years. Juveniles can be active diurnally and nocturnally, whereas adults are mainly nocturnal.

The diet of California red-legged frogs is highly variable. Invertebrates are the most common food items for adults, although vertebrates such as Pacific treefrogs (*Hyla regilla*) and California mice (*Peromyscus californicus*) can constitute over half of the prey mass eaten by larger frogs (Hayes and Tennant 1985). Larvae eat algae and detritus.

The historical range of the California red-legged frog extended coastally from southern Mendocino County and inland from the vicinity of Redding, California, southward to northwestern Baja California, Mexico (Jennings and Hayes 1985, Storer 1925). The California red-legged frog has been extirpated or nearly extirpated from 70 percent of its former range. Historically, California red-legged frogs were found throughout the Central Valley and Sierra Nevada foothills. California red-legged frogs have been documented in 46 counties in California, but now remain in only 238 streams or drainages in 31 counties in California and one region in Baja California, Mexico (Grismer 2002, Fidenci 2004, Smith and Krofta 2005, Service 2009).

Over-harvesting, habitat loss, non-native species introduction, and urban encroachment are the primary factors that have negatively affected the California red-legged frog throughout its range (Jennings and Hayes 1985, Hayes and Jennings 1988). Ongoing causes of decline include direct habitat loss due to stream alteration and disturbance to wetland areas, indirect effects of expanding urbanization, and competition or predation from non-native species. Other causes of declines in amphibian species have been studied by Davidson et al. (2001). Results indicate that ozone depletion resulting in an increase in ultraviolet radiation is a potential factor of amphibian decline. In addition, upwind pesticides and/or other chemicals used for agricultural purposes have been identified as factors in a number of declining California amphibians.

An additional threat affecting amphibians worldwide is the chytrid fungus *Batrachochytrium dendrobatidis*. *Batrachochytrium dendrobatidis* causes chytridiomycosis, a skin disease that has been found to disrupt osmoregulatory function in the skin of amphibians, resulting in an imbalance of electrolytes and death (Voyles et al. 2009). Chytridiomycosis in amphibians may be marked by deformed mouthparts in tadpoles, wherein most infected tadpoles will die at metamorphosis (Service 2002). Infected boreal toads (*Anaxyrus boreas boreas*) showed few clinical signs of the disease but many appeared weak or lethargic, exhibited excessive shedding of skin and were reluctant to flee at the approach of humans (U.S. Geological Service 2000, as cited in Service 2002). Chytrid fungi are widespread in the environment where they act as decomposers of keratin, chitin, cellulose, and other plant material, and are known parasites of fungi, algae, higher plants, protozoa, invertebrates, and most recently in vertebrates. Chytrid fungi reproduce asexually by means of minute, fragile, motile spores, and are probably spread directly from amphibian to amphibian in water. These fungi most likely move from one water

source to another on migrating amphibians, waterbirds, or flying insects (Daszak et al. 1999 as cited in Service 2002).

Since its discovery in 1998, chytrid fungus has likely been responsible for die-offs of a number of amphibian species, including remaining populations of the endangered boreal toad (*Bufo boreas boreas*) in the southern Rocky Mountains, and Chiricahua leopard frogs (*Rana chiricahuensis*) in Arizona (Colorado Herpetological Society 2000, as cited in Service 2002). Occurrences of infection have been observed in two amphibian species in the Sierra Nevada, the mountain yellow-legged frog (*Rana muscosa)* and the Yosemite toad (*Bufo canoris*). An infected California red-legged frog tadpole was collected in Calabasas Pond on the Ellicott Slough National Wildlife Refuge in Santa Cruz County (Service 2002).

The chytrid fungus *Batrachochytrium dendrobatidis* is now recognized for its ability to spread quickly through amphibian populations and infect numerous species, causing high rates of mortality, and persisting at low host densities (Voyles et al. 2009). These recent findings validate the importance of taking precautions to prevent the spread of chytrid fungus or any disease agent into and/or between amphibian populations.

The recovery plan and listing rule discuss the following threats to California red-legged frog in further detail: the present or threatened destruction, modification, or curtailment of habitat or range; overutilization for commercial, recreational, scientific, or education purposes; disease and predation; the inadequacy of existing regulatory mechanisms; and other natural, or manmade factors affecting their continued existence (Service 1996, 2002)

Critical Habitat for the California Red-legged Frog

On March 17, 2010, the Service designated critical habitat for the California red-legged frog (Service 2010a). In total, 1,636,609 million acres were designated as critical habitat for the California red-legged frog in 27 California counties. The current designation better reflects the lands containing those essential habitat features necessary for the conservation of the California red-legged frog than did earlier designations that had been subject to litigation. A detailed discussion of the methods used in developing proposed critical habitat can be found in the final rule (Service 2010a).

We have identified the physical or biological features, or PCEs, essential to the conservation of the species that may require special management considerations or protection. Because not all life-history functions require all the PCEs, not all areas designated as critical habitat will contain all the PCEs. Based on our current knowledge of the life-history, biology, and ecology of the California red-legged frog, we determined the California red-legged frog's PCEs to consist of: 1) aquatic breeding habitat; 2) aquatic non-breeding habitat; 3) upland habitat, and 4) dispersal habitat. Detailed descriptions of these PCEs can be found in the final rule (Service 2010a). The following is a brief summary of the PCEs:

1. Aquatic breeding habitat consists of standing bodies of fresh water (with salinities less than 4.5 part per thousand), including natural and manmade (stock) ponds, slow moving

streams or pools within streams and other ephemeral or permanent water bodies that typically become inundated during winter rains and hold water for a minimum of 20 weeks in all but the driest of years.

2. Aquatic non-breeding habitat consists of the freshwater habitats as described for aquatic breeding habitat but which may or may not hold water long enough for the species to complete the aquatic portion of its lifecycle but which provide for shelter, foraging, predator avoidance, and aquatic dispersal habitat of juvenile and adult California red-legged frogs.

3. Upland habitat consists of upland areas adjacent to or surrounding breeding and non-breeding aquatic and riparian habitat up to a distance of one mile in most cases (i.e., depending on surrounding landscape and dispersal barriers) including various vegetation types such as grassland, woodland, forest, wetland, or riparian areas that provide shelter, forage, and predator avoidance for the California red-legged frog. Upland habitat should include structural features such as boulders, rocks and organic debris (e.g., downed trees, logs), small mammal burrows, or moist leaf litter.

4. Dispersal habitat consists of accessible upland or riparian habitat within and between occupied or previously occupied sites that are located within one mile of each other, and that support movement between such sites. Dispersal habitat includes various natural habitats, and altered habitats such as agricultural fields, that do not contain barriers (e.g., heavily traveled roads without bridges or culverts) to dispersal. Dispersal habitat does not include moderate- to high-density urban or industrial developments with large expanses of asphalt or concrete, nor does it include large lakes or reservoirs over 50 acres in size, or other areas that do not contain those features identified in PCE 1, 2, or 3 as essential to the conservation of the species.

Recovery Objectives

The recovery plan for the California red-legged frog describes the overall strategy for recovery (Service 2002):

1. Protecting existing populations by reducing threats;
2. restoring and creating habitat that will be protected and managed in perpetuity;
3. Surveying and monitoring populations and conducting research on the biology of and threats to the species; and reestablishing populations of the species within its historic range.

ENVIRONMENTAL BASELINE

Action Area

The implementing regulations for section 7(a)(2) of the Act define the "action area" as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 Code of Federal Regulations 402.02). For the purposes of this

biological opinion, we consider the action area to include all areas where people and equipment would be working within project footprints. This includes any areas subject to Program activities in immediate work areas, downstream and upstream areas indirectly affected by Program activities, and staging and access areas.

The exact locations of Program activities are not known at this time. All of the activities will take place in counties within the jurisdiction of the San Francisco District of the Corps and the VFWO. This includes various watersheds in the counties of San Luis Obispo, Monterey, Santa Cruz, and San Benito. The CDFW will provide the Service with notification of specific project information including the names and types of projects to be conducted, and the locations of projects including creeks, watersheds, cities or towns at least 90 days prior to project implementation. Notification will be made via mail or electronic mail to the appropriate contact at the VFWO (CDFW 2015b).

Habitat Characteristics and Existing Conditions of the Action Area

Program activities typically occur in watersheds that have been subject to significant levels of logging, road building, mining, grazing, and other activities that have reduced the quality and quantity of stream habitat available for native anadromous fish. Coastal watersheds previously dominated by mature redwood (subfamily Sequoioideae) and Douglas fir (*Pseudotsuga menziesii*) forests contain extensive road and skid trail systems from tractor logging. These previously mature and forested areas are now found in various seral stages of vegetative recovery and are predominate in the coastal Program region. Inland locations are usually in watersheds dominated by pine (*Pinus* spp.) and fir (*Abies* spp.) forests, often with steep unstable terrain; some inland locations are in valley areas in agricultural use.

Previous Consultations in the Action Area

In 2004 and again in 2010, we issued biological opinions for the Fisheries Restoration Grant Program RGP for restoration activities (Service 2004, 2010b). Annual reporting from 2010-2015 indicate California red-legged frogs were not observed or in need of relocation during activities in VFWO's north coast counties (CDFW 2016, 2014, 2013, 2011).

Condition (Status) of the Species in the Action Area

California red-legged frog occurs in all counties considered in this biological opinion. The California Natural Diversity Database (CNDDB) reports the following historical and current occurrences for California red-legged frogs in these counties (CNDDB 2016b).

Table 1. Number of California red-legged frog occurrences by county

COUNTY	PRESUMED EXTANT	POSSIBLY EXTIRPATED
San Luis Obispo	126	2
Monterey	102	0
Santa Cruz	77	0
San Benito	48	0

Table 2. Number of streams per county where California red-legged frogs are present, post-1985 (Service 2002).

COUNTY	NUMBER OF STREAMS
San Luis Obispo	30
Monterey	32
Santa Cruz	17
San Benito	5

San Luis Obispo County
In San Luis Obispo County, California red-legged frogs are found in many streams, stock ponds, dune ponds, and springs on the coastal plain and western slopes of the Santa Lucia Range from San Carpoforo Creek in the north to the Santa Maria River in the south. Sites include Pico, Little Pico, and Toro Creeks; Pico Pond; and San Simeon, Santa Rosa, Chorro, and Arroyo Grande Creeks. On Camp San Luis Obispo of the California National Guard, frogs occur in Whiskey Spring, tributaries to Chorro Creek and Chorro Reservoir, and other sites (Jennings et al. in litt. 1992, U.S. Fish and Wildlife Service 1996a). Additional details and locations are available in the CNDDB records for the species in San Luis Obispo County (CNDDB 2016b)

Monterey County
This species is widespread in Monterey County; nearly all coastal drainages from Garrapata Creek south to Salmon Creek, including the Little and Big Sur drainages and the vicinity of Pfeiffer Beach, support frogs. Some of these locations include the Salinas River, Elkhorn Slough watershed, and Carmel River. Additional details and locations are available in the CNDDB records for the species in Monterey County (CNDDB 2016b).

Santa Cruz County
Almost all coastal drainages from the Santa Cruz - San Mateo County line south to the City of Santa Cruz are occupied by California red-legged frogs (CNDDB 2016b, EIP Associates 1993). Some locations include Scott Creek, Liddell Creek, Wilder Ranch State Park, and Watsonville Slough. Additional details and locations are available in the CNDDB records for the species in Santa Cruz County (CNDDB 2016b).

San Benito County
In San Benito County, California red-legged frogs are found in a number of waterways, including Quien Sabe and Tres Pinos Creeks, the Pajaro and San Benito Rivers, and the general vicinity of Hollister in Santa Ana Creek, Tequisquita Slough, and the Hollister Hills State Vehicular Recreation Area. Numerous populations exist in Pinnacles National Park, particularly in Chalome and Bear Gulch Creeks (CNDDB 2016b, M. Jennings in litt. 1998). Additional details and locations are available in the CNDDB records for the species in San Benito County (CNDDB 2016b).

Recovery
The action area is located primarily in recovery units 5 and 6: Unit 5, Central Coast and Unit 6, Diablo Range and Salinas Valley. Unit 5 includes the following watersheds: San Francisco Coastal South (partial), San Lorenzo-Soquel, Central Coastal, and Carmel. The recovery plan identified Unit 5 as supporting the greatest number of occupied drainages. Unit 6 includes the Panoche-San Luis Reservoir, Pajaro, Upper Gatos, Estrella, Tulare-Buena Vista Lakes (partial), Carrizo Plain, Alisal-Elkhorn Sloughs, and Salinas Watersheds.

Within recovery units, several areas are identified as core areas where recovery actions will be focused. Core areas are distributed throughout portions of the historic and current range and represent a system of areas that will allow for long-term viability of existing populations and reestablishment of populations within the historic range when protected and managed for California red-legged frogs. The core areas were chosen for focused recovery either because they represent viable populations (possibly even source populations for larger metapopulations), or because the locations will contribute to the connectivity of habitat and thus increase dispersal opportunities between populations. Preservation and enhancement of each core area is important to maintain and expand the distribution of California red-legged frog populations range-wide. Core areas will require long-term protection and management so existing and reestablished populations remain viable. Recovery and delisting will be facilitated by meeting recovery criteria in all core areas (Service 2002).

The action area includes the following core areas by county:

San Luis Obispo County
Core Areas: Estero Bay, Estrella River, Arroyo Grande Creek

Monterey County
Core Areas: Watsonville Slough–Elkhorn Slough, Carmel River–Santa Lucia

Santa Cruz County
Core Areas: Watsonville Slough–Elkhorn Slough, South San Francisco Bay

San Benito County
Core Areas: Santa Clara Valley, Gabilan Range, East San Francisco Bay

Condition (Status) of Critical Habitat in the Action Area
As discussed in the Status of the Species section, in determining which areas within the geographical area occupied by the species at the time of listing to designate as critical habitat, we consider the physical and biological features essential to the conservation of the species that may require special management considerations or protection to be the PCEs laid out in the appropriate quantity and spatial arrangement essential to the conservation of the species. The PCEs for the California red-legged frog are (1) aquatic breeding habitat, (2) aquatic non-breeding habitat, (3) upland habitat, and (4) dispersal habitat (Service 2010). The proposed project has the

potential to occur in the following critical habitat units. California red-legged frogs are present in these units (Service 2010).

Table 3. Critical habitat in the action area

UNIT	ACRES	WATERSHEDS	PCEs and HABITAT
SLO-2	82,673	Arroyo de los Chinos, Lower Arroyo de la Cruz, Arroyo del Corral, Oak Knoll Creek, Broken Bridge Creek, Pico Creek, Upper San Simeon Creek, Lower San Simeon Creek, Steiner Creek, Upper Santa Rosa Creek, Lower Santa Rosa Creek, and Lower Green Valley Creek.	PCEs 1, 2, 3, 4 Provides connectivity Contains high-quality habitat
SLO-3	116,517	Old Creek, Whale Rock Reservoir, the southern portion of Hale Creek, Morro Bay, San Luisito Creek, the western and southern portions of Santa Margarita Creek, Choro Reservoir, Stenner Lake, Reservoir Canyon, Trout Creek, and Big Falls Canyon.	PCEs 1, 2, 3, 4 Provides connectivity
SLO-4	34,463	Horse Mesa, Douglas Canyon, American Canyon, and Coyote Hole.	PCEs 2, 3, 4 Provides connectivity
MNT-1	519	Eastern edge of the Elkhorn Slough watershed and the western edge of the Strawberry Canyon watershed	PCEs 1, 2, 3, 4 Large estuary/freshwater slough system
MNT-2	119,492	Southern portion of Carmel Bay, Carmel Valley, Robinson Canyon, San Jose Creek, Las Garces Creek, Hitchcock Canyon, the western portion of Lower Tularcitos Creek, Klondike Canyon, Black Rock Creek, Pine Creek, Danish Creek, Cachagua Creek, Lower Finch Creek, Bear Canyon, Bruce Fork, and Miller Canyon.	PCEs 1, 2, 3, 4 Largest unit within Monterey County
MNT-3	27,542	Point Sur, Big Sur River, Ventana Creek, Sycamore Canyon, and Partington Creek.	PCEs 1, 2, 3, 4 Provides connectivity Largest coastal habitat within Monterey Bay region
SCZ-1	72,249	Green Oaks Creek, Waddell Creek, East Waddell Creek, Scott Creek, Big Creek, Little Creek, San Vicente Creek, Laguna Creek, and Majors Creek	PCEs 1, 2, 3, 4 Provides connectivity Contains high-quality habitat
SCZ-2	4,057	Portions of the Corralitos Lagoon and mouth of the Pajaro River	PCEs 1, 2, 3, 4 Provides connectivity
SNB-1	36,294	Southern portions of San Justo Reservoir, Northeast Hollister Hills, and Upper Bird Creek; Left Fork Bird Creek; Sulfur Canyon; and the western portions of Arroyo Hondo, Willow Grove School, Paicines Ranch, and Lower Pescadero Creek	PCEs 1, 2, 3, 4 Provides connectivity between the coast plain and inner Coast Range
SNB-2	17,356	Tres Pinos Creek drainage within the Antelope Creek watershed	PCEs 1, 2, 3, 4 Expected to prevent further fragmentation of habitat in this portion of the range
SNB-3	63,753	Gloria Lake, Bickmore Canyon, Sulfur Creek, and George Hansen Canyon	PCEs 1, 2, 3, 4 Expected to prevent further fragmentation of habitat in this portion of the range

EFFECTS OF THE ACTION

Effects of the Proposed Action on California Red-Legged Frog

Direct effects to California red-legged frog adults, sub-adults, and/or tadpoles in the footprint of projects would include injury or mortality from being crushed by earth-moving equipment, construction debris, and worker foot traffic. Measures proposed by the Corps, including restricting timing of projects to the dry season in California red-legged frog habitat, pre-project surveys, training of construction personnel, minimizing and clearly demarcating the boundaries of the project areas, and monitoring, would avoid or minimize these effects. Because ground-disturbing activities in potential California red-legged frog habitat will be restricted to the period between July 1 and October 15, California red-legged frog egg masses should not be encountered.

Relocating California red-legged frogs out of harm's way would reduce injuries or mortalities due to project activities; however, California red-legged frog could be injured or killed from improper handling, containment, transport of individuals, or releasing them into unsuitable habitat (e.g., where nonnative predators are present). Ensuring biologists are qualified and pre-approved by the Service would minimize these effects.

Releasing amphibians following a period of captivity, during which they can contract infections or disease, may cause an increased risk of mortality in wild populations. Amphibian pathogens and parasites can be carried between habitats on the hands, footwear, or equipment of field personnel, spreading them to areas that have had little or no prior exposure. Relocation of California red-legged frogs captured from the project area could contribute to the spread of chytrid fungus or other disease. In addition, infected equipment or footwear could introduce chytrid fungus into areas where it did not previously occur. Following the Declining Amphibian Populations Task Force (DAPTF) Fieldwork Code of Practice (DAPTF 1998) (Appendix A), in conjunction with the use of a Service-approved biologist would minimize these effects.

Work activities, including noise and vibration, may cause California red-legged frogs to leave the work area, increasing the potential for predation and/or desiccation. Measures proposed by the Corps, including restricting timing of projects to the dry season in California red-legged frog habitat, pre-project surveys, training of construction personnel, minimizing and clearly demarcating the boundaries of the project areas, and monitoring, would avoid or minimize these effects.

California red-legged frogs are more likely to disperse in mesic conditions. Because the projects would be conducted in the dry season in California red-legged frog habitat, dispersal during project activities is less likely; however, California red-legged frog may disperse if an unseasonable rain event occurs. Unseasonable and substantial rainfall events (greater than 0.5 inch of rain in a 24-hour period) could make California red-legged frog vulnerable to the effects of project activities.

Tadpoles may be injured or killed if entrained by pump or water diversion intakes. The Corps proposes to screen intakes with wire mesh no larger than 0.125 inch to prevent California red-legged frog from entering the pump system. This measure would greatly reduce the potential for tadpoles to become caught in the inflow.

Ponded water can create favorable habitat for nonnative predators such as bullfrogs, crayfish, and centrarchid fishes, exposing California red-legged frogs to higher than normal rates of predation. The Corps proposes to minimize the potential for ponding by releasing diverted water during construction activities. Any areas that may become ponded will be monitored for California red-legged frogs. These measures would minimize the effects to California red-legged frog due to ponded water.

Trash left during or after project activities may attract predators to work sites that could injure or kill California red-legged frogs. Raccoons (*Procyon lotor*), coyotes (*Canis latrans*), and feral cats (*Felis catus*) are attracted to trash and prey opportunistically on California red-legged frogs. Properly containing and removing trash from the work site regularly would minimize this effect.

Accidental spills of hazardous materials or careless fueling or oiling of vehicles or equipment could degrade water quality or upland habitat, potentially injuring California red-legged frogs. Proposed measures to ensure spill prevention and response plans are in place and performing all fueling and maintenance activities at least 65 feet from any riparian habitat or waterbody would reduce the minimize the potential for these impacts.

Work in live streams or in floodplains could cause siltation downstream. This siltation could alter the quality of the habitat to the extent that use by California red-legged frogs is precluded. Implementing best management practices for erosion and sediment control and restricting work areas would minimize these effects.

Uninformed workers could disturb, injure, or kill California red-legged frogs if they are present and are not detected. Holding a training session for all personnel on California red-legged frog biology, habitat, and protective measures in place would minimize the potential for these impacts.

Program projects are intended to provide additional habitat for and increased populations of salmonids. The effects of increasing numbers of potential predators on California red-legged frogs cannot be accurately predicted. Although we anticipate that some predation of California red-legged frogs by salmonid fishes may occur, this level of predation is not expected to appreciably alter the population structure within the project areas. The recovery plan identifies coho salmon (*Oncorhynchus kisuch*) and steelhead trout (*O. mykiss*) as species associated with the California red-legged frog and its habitat, emphasizing multi-species protection strategies, recognizing interactions of organisms and their environments. Restoration and protection of processes that maintain diversity and healthy ecosystems is a goal (Service 2002). Although some native predators are identified in the listing rule, salmonid species are not named. Nonnative predators, particularly bullfrogs and crayfish, are of particular concern (Service 1996).

Restoration and enhancement of riparian vegetation in Program areas is likely to increase the number and quality of forage and cover sites and the diversity and abundance of prey species for California red-legged frogs. The Program will also contribute to California red-legged frog populations by removing non-native predators such as bullfrogs and crayfish. The proposed authorization is expected to improve conditions for California red-legged frog overall.

Effects of the Proposed Action on Critical Habitat of the California Red-Legged Frog
As described in Table 3 in the Environmental Baseline, the critical habitat units in the action area contain the physical and biological features that are essential for the conservation of the species. The units are currently occupied by California red-legged frogs and contain permanent and ephemeral aquatic habitat for breeding and non-breeding activities (PCEs 1 and 2), and upland habitat for foraging, dispersal, and shelter (PCEs 3 and 4). Some of these units include areas with high quality habitat, while others provide important connectivity between habitats or unique habitat characteristics. We consider the PCEs in the action area to be functioning at an overall high level.

Project locations and size will vary throughout the life of the RGP. Specific locations and project areas are not known until projects are awarded grant funding, and the CDFW provides the Service a notification of projects for each individual year. Based on projects funded in the past, the size of the projects are small relative to the acres of critical habitat in the action area.

Access and construction activities, including excavation and removal of vegetation, may temporarily reduce the quality and/or availability of foraging, dispersal, and sheltering habitat for California red-legged frogs. Creek diversion and dewatering may temporarily reduce the quality and/or availability of permanent and ephemeral aquatic habitat for California red-legged frog. Working in the dry season, restricting the size of project areas, and implementing best management practices for dewatering and erosion control will help minimize effects to these habitats. Ultimately, creek stabilization and restoration will reduce erosion in and downstream of the action area, and placement of structures such as large woody debris would create sheltering habitat, enhance pool formation. Though Program projects may cause temporary impacts to critical habitat during implementation, these projects are expected to enhance habitat for California red-legged frogs and improve the condition of critical habitat in these stream reaches overall.

Effects on Recovery
As discussed in the Environmental Baseline, recovery core areas represent a system of areas that will allow for long-term viability of existing populations and reestablishment of populations within the historic range when protected and managed for California red-legged frogs. Though individual California red-legged frog may be affected by Program activities and habitat would be temporarily disturbed, the Program projects will ultimately restore and create habitat. The Program also reduces threats by removal of nonnative predators such as bullfrogs and crayfish. The enhancement of these stream reaches for salmonids is likely to support productivity of California red-legged frog populations in these areas.

The recovery plan identifies coho salmon and steelhead trout species as associated with California red-legged frog. The recovery plan reiterates the Service's commitment to applying an ecosystem approach to conservation, with restoration and protection of processes that maintain diversity and healthy ecosystems as a goal. The restoration and protection of associated salmonid species is expected to contribute to the recovery of the California red-legged frog.

Summary of Effects

The proposed project may cause adverse effects to California red-legged frogs if they are within the project area during project activities and not detected by biological monitors or construction personnel, or if they are found and relocated. Although Program activities are proposed to occur in the dry season, California red-legged frogs may disperse if an unseasonable rain event occurs. Unseasonable rain events could make California red-legged frog vulnerable to the effects of project activities if they are dispersing through work areas and are not detected.

Critical habitat in the action area is occupied and contains all four PCEs for the species. These critical habitat units contain high-quality habitat, providing connectivity and preventing further fragmentation. Program activities may temporarily reduce the quality and/or availability of foraging, dispersal, and sheltering habitat, and may temporarily reduce the quality and/or availability of permanent and ephemeral aquatic habitat for California red-legged frogs. Though Program projects may cause temporary impacts to critical habitat during implementation, these projects are expected to enhance habitat for California red-legged frogs and maintain or improve the condition and function of critical habitat in these stream reaches overall.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. We do not consider future Federal actions that are unrelated to the proposed action in this section because they require separate consultation pursuant to section 7 of the Act.

Currently, a habitat conservation plan (HCP) is in development for the City of Santa Cruz (City) Water Department in Santa Cruz County. This plan is for the construction, operation, and maintenance of water supply facilities, the construction and maintenance of roads, waste management activities, storm water management, and the operation and maintenance of recreation and open space areas. The total watershed and water service/urban areas containing the City's activities are approximately 176 square miles and include three geographically distinct areas: the North Coast watersheds, the San Lorenzo River watershed, and the Santa Cruz urban center, as well as the water service areas outside of the City limits; however, California red-legged frogs occur only within the North Coast Unit of the plan area. Program project areas may overlap within watersheds covered in the City's habitat conservation plan.

California red-legged frog is a covered species under the City's HCP. The HCP identifies potential direct and indirect effects to California red-legged frog and critical habitat due to

construction, operations, and maintenance activities. Potential effects include habitat disturbance and relocation of California red-legged frog in the work areas. The HCP provides measures to avoid and minimize effects to California red-legged frog, and a strategy to mitigate for impacts that cannot be avoided.

CONCLUSION

The regulatory definition of "to jeopardize the continued existence of the species" focuses on assessing the effects of the proposed action on the reproduction, numbers, and distribution, and their effect on the survival and recovery of the species being considered in the biological opinion. For that reason, we have used those aspects of the California red-legged frog's status as the basis to assess the overall effect of the proposed action on the species.

Reproduction

The majority of habitat restoration projects under the Program would improve overhead cover, spawning gravels, and pool habitat; reduce or eliminate erosion and sedimentation impacts; screen diversions; and remove barriers to fish passage for salmonids. California red-legged frog aquatic breeding habitat includes slow moving streams or pools within streams and other ephemeral or permanent water bodies that are not subject to sedimentation. Program projects may cause temporary disturbance to California red-legged frog individuals and their habitat; however, the projects would create or improve breeding habitat, or at the very least, improve or create aquatic non-breeding habitat. Aquatic non-breeding habitat is a PCE that provides for shelter, foraging, predator avoidance, and aquatic dispersal habitat for juveniles and adults. Based on these factors, we conclude that Program projects will not reduce the reproductive capacity of the species; instead, the Program is expected provide benefits toward the reproductive capacity of California red-legged frogs.

Numbers and Distribution

Although the proposed action may cause adverse effects to individual California red-legged frogs if they are present in the project areas, we do not expect these effects would result in a reduction in numbers or distribution to the species as a whole. As described in the Status of the Species, California red-legged frogs are present in all four counties within multiple watersheds. The CNDDB lists numerous extant occurrences for the species. The critical habitat units in the Program areas contain all four PCEs and contain high-quality habitat, providing connectivity and preventing further fragmentation. Though Program projects may cause temporary disturbance to California red-legged frog individuals and their habitat, the projects would create or improve habitat for shelter, foraging, predator avoidance, aquatic dispersal, and potentially for breeding. Based on these factors, we conclude that Program projects will not appreciably reduce the numbers and/or distribution of California red-legged frog range-wide and may facilitate an increase in numbers and distribution with restoration of habitat.

Recovery

As discussed in the Status of the Species, protection and recovery of the California red-legged frog will require reduction of the threats from the present or threatened destruction, modification,

or curtailment of habitat or range; overutilization for commercial, recreational, scientific, or education purposes; disease and predation; the inadequacy of existing regulatory mechanisms; and other natural, or manmade factors affecting their continued existence; habitat loss and alteration being the primary factors negatively affecting the California red-legged frog throughout its range.

The overall strategy for recovery of the California red-legged frog is (1) protecting existing populations by reducing threats; (2) restoring and creating habitat that will be protected and managed in perpetuity; and (3) surveying and monitoring populations and conducting research on the biology of and threats to the species; and (4) reestablishing populations of the species within its historic range (Service 2002).

Though individual California red-legged frog may be affected by Program activities and habitat that would be temporarily disturbed, the Program projects will ultimately restore and create habitat. The Program also reduces threats by removal of nonnative predators such as bullfrogs and crayfish. The enhancement of these stream reaches for salmonids is likely to support productivity of California red-legged frog populations in these areas. The recovery plan recognizes that salmonid species and their habitats are associated with California red-legged frogs, and reiterates the Service's commitment to applying an ecosystem approach to conservation, with restoration and protection of processes that maintain diversity and healthy ecosystems as a goal. Habitat restoration for salmonids will benefit California red-legged frogs by creating and/or restoring habitat for shelter, foraging, predator avoidance, aquatic dispersal, and potentially breeding. Based on these factors, we conclude that Program projects will not appreciably reduce the recovery of California red-legged frog range-wide and may instead contribute to the overall recovery of the species.

After reviewing the current status of the California red-legged frog, the environmental baseline for the action area, the effects of the proposed Program, and the cumulative effects, it is the Service's biological opinion that authorization of the Restoration Grant Program Regional General Permit 12, as proposed, is not likely to jeopardize the continued existence of the California red-legged frog.

After reviewing the current status of the critical habitat of the California red-legged frog, the environmental baseline of critical habitat for the action area, the effects of the proposed authorization of the Restoration Grant Program Regional General Permit 12 on critical habitat, and the cumulative effects, it is the Service's biological opinion that the authorization, as proposed, is not likely to result in the destruction or adverse modification of critical habitat of the California red-legged frog because the proposed action is expected to enhance habitat for California red-legged frogs and maintain or improve the condition and function of critical habitat overall.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened wildlife 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 the Service to include significant habitat modification or degradation that results in death or injury to wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not the purpose of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this incidental take statement.

In June 2015, the Service finalized new regulations implementing the incidental take provisions of section 7(a)(2) of the Act. The new regulations also clarify the standard regarding when the Service formulates an Incidental Take Statement [50 CFR 402.14(g)(7)], from "…if such take may occur" to "…if such take is reasonably certain to occur." This is not a new standard, but merely a clarification and codification of the applicable standard that the Service has been using and is consistent with case law. The standard does not require a guarantee that take will result; only that the Service establishes a rational basis for a finding of take. The Service continues to rely on the best available scientific and commercial data, as well as professional judgment, in reaching these determinations and resolving uncertainties or information gaps.

We anticipate that some California red-legged frog could be taken as a result of the proposed action. We expect the incidental take to be in the form of wounding or killing of individuals if they are within the project area during project activities and not detected by biological monitors or construction personnel, or if they are found and mishandled during relocation.

We cannot quantify the precise number of California red-legged frog that may be taken as a result of the actions that the Corps has proposed because California red-legged frogs move over time; for example, animals may have entered or departed the action area since the time of pre-construction surveys. Other individuals may not be detected due to their cryptic nature, small size, and low mobility. Finding dead or injured California red-legged frogs is unlikely. The protective measures proposed by the Corps are likely to prevent mortality or injury of most individuals.

Consequently, we are unable to reasonably anticipate the actual number of California red-legged frogs that would be taken by the proposed project; however, we must provide a level at which formal consultation would have to be reinitiated. The Environmental Baseline and Effects Analysis sections of this biological opinion indicate that adverse effects to California red-legged

frogs would likely be low given the nature of the proposed activities, and we, therefore, anticipate that take of California red-legged frogs would also be low. We also recognize that for every California red-legged frog found dead or injured, other individuals may be killed or injured that are not detected; so when we determine an appropriate take level we are anticipating that the actual take would be higher and we set the number below that level.

Similarly, for estimating the number of California red-legged frogs that would be taken by capture, we cannot predict how many may be encountered for reasons stated earlier. While the benefits of relocation (i.e., minimizing mortality) outweigh the risk of capture, we must provide a limit for take by capture at which consultation would be reinitiated because high rates of capture may indicate that some important information about the species in the action area was not apparent (e.g., it is much more abundant than thought). Conversely, because capture and relocation can be highly variable, depending upon the species and the timing of the activity, we do not anticipate a number so low that reinitiation would be triggered before the effects of the activity were greater than what we determined in the Effects Analysis.

Therefore, if 2 adult or juvenile California red-legged frogs or 10 percent of tadpoles encountered are wounded or killed at any given project site, the Corps must contact our office immediately to reinitiate formal consultation. If six adults or juveniles are captured and relocated at any given project site, the Corps must contact our office immediately to evaluate if reinitiation is necessary. Any California red-legged frogs wounded or killed as a result of relocation activities will be counted toward the totals. Project activities that are likely to cause additional take should cease during this review period because the exemption provided under section 7(o)(2) would lapse and any additional take would not be exempt from the section 9 prohibitions. Incidental take limits are depicted in Table 4.

Table 4. Incidental take limits per project site

INJURY OR MORTALITY	LIMIT
ADULTS/JUVENILES	2
TADPOLES	10%

CAPTURE AND RELOCATION	LIMIT
ADULTS/JUVENILES	6

REASONABLE AND PRUDENT MEASURES

The measures described below are non-discretionary, and must be undertaken by the Corps or made binding conditions of any grant or permit issued to the CDFW, as appropriate, 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 the CDFW 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. To monitor the impact of incidental take, the Corps must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement [50 CFR 402.14(i)(3)].

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize the impacts of the incidental take of California red-legged frogs:

1. Only Service-approved biologists will conduct capture and relocation activities of California red-legged frogs;

2. Effects to California red-legged frog caused by project activities must be minimized.

3. The CDFW will notify the Service of specific locations of Program projects prior to onset of project activities.

TERMS AND CONDITIONS

To be exempt from the prohibitions of section 9 of the Act, the Corps must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline reporting and monitoring requirements. These terms and conditions are non-discretionary.

1. The following terms and conditions implement reasonable and prudent measure 1:

    a. Only qualified personnel authorized under this biological opinion may handle California red-legged frogs. Based on the information provided on June 1, 2016 (K. Carpio, CDFW in litt. 2016), we authorize Derek Acomb, Mark Allaback, Sierra Cantor, Jonathan Koehler, Jennifer Michaud, and Dawn Kathleen Smith Reis, to independently monitor for, capture, handle, and relocate California red-legged frogs during Program activities as analyzed in this biological opinion. Joseph D. Scriven is authorized to independently monitor for California red-legged frogs, and conduct capture, handling, and relocation activities under the supervision of an independently authorized biologist to gain experience necessary to conduct these activities independently in the future. The supervising biologist must be on site and within close enough proximity to observe, answer questions, or provide guidance whenever necessary.

    b. If the CDFW wishes to use other biologists to capture, handle, and relocate California red-legged frogs in the future, they must submit the credentials of the biologists who will conduct these activities to us for review and approval at least 15 days prior to the onset of any such activities.

2. The following terms and conditions implement reasonable and prudent measure 2:

    a. Any California red-legged frogs within active project areas that may be adversely affected by project activities will be captured and relocated.

b. If an unseasonable substantial rainfall (greater than 0.5 inch of rain in a 24-hour period) occurs, the Service-approved biologist must search the work and staging areas for California red-legged frogs prior to work activities. The Service-approved biologist must also monitor work areas during periods of rain. Work activities may continue if the Service-approved biologist determines that California red-legged frogs are not present in the work area.

3. The following term and condition implements reasonable and prudent measure 3:

   a. For activities in Monterey, San Benito, San Luis Obispo, and Santa Cruz counties, the Corps or the CDFW must provide the Ventura Fish and Wildlife Office (2493 Portola Road, Suite B; Ventura, California 93003) with notification of projects that are authorized through the RGP at least 90 days prior to project implementation. This notification will contain specific project information including the names and types of projects to be conducted and the locations of projects including creeks, watersheds, city or towns, and counties.

REPORTING REQUIREMENTS

Pursuant to 50 CFR 402.14(i)(3), the Corps must report the progress of the action and its impact on the species to the Service as specified in this incidental take statement. For San Luis Obispo, Monterey, Santa Cruz, and San Benito Counties, the CDFW will submit an annual report describing implemented projects to the Ventura Fish and Wildlife Office by January 31 of each year.

The report will include:

1. A table documenting the number of California red-legged frogs killed, injured, and handled during each Program project under the Corps authorization.

2. A summary of how the terms and conditions of the biological opinion and the protective measures worked.

3. Any suggestions of how the protective measures could be revised to improve conservation of this species while facilitating compliance with the Act.

DISPOSITION OF DEAD OR INJURED SPECIMENS

As part of this incidental take statement and pursuant to 50 CFR 402.14(i)(1)(v), upon locating a dead or injured California red-legged frog, initial notification within 3 working days of its finding must be made by telephone and in writing (or electronic mail) to the Ventura Fish and Wildlife Office (805-644-1766). The report must include the date, time, location of the carcass, a photograph, cause of death or injury, if known, and any other pertinent information.

The Corps must take care in handling injured animals to ensure effective treatment and care, and in handling dead specimens to preserve biological material in the best possible state. The applicant and/or its representative must transport injured animals to a qualified veterinarian. Should any treated California red-legged frogs survive, the applicant and/or its representative must contact the Service regarding the final disposition of the animal(s). The remains of California red-legged frogs must be placed with the California Academy of Sciences (Contact: Jens Vindum, Collections Manager, California Academy of Sciences Herpetology Department, Golden Gate Park, San Francisco, California, 94118, (415) 750-7037).

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to use their authorities to further the purposes of the Act 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.

1. We recommend that the Service-approved biologist(s) relocate any other native reptiles or amphibians found within work areas, using methods that will not adversely affect California red-legged frogs, if such actions are in compliance with State laws.

2. The Corps should investigate the efficacy of capture and moving of California red-legged frogs to determine if use of this minimization measure reduces adverse effects of project actions on the species. As part of this, information on repeat capture and behavior of individuals post-movement should be noted.

The Service requests notification of the implementation of any conservation recommendations so we may be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats.

REINITIATION NOTICE

This concludes formal consultation on the action(s) outlined in the request. As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, the exemption issued pursuant to section 7(o)(2) may have lapsed and any further take could be a violation of section 4(d) or 9. Consequently, we recommend that any operations causing such take cease pending reinitiation.

If you have any questions about this biological opinion, please contact Jake Martin of my staff at (831) 768-6953, or by e-mail at Jacob_Martin@fws.gov.

Sincerely,

Stephen P. Henry
Field Supervisor

REFERENCES CITED

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APPENDIX A

The Declining Amphibian Populations Task Force Fieldwork Code of Practice

1. Remove mud, snails, algae, and other debris from nets, traps, boots, vehicle tires, and all other surfaces. Rinse cleaned items with sterilized (e.g., boiled or treated) water before leaving each work site.

2. Boots, nets, traps, and other types of equipment used in the aquatic environment should then be scrubbed with 70 percent ethanol solution and rinsed clean with sterilized water between study sites. Avoid cleaning equipment in the immediate vicinity of a pond, wetland, or riparian area.

3. In remote locations, clean all equipment with 70 percent ethanol or a bleach solution, and rinse with sterile water upon return to the lab or "base camp." Elsewhere, when washing-machine facilities are available, remove nets from poles and wash in a protective mesh laundry bag with bleach on the "delicates" cycle.

4. When working at sites with known or suspected disease problems, or when sampling populations of rare or isolated species, wear disposable vinyl[2] gloves and change them between handling each animal. Dedicate sets of nets, boots, traps, and other equipment to each site being visited. Clean them as directed above and store separately at the end of each field day.

5. When amphibians are collected, ensure that animals from different sites are kept separately and take great care to avoid indirect contact (e.g., via handling, reuse of containers) between them or with other captive animals. Isolation from unsterilized plants or soils which have been taken from other sites is also essential. Always use disinfected and disposable husbandry equipment.

6. Examine collected amphibians for the presence of diseases and parasites soon after capture. Prior to their release or the release of any progeny, amphibians should be quarantined for a period and thoroughly screened for the presence of any potential disease agents.

7. Used cleaning materials and fluids should be disposed of safely and, if necessary, taken back to the lab for proper disposal. Used disposable gloves should be retained for safe disposal in sealed bags.

The Fieldwork Code of Practice has been produced by the Declining Amphibian Populations Task Force with valuable assistance from Begona Arano, Andrew Cunningham, Tom Langton, Jamie Reaser, and Stan Sessions.

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2 Do not use latex gloves as latex is toxic to amphibians.

For further information on this Code, or on the Declining Amphibian Populations Task Force, contact John Wilkinson, Biology Department, The Open University, Walton Hall, Milton Keynes, MK7 6AA, UK, e-mail: DAPTF@open.ac.uk.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Arcata Fish and Wildlife Office
1655 Heindon Road
Arcata, California 95521
Phone: (707) 822-7201 FAX: (707) 822-8411

In Reply Refer To:
AFWO-11B0242-16I0058

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

Subject: Informal Consultation on California Department of Fish and Wildlife's 2015-2020 Fisheries Restoration Grant Program's Salmon Stream Restoration Projects

Dear Ms. Hicks:

This document is in reply to your letter dated November 20, 2015, and received by the U.S. Fish and Wildlife Service's (Service) Arcata Fish and Wildlife Office on November 30, 2015, regarding your request to reinitiate, and extend to December 31, 2018, our May 18, 2009, informal consultation (81331-2009-I-0097), and our latest December 16, 2013, informal consultation (11B0242-14I0016) due to expire December 31, 2015, on the California Department of Fish and Wildlife's (CDFW) Fisheries Restoration Grant Program (FRGP) as implemented under Regional General Permit 12. You have requested that we refer to the species determinations contained in your November 20, 2015, letter to complete this consultation. This document is prepared in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*)(Act).

Although your letter dated November 20, 2015, was addressed to three Service offices (i.e., Arcata, Sacramento, and Ventura), our response will address only potential effects to federally listed species within the Arcata Fish and Wildlife Office's (AFWO) jurisdiction. Based on information contained in our files, and recent email and telephone discussions between the Army Corps of Engineers (Corps), CDFW, and the Service in 2015, the Corps has made the following determinations for restoration activities proposed to occur January 1, 2016, through December 31, 2020, within AFWO's jurisdiction.

- Tidewater goby (*Eucyclogobius newberryi*; goby): may affect, but not likely to adversely affect. We do not agree with your determination and conclude that the proposed restoration activities will have no effect on gobies. Our determination is based on a review of the location of restoration activities that have occurred 2009 through 2015, recent information from CDFW that no proposed restoration activities will occur within tidally influenced waters or suitable habitat for tidewater gobies, and the Best Management Practices implemented to control sediment input. We have no regulatory or statutory authority for concurring with no effect determinations.

- Marbled murrelet (*Brachyramphus marmoratus*): may affect, but not likely to adversely affect. As stated in our 2009 and 2013 informal consultation letters to the Corps, we do not agree with your determination, and continue to conclude that the proposed restoration activities will have no effect on marbled murrelets. Our determination is based on two components of the FRGP: (1) suitable habitat will not be affected and, (2) restoration work will completely avoid disturbance of nesting marbled murrelets and their young through the implementation of a seasonal work restriction from March 24 through September 15.

- Northern spotted owl (*Strix occidentalis caurina*): may affect, but not likely to adversely affect. As stated in our 2009 and 2013 informal consultation letters to the Corps, we continue to concur with your determination based on two components of the FRGP: (1) suitable habitat will not be affected and, (2) restoration work will partially avoid disturbance of nesting northern spotted owls and their young through the implementation of a seasonal work restriction from February 1 through July 9.

- California red-legged frog (*Rana aurora draytonii*): may affect, but not likely to adversely affect. As stated in our 2009 and 2013 informal consultation letter to the Corps, we do not agree with your determination, and continue to conclude that proposed restoration activities that occur outside the range of the California red-legged frog in southern Mendocino County (see enclosed map) will have no effect. However, in 2016-2020, if a proposed restoration activity is located in California red-legged frog suitable habitat or designated critical habitat in southern Mendocino County, the Corps will consult individually on such proposed actions prior to completion of the CDFW Negative Declaration for that year.

- Yellow-billed cuckoo (*Coccyzus americanus*; cuckoo): no determination was made for the yellow-billed cuckoo in your November 20, 2015, letter. The yellow billed cuckoo was listed as Threatened under the Act in 2014, and is known to inhabit areas in Humboldt County. Critical habitat was proposed in 2014 and includes areas in Humboldt County. No determination was made in your November 20, 2014, letter with respect to the cuckoo. However, in 2016-2020, if a proposed restoration activity is located in yellow-billed cuckoo suitable habitat or critical habitat for the cuckoo in Humboldt County, or elsewhere in AFWO's jurisdiction, the Corps will consult individually on such proposed actions prior to completion of the CDFW Negative Declaration for that year.

This concludes informal consultation on the CDFW Fisheries Restoration Grant Program projects (Corps Regional General Permit 12). Unless new information reveals that the proposed actions: (1) may affect listed species in a manner or to an extent not considered in your correspondence, (2) the action is modified in a manner that causes an effect on the listed species or critical habitat not considered in your correspondence, or (3) a new species or critical habitat is designated that may be affected by the proposed action, no further action pursuant to the Act, is necessary.

Please contact Service biologist Steve Kramer at (707) 822-7201 should you have further questions regarding this consultation.

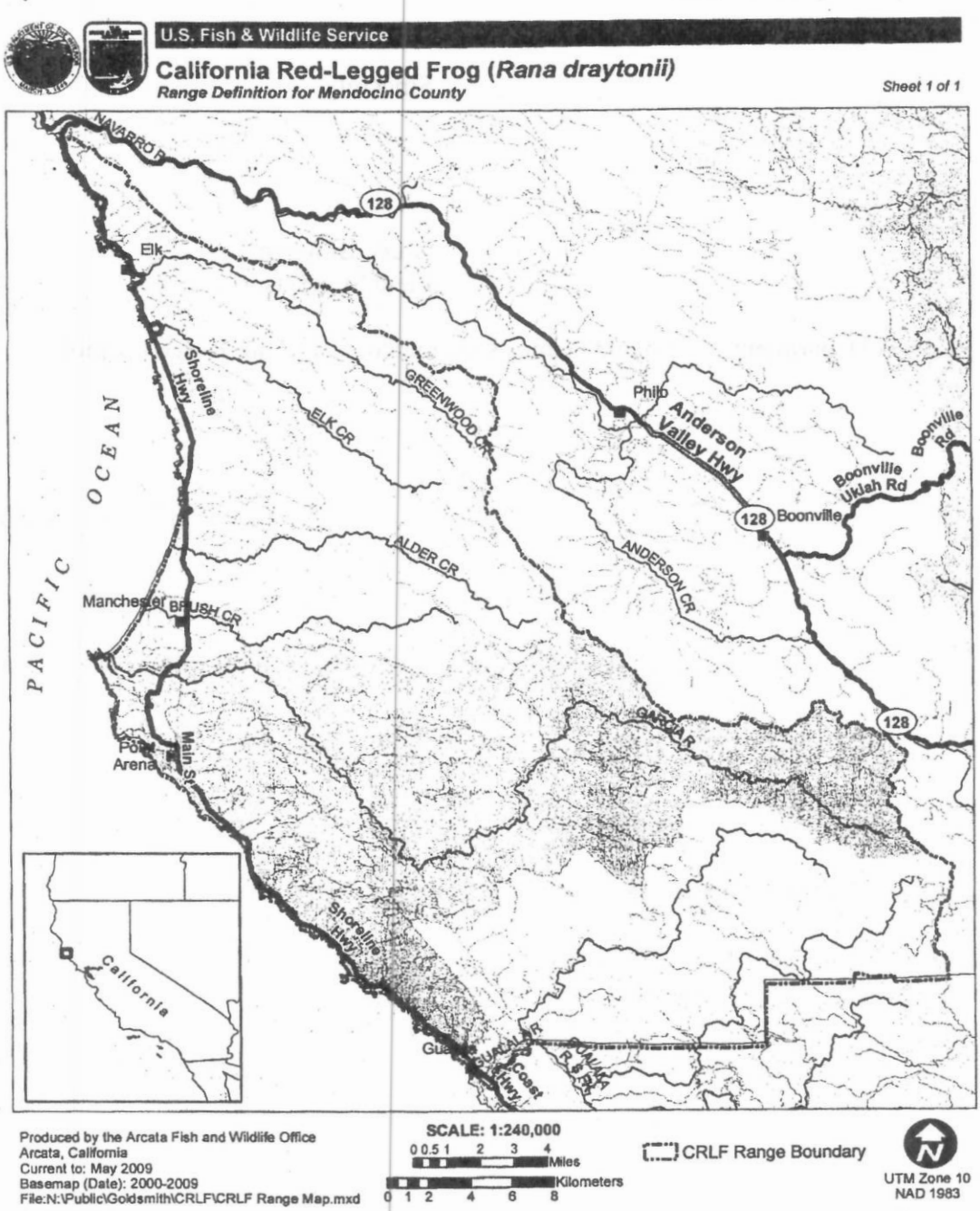
Sincerely,

for Bruce Bingham
Field Supervisor

cc: California Department of Fish and Game, Sacramento, CA (Attn: Karen Carpio)

Steve_kramer@fws.gov

Enclosure (AFWO-11B0242-16I0058)



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE

West Coast Region
777 Sonoma Avenue, Room 325
Santa Rosa, California 95404

MAY 26 2016

Refer to NMFS No: WCR-2015-2400

Aaron Allen, Acting Regulatory Branch Chief
U.S. Department of the Army
San Francisco District, Corps of Engineers
1455 Market Street
San Francisco, California 94103-1398

Re: Endangered Species Act Section 7(a)(2) Biological Opinion, and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the Issuance of a Regional General Permit to the California Department of Fish and Wildlife for Implementation of Anadromous Fish Habitat Restoration Projects under the Fisheries Restoration Grants Program (Corps File No. 2003-279220)

Dear Mr. Allen:

Thank you for your letter of December 4, 2015 (received December 7, 2015), requesting initiation of consultation with NOAA's National Marine Fisheries Service (NMFS) pursuant to section 7 of the Endangered Species Act (ESA) of 1973 (16 U.S.C. 1531 *et seq.*) for the U.S. Army Corps of Engineers (Corps) proposed issuance of a five-year Regional General Permit (RGP) 12 for habitat restoration activities under the California Department of Fish and Wildlife (CDFW) Fisheries Restoration Grants Program (FRGP) in Northern and Central California under Section 404 of the Clean Water Act of 1973, as amended (33U.S.C. Section 1344 *et seq.*). This letter transmits NMFS' final biological opinion and Essential Fish Habitat (EFH) consultation 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 not likely to adversely affect certain ESA listed species.

The enclosed biological opinion concludes formal consultation for activities in the FRGP that will be included under the RGP, including an EFH consultation. The biological opinion is based on information provided in the request to initiate consultation received on December 7, 2015, as well as the revised list of effects determinations received on April 15, 2016. The biological opinion addresses potential adverse effects on the following Evolutionarily Significant Units (ESUs) or Distinct Population Segments (DPSs) and designated critical habitats in accordance with section 7 of the ESA:

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

Central California Coast (CCC) coho salmon
Endangered (70 FR 37160, June 28, 2005)
Designated Critical Habitat (64 FR 24049, May 5, 1999);

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

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

CCC steelhead
Threatened (71 FR 834, January 5, 2006)
Designated Critical Habitat (70 FR 52488, September 2, 2005);

South-Central California Coast (S-CCC) steelhead
Threatened (71 FR 834, January 5, 2006)
Designated Critical Habitat (70 FR 52488, September 2, 2005).

Based on the best scientific and commercial information available, NMFS concludes that the RGP, as proposed, 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 that certain activities of the proposed action will result in incidental take of SONCC coho salmon, CCC coho salmon, CC Chinook salmon, NC steelhead, CCC steelhead, or 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, and S-CCC steelhead occurring as a result of the proposed action.

NMFS has also concurred with the Corps' determination that the Pacific eulachon's (*Thaleichthys pacificus*) southern DPS, North American green sturgeon (*Acipenser medirostris*) southern DPS, California Central Valley steelhead (*O. mykiss*), Sacramento River winter-run Chinook salmon (*O. tshawytscha*), and Central Valley spring-run Chinook salmon (*O. tshawytscha*) are not likely to be adversely affected by the proposed action. Additionally, three discretionary conservation recommendations are provided in the biological opinion.

NMFS' analysis of the action's likely effects on EFH was pursuant to section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA). Based on our review, NMFS concludes that the proposed action would adversely affect EFH for coho salmon and Chinook salmon, species managed under the Pacific Coast Salmon Fishery Management Plan. NMFS has included two EFH conservation recommendations that can be taken by the action

agency to avoid, minimize, or otherwise offset potential adverse effects on EFH. Section 305(b)(4)(B) of the MSA requires Federal agencies to provide a detailed written response to NMFS with 30 days of receiving EFH Conservation Recommendations. The final response must include a description of measures proposed to avoid, mitigate, or offset the adverse effects 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.

Please contact Julie Weeder (Northern California Office) at (707) 825-5168 or julie.weeder@noaa.gov, or Rick Rogers (North Central Coast Office) at (707) 578-8552 or rick.rogers@noaa.gov, if you have any questions concerning this section 7 consultation or EFH response, of if you require additional information.

Sincerely,

William W. Stelle, Jr.
Regional Administrator

cc: Justin Yee – Army Corps of Engineers, San Francisco District, San Francisco, California
Karen Carpio – California Department of Fish and Wildlife, Sacramento, California
Copy to AR File #151422WCR2015AR00102
Copy to CHRON File

Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation

Issuance of a Regional General Permit (RGP) to the California Department of Fish and Wildlife (CDFW) for implementation of Anadromous Fish Habitat Restoration Projects under the Fisheries Restoration Grants Program (FRGP) in coastal Northern and Central California

NMFS Consultation Number: WCR-2015-2400
Action Agency: United States Army Corps of Engineers, San Francisco District

Affected Species and NMFS' Determinations:

ESA-Listed Species	Status	Is Action Likely to Adversely Affect Species or Critical Habitat?*	Is Action Likely To Jeopardize the Species?	Is Action Likely To Destroy or Adversely Modify Critical Habitat?
Southern Oregon/Northern California Coast (SONCC) coho salmon *(Oncorhynchus kisutch)*	Threatened	Yes	No	No
Central California Coast (CCC) coho salmon	Endangered	Yes	No	No
California Coastal (CC) Chinook salmon (*O. tshawytscha*)	Threatened	Yes	No	No
Central Valley spring-run Chinook salmon (*O. tshawytscha*)	Threatened	No	NA	NA
Sacramento River winter-run Chinook salmon (*O. tshawytscha*)	Endangered	No	NA	NA
Northern California (NC) steelhead (*O. mykiss*)	Threatened	Yes	No	No
Central California Coast (CCC) steelhead	Threatened	Yes	No	No

South-Central California Coast (S-CCC) steelhead	Threatened	Yes	No	No
Southern green sturgeon (*Acipenser medirostris*)	Threatened	No	NA	NA
Southern eulachon (*Thaleichthys pacificus*)	Threatened	No	NA	NA

*Please refer to section 2.11 for the analysis of species or critical habitat that are not likely to be adversely affected.

Fishery Management Plan That Describes EFH in the Project Area	Does Action Have an Adverse Effect on EFH?	Are EFH Conservation Recommendations Provided?
Pacific Coast Salmon	Yes	Yes

Consultation Conducted By: National Marine Fisheries Service, West Coast Region

Issued By: Alecia for

William W. Stelle, Jr.
Regional Administrator

Date: MAY 26 2016

TABLE OF CONTENTS

1. INTRODUCTION

This Introduction section provides information relevant to the other sections of this document and is incorporated by reference into Sections 2 and 3 below.

1.1 Background

NOAA's National Marine Fisheries Service (NMFS) prepared the biological opinion (opinion) and incidental take statement portions of this document in accordance with section 7(b) of the Endangered Species Act (ESA) of 1973 (16 U.S.C. 1531 *et seq*.), and implementing regulations at 50 CFR 402.

We also completed an essential fish habitat (EFH) consultation on the proposed action, in accordance with section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C. 1801 *et seq*.) and implementing regulations at 50 CFR 600.

We completed pre-dissemination review of this document using standards for utility, integrity, and objectivity in compliance with applicable guidelines issued under the Data Quality Act (section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001, Public Law 106-554). The document will be available through NMFS' Public Consultation Tracking System [https://pcts.nmfs.gov/pcts-web/homepage.pcts]. A complete record of this consultation is on file at the NMFS Northern California Office, Arcata, California.

1.2 Consultation History

On December 7, 2015, NMFS received a letter from the U.S. Army Corps of Engineers (Corps) requesting initiation of consultation on the project. This letter had seven enclosures: Attachments A, B, and C from the application for a Department of Army permit; a map showing the locations of projects funded in 2014; NMFS-suggested changes to the proposed action regarding four project types (dated July 7, 2015); mitigation, measures, monitoring, and reporting programs from the California Environmental Quality Act Mitigated Negative Declaration; and an explanation of responses to an initial study environmental checklist.

On April 4, 2016, NMFS and CDFW had a meeting via phone to describe anticipated changes to the biological opinion compared to the previous biological opinion. Specifically, the limit on the number of sediment-producing projects per Hydrologic Unit Code (HUC)-10 (the "sideboards") would apply to both new and ongoing projects. Fish screens would no longer be included in the biological opinion. NMFS also indicated that the opinion would set limits on the number of fish that could be relocated each year per ESU/DPS, using FRGP relocation data from the last 10 years. Finally, NMFS noted that the biological opinion would include a term and condition to, within one year, create a team of NMFS and CDFW staff to evaluate the results of the implementation monitoring that has been done for the last 10 years.

On April 15, 2015, the Corps provided NMFS with a revised list of effects determinations for all ESA-listed species in order to confirm which species the Corps determined the project is "Not

Likely to Adversely Affect" and which the Corps determined the project is "Likely to Adversely Affect."

1.3 Proposed Action

"Action" means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies (50 CFR 402.02).

The Corps proposes to issue a five-year (2016-2021) Corps RGP 12 to CDFW pursuant to section 404 of the Federal Clean Water Act of 1972, as amended (33 U.S.C. 1344 *et seq*.), for the placement of fill material into the waters of the United States to annually implement anadromous salmonid habitat restoration projects under the FRGP. The proposed RGP applies to portions of the following coastal counties that are within the regulatory jurisdictional boundaries of the Corps' San Francisco District (Figure 1): 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. The types of projects to be authorized are instream habitat improvement, fish passage improvement, bank stabilization, riparian restoration, streamflow augmentation, and upslope restoration.

"Interrelated actions" are those that are part of a larger action and depend on the larger action for their justification. "Interdependent actions" are those that have no independent utility apart from the action under consideration (50 CFR 402.02). NMFS does not anticipate any interrelated or interdependent actions.

Based on information obtained from the Corps' December 4, 2015, letter and enclosures, and subsequent discussions with the Corps and CDFW, the following is a description of the proposed action. The FRGP has an annual grant cycle, initiated in the spring of each year, which provides both Federal and state funds to applicants to restore anadromous salmonid habitat. Each proposal goes through a rigorous review process by the CDFW Technical Review Team (members include personnel from CDFW, NMFS and the California Coastal Conservancy), regional field evaluators, the California Coastal Salmonid Restoration Grants Peer Review Committee and the Director of CDFW. During the review process, reviewers evaluate the biological soundness, technical feasibility, and cost effectiveness of each proposal and make recommendations for funding based on coast-wide and regional goals and priorities, including recommendations identified in the plans described in Table 1.

Table 1. Documents describing regional goals and priorities that are consulted when reviewing FRGP proposals.

Name of document	Date
Steelhead Restoration and Management Plan for California	CDFG 1996
Recovery Strategy for California Coho Salmon	CDFG 2004
Central California Coast Coho Salmon Recovery Plan	NMFS 2012
Southern California Steelhead Recovery Plan	NMFS 2012
South Central California Coast Steelhead Recovery Plan	NMFS 2013
Recovery Plan for the SONCC ESU of Coho Salmon	NMFS 2014
Coastal Multispecies Public Draft Recovery Plan	NMFS 2015

Projects selected for funding are typically announced the following January. Projects that receive funding from the FRGP 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 projects must be implemented within two to five years of receiving the grant. CDFW manages the grant for each project that receives funding and coordinates with each applicant for permitting and implementation. The majority of the FRGP funding goes to restoration projects that improve instream cover, pool habitat, and spawning habitat; remove barriers to fish passage; and reduce or eliminate erosion and sedimentation impacts.

On an annual basis, prior to the summer low-flow construction season, CDFW will provide the Corps and NMFS with a list of the scheduled restoration projects that fall within the scope and coverage of the RGP.

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 (Flosi *et al*. 2010). Part IX of the Restoration Manual (Flosi *et al.* 2010) 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 CDFW and/or NMFS Guidelines and Criteria as identified and referenced in the Restoration Manual.

CDFW oversight will include implementation monitoring of 100 percent of projects and effectiveness/validation monitoring of 10 percent of projects.

Dam removal projects, fish ladder projects[1], fish hatchery/fish stocking projects, watershed stewardship training, salmon in the classroom, fish screen installation or monitoring projects, projects involving obstruction blasting (with explosives) or pile driving, fish screen maintenance and repair projects, and projects that would dewater or disturb more than 500 contiguous feet of stream reach were not analyzed in this opinion. These projects will require separate section 7 consultations to determine impacts to listed salmonids.

Although in some cases the restoration manual (Flosi *et al.* 2010) 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.

1.3.1 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 during the summer low-flow period[2] between June 15 and November 1 or the first significant rainfall, whichever comes first. The Restoration Manual (Flosi *et al.* 2010) 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 in Flosi *et al.* (2010). Implementation of the restoration project types described below may require use of heavy equipment (*e.g.,* self-propelled logging yarders, mechanical excavators, backhoes, *etc.*); however, hand labor will be used when possible.

1.3.1.1 Instream Habitat Improvements

Instream habitat structures and improvements are intended to provide cover for salmonids to rest and hide from predators, increase spawning habitat, improve upstream and downstream migration corridors, improve pool to riffle ratios, or add habitat complexity and diversity. Specific techniques for instream habitat improvements are described in Flosi *et al.* (2010). These techniques 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.

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

[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.

Additional techniques for instream habitat improvements are described in a document provided as an enclosure to the letter from the Corps to NMFS. This document is titled "Suggested changes to proposed action regarding four project types," is dated July 7, 2015, and describes engineered logjams/complex wood jams and establishment of off-channel or side-channel habitat.

Engineered logjams and complex wood jams are one method of recreating pool-forming features in riverine channels. They differ from the large wood placement projects described in Flosi *et al.* (2010) in terms of scale, as they are generally larger (20-30 logs) than structure types identified in the manual and often provide significantly more habitat for the target species than single log features. These structures are built to function like natural logjams by stabilizing banks, catching debris moving downstream, and increasing habitat complexity for juvenile salmonids to utilize. These structures represent channel obstructions that must withstand the full-force of streamflow hydraulics (*e.g.*, the 100-year flood event), and therefore require robust structural design based upon engineering analyses. In reference to those analyses, these large wood structures are colloquially known as engineered log jams.

Habitat may be constructed in off-channel or side channel areas to provide complex slow water habitats essential for juvenile salmonid survival and rearing success. These types of projects include the following:

- Re-connection of existing and naturally formed but abandoned side channel or alcove habitats to restore fish access lost as the result of anthropogenic activities. Re-connection of side channels refers to restoration of hydraulic and hydrologic connection to the main channel by restoring the relative elevation of the channel to the mainstem or removing flow blockages such as levees and sediment plugs.

- Improvement of hydrologic connection between floodplains and main channels.

- Creation of new, self-maintaining side channel or off-channel habitat that mimics or replicates naturally formed and maintained fluvial features, which does not replace or displace other functioning floodplain or riverine environments.

- Re-connection of still water floodplain features that have been isolated from the meandering channel by anthropogenic activities. Oxbow lakes, features of meandering channels that naturally evolve from aquatic to increasingly terrestrial habitat, often represent distinct, biologically rich ecosystems worthy of conservation regardless of their utility to anadromous fishes. Projects that propose altering such habitat will be required to demonstrate the ecological imperative for doing so.

1.3.1.2 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. All such projects authorized through the RGP will require field review, design review, and design approval from a CDFW or NMFS fish

passage specialist prior to project implementation. Techniques for improving fish passage are described in Flosi *et al.* (2010). These activities include modifying logjams (typically less than 10 cubic yards), beaver dams, natural waterfalls and chutes, and landslides, to improve salmonid fish passage. CDFW 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]

CDFW (2015a), which in part describes the Corps' proposed action, describes the removal of small permanent dams. Types of small dams included in the proposed action are permanent, flashboard, and seasonal dams that are not considered high risk. Small dam removals that are considered high risk are those that: (1) mobilize contaminated sediment; (2) potentially impact infrastructure during or following removal; (3) negatively affect valuable limited habitat (*i.e.*, sediment predicted to extend beyond 1,500 feet); (4) expose problematic bedrock or sediment layers (*e.g.* slaking clays); (5) require more than five vertical feet total of grade control to avoid the conditions described in Items 2 through 4; or (6) affect storage of flood flows. These high-risk removals may be considered for funding under FRGP, but will be permitted separately. Dam removals covered by this biological opinion must not contain any of the risks listed above.

1.3.1.3 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 delivery from bank erosion 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 Flosi *et al.* (2010).

1.3.1.4 Fish Passage Improvement at Stream Road Crossings

Some projects intended to enhance fish passage 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 (Flosi *et al.* 2010), 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

[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 in line 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).

new or retrofitted crossings that will be at least as wide as the active channel, designed to pass the 100-year storm flow, and have culvert or piling bottoms buried below the streambed. Projects may also contain downstream grade control or small fish ladders, if NMFS and CDFW engineers believe those features improve the stability and function of the crossing. Part XII of the Restoration Manual (Flosi *et al.* 2010) 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 CDFW Culvert Criteria for Fish Passage (Appendix IX-A of Flosi *et al.* 2010) and NMFS Southwest Region Guidelines for Salmonid Passage at Stream Crossings (Appendix IX-B of Flosi *et al.* 2010). In addition, all projects authorized through the RGP will require field review, design review, and design approval from a CDFW or NMFS fish passage specialist prior to project implementation.

1.3.1.5 Riparian Habitat Restoration

The goal of riparian restoration is to improve salmonid habitat through improved riparian habitat that will lower stream temperatures through shading and increase future large woody debris (LWD) recruitment, bank stability, and invertebrate production. Riparian habitat restoration projects will also restore riparian habitat by increasing plant numbers and plant groupings. Flosi *et al.* (2010) describes riparian restoration methods and design, including guidance on natural regeneration, livestock exclusionary fencing, bioengineering, and revegetation projects.

1.3.1.6 Upslope Watershed Restoration

Upslope watershed restoration projects reduce excessive sediment delivery to anadromous salmonid streams. Flosi *et al.* 2010 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 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; 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).

1.3.1.7 Streamflow Augmentation

CDFW funds projects to enhance and restore stream flows for anadromous salmonids. The three project types are listed below.

Water Conservation Measures

Eligible water conservation projects are those that provide more efficient use of water extracted from stream systems, enabling reduced water diversions. 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.

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 (USBOR 1997). The instream gauges must be installed so they do not impede fish passage in anadromous streams.

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 once purchased or leased.

1.3.2 Sideboards and Minimization Measures

1.3.2.1 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 sediment-producing 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, and upslope roadwork.

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

Distance between instream projects
Each year, all sediment-producing instream projects will be separated both upstream and downstream from other proposed RGP permitted instream projects by at least 1,500 lineal feet in fish bearing stream reaches. In non-fish bearing reaches, the distance separating sediment-producing projects will be 500 feet.

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

CDFW will limit the number of instream projects implemented annually within any HUC-10 watershed in accordance with Table 2.[4]

Table 2. Maximum annual number of proposed instream and upslope projects per HUC-10 watershed.

Size of HUC-10 watershed (mi^2)	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

[4] 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 they are not considered when computing maximum project density per watershed. 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, road crossings in these upslope areas typically 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.

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.

1.3.2.2 Minimization Measures

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, water conservation, and off-channel habitat improvement.

CDFW personnel (or designated agents) will capture and relocate fish and amphibians away from the work area of the restoration project 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 Flosi *et al.* (2010).

CDFW 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.

- Periodically pump the work area 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. 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 are excerpted from Flosi *et al.* (2010) and presented below:

- If feasible, plan to perform 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.

- 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 CDFW collectors permit, and experience with fish capture and handling. Check with a CDFW biologist for assistance.

- Electrofishing should only be conducted by properly trained personnel following CDFW and NMFS guidelines.

- 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. Completely secure the bottom edge of net or screen to the channel bed to prevent fish from reentering the work area. Place exclusion screening 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). Choose release sites with the following characteristics if possible:

    - Similar water temperature as capture location
    - Adequate dissolved oxygen
    - Ample habitat for captured fish
    - 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 water out of the pool and then seining or dip netting fish.
- 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 aeration device. 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 CDFW and NMFS in a timely fashion.
- If mortality during relocation exceeds 3 percent, stop efforts and immediately contact the appropriate agencies.

Instream Construction

Measures to minimize disturbance associated with instream habitat restoration are excerpted from Flosi *et al.* (2010) and are presented below.

- 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 falls 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 from flood-prone areas prior to close of the seasonal 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.

Water Quality

Measures to minimize water quality degradation associated with construction activities are presented below, and are excerpted from Flosi *et al.* (2010).

- 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 percent 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 CDFW 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).

Riparian Vegetation

Measures to minimize the loss or disturbance of riparian vegetation associated with habitat restoration (other than riparian habitat restoration) are presented below, which are excerpted from Flosi *et al.* (2010).

- 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 that operate with vegetable-based bar oil.
- Decompact the disturbed soils at project completion after 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 native woody and herbaceous species.

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 CDFW and compliance with all lawful conditions required by CDFW. 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). CDFW will review the appropriation of water to ensure fish and wildlife resources are protected. The following conditions shall then be applied:

- Seasonal Restriction: No pumping is allowed when stream flow drops below 0.7 cubic feet per second (cfs) except as permitted by CDFW in the event of an emergency.
- Bypass Flows: Pumping withdrawal rates shall not exceed 5 percent of stream flow. If CDFW determines that the streamflow monitoring data indicate that fisheries are not adequately protected, then the bypass flows are subject to revision by CDFW and NMFS.
- 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.
- CDFW 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 CDFW access.

"Interrelated actions" are those that are part of a larger action and depend on the larger action for their justification. "Interdependent actions" are those that have no independent utility apart from the action under consideration (50 CFR 402.02). There are not any interdependent or interrelated activities associated with the proposed action.

1.4 Action Area

"Action area" means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02).

The action area 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 (Figure 1). 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. 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 (1,500 feet) downstream. The specific location for each individual habitat restoration project cannot be described, as it has not yet been identified. The location will vary depending on project type, specific project methods, site conditions, and habitat restoration opportunities.

The action area includes all coastal anadromous California streams from Del Norte County at the Oregon/California border south to San Luis Obispo County, including their estuarine extent, 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 on the coast 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. The Klamath basin extends into the Cascade Mountains. The Eel River basin also extends inland, with some areas at high elevation. In the coastal basins, most precipitation falls during the winter and early spring as rain. 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. In the interior areas of the Klamath and Eel River basins, winters are cold and precipitation often falls as snow, leading to a snowmelt-driven hydrograph.

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.

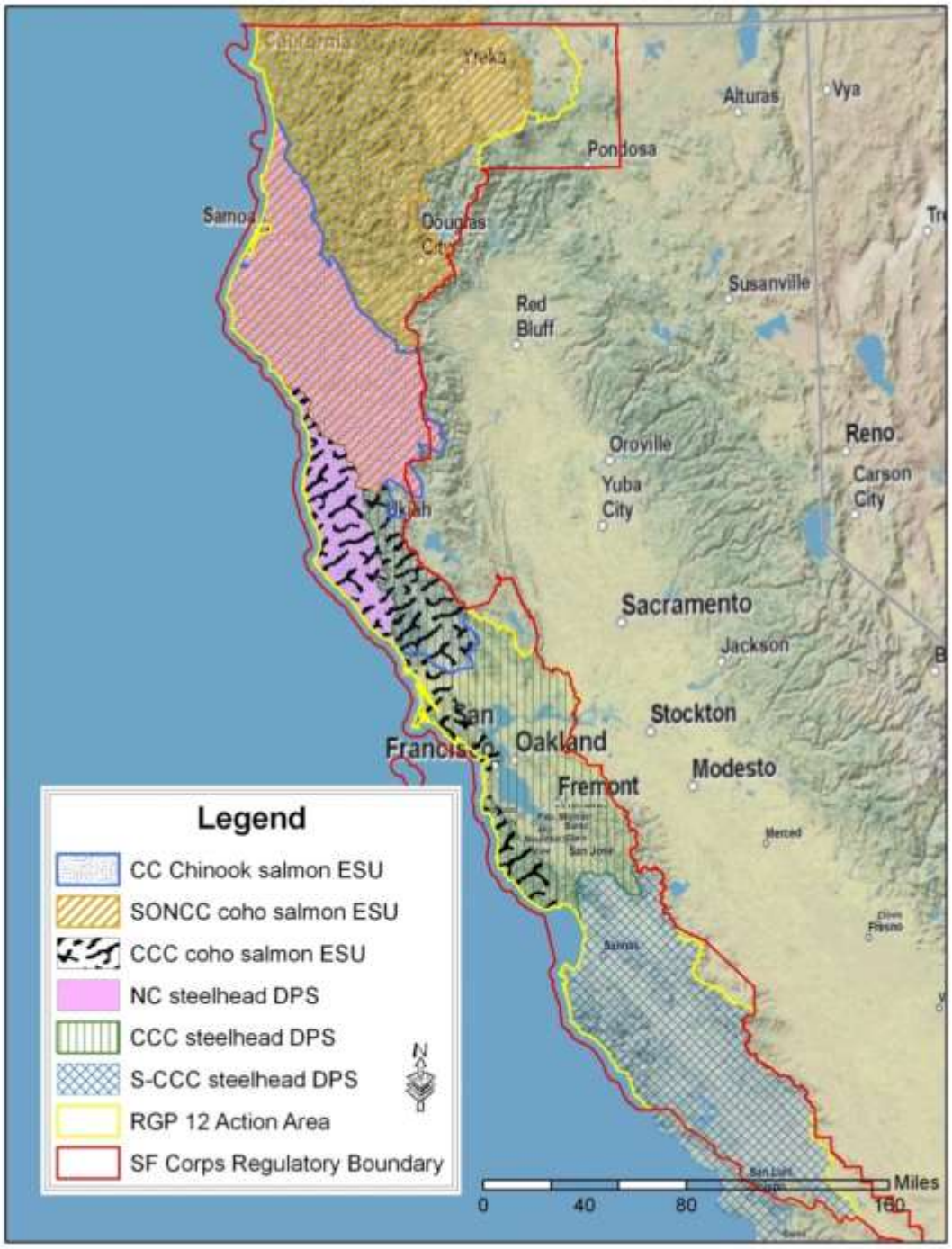


Figure 1. Action area and listed salmonid species range.

Figure 2. The geographic areas within the RGP action area.

2. ENDANGERED SPECIES ACT:

BIOLOGICAL OPINION AND INCIDENTAL TAKE STATEMENT

The ESA establishes a national program for conserving threatened and endangered species of fish, wildlife, plants, and the habitat upon which they depend. As required by section 7(a)(2) of the ESA, Federal agencies must ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species, or adversely modify or destroy their designated critical habitat. Per the requirements of the ESA, Federal action agencies consult with NMFS and section 7(b)(3) requires that, at the conclusion of consultation, NMFS provides an opinion stating how the agency's actions would affect listed species and their critical habitat. If incidental take is expected, section 7(b)(4) requires NMFS to provide an incidental take statement (ITS) that specifies the impact of any incidental taking and includes non-discretionary reasonable and prudent measures and terms and conditions to minimize such impacts.

The proposed action is not likely to adversely affect the Sacramento River Winter-run Chinook Salmon ESU, the Central Valley Steelhead DPS, the Central Valley Spring-Run Chinook Salmon ESU, Southern DPS Pacific eulachon, or Southern DPS green sturgeon or their critical habitat. The analysis is found in the "Not Likely to Adversely Affect" Determinations section (2.11).

2.1 Analytical Approach

This biological opinion includes both a jeopardy analysis and an adverse modification analysis. The jeopardy analysis relies upon the regulatory definition of "to jeopardize the continued existence of a listed species," which is "to engage in an action that would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 CFR 402.02). Therefore, the jeopardy analysis considers both survival and recovery of the species.

The adverse modification analysis considers the impacts of the Federal action on the conservation value of designated critical habitat. This biological opinion relies on the definition of "destruction or adverse modification," which "means a direct or indirect alteration that appreciably diminishes the value of critical habitat for the conservation of a listed species. Such alterations may include, but are not limited to, those that alter the physical or biological features essential to the conservation of a species or that preclude or significantly delay development of such features (81 FR 7214).

We use the following approach to determine whether a proposed action is likely to jeopardize listed species or destroy or adversely modify critical habitat:

- Identify the rangewide status of the species and critical habitat likely to be adversely affected by the proposed action.

- Describe the environmental baseline in the action area.

- Analyze the effects of the proposed action on both species and their habitat using an "exposure-response-risk" approach.
- Describe any cumulative effects in the action area.
- Integrate and synthesize the above factors to assess the risk that the proposed action poses to species and critical habitat.
- Reach jeopardy and adverse modification conclusions.
- If necessary, define a reasonable and prudent alternative to the proposed action.

2.2 Rangewide Status of the Species and Critical Habitat

This opinion examines the status of each species that would be adversely affected by the proposed action. The status is determined by the level of risk that the listed species faces, based on parameters considered in documents such as recovery plans, status reviews, and listing decisions. The species status section helps to inform the description of the species' current "reproduction, numbers, or distribution" as described in 50 CFR 402.02. The opinion also examines the condition of critical habitat throughout the designated area, evaluates the conservation value of the various watersheds and coastal and marine environments that make up the designated area, and discusses the current function of the essential physical and biological features that help to form that conservation value.

2.2.1 Life History and Range

2.2.1.1 Coho Salmon

Coho salmon adults migrate to 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 November through December, with fry emerging from the gravel in the spring, approximately three to four 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 one to two years rearing in freshwater (Bell and Duffy 2007), or emigrate to an estuary shortly after emerging from spawning gravels (Tschaplinski 1988). With the onset of fall rains, coho salmon juveniles are also known to redistribute into non-natal rearing streams, lakes, or ponds, where they overwinter (Peterson 1982). At a length of 38–45 mm, fry may migrate upstream a considerable distance to reach lakes or other rearing areas (Sandercock 1991, Nickelson *et al.* 1992). Emigration from streams to the estuary and ocean generally takes place from March through June.

The SONCC coho salmon 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 Rivers Hatchery in the Rogue River Basin, and the Trinity and Iron Gate Hatcheries in the Klamath-Trinity River Basin.

The CCC coho salmon ESU includes all naturally spawned populations of coho salmon from Punta Gorda in northern California south to and including the San Lorenzo River in central California, as well as populations in tributaries of San Francisco Bay, excluding the Sacramento-San Joaquin River system. In addition, this ESU contains four artificial propagation programs: The Don Clausen Fish Hatchery Captive Broodstock Program, Scott Creek/King Fisher Flats Conservation Program, the Scott Creek Captive Broodstock Program, and the Noyo River Fish Station Egg-Take Program, which was discontinued over a decade ago.

2.2.1.2 Chinook Salmon

Chinook salmon follow the typical life cycle of Pacific salmon in that they hatch in freshwater, migrate to the ocean, and return to freshwater to spawn. Diversity within this life cycle exists, however, in the time spent at each stage. Juvenile Chinook salmon are classified into two groups, ocean-type and stream-type, based on the period of freshwater residence (Healey 1991). Ocean-type Chinook salmon spend a short period of time in freshwater after emergence, typically migrating to the ocean within their first year of life. Stream-type Chinook salmon reside in freshwater for a longer period, typically a year or more, before migrating to the ocean. After emigration, Chinook salmon remain in the ocean for two to five years (Healey 1991) tending to stay in the coastal waters of California and Oregon. Chinook salmon are also characterized by the timing of adult returns to freshwater for spawning, with the most common types referred to as fall-run and spring-run fish. Typically, spring-run fish have a protracted adult freshwater residency, sometimes spawning several months after entering freshwater, and produce stream-type progeny. Fall-run fish spawn shortly after entering freshwater and generally produce ocean-type progeny. Historically, both spring-run and fall-run fish existed in the CC Chinook salmon ESU. At present only fall-run fish appear to be extant in the ESU.

Fall-run Chinook salmon are decidedly 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).

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

but these programs were discontinued over a decade ago.

2.2.1.3 Steelhead

Steelhead probably have the most diverse life history of any of any salmonid (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 expression of the life history diversity of steelhead is the "half pounder" - 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. This steelhead life history form has only been observed in the Rogue and Klamath Rivers (of the Klamath Mountain Province steelhead DPS) and the Mad and Eel Rivers (of the NC steelhead DPS, Busby *et al.* 1996). 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.

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), but these programs were discontinued over a decade ago.

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 (Russian River), 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.

2.2.2 Status of the Species

2.2.2.1 Coho salmon

2.2.2.1.1 SONCC Coho Salmon

The following summary is from Williams *et al.* 2016, the most recent biological viability report for SONCC coho salmon.

> Although long-term data on coho abundance in the SONCC Coho Salmon ESU are scarce, all available evidence from more recent trends since the 2011 assessment (Williams *et al.* 2011) indicate little change since the 2011 assessment. The two population-unit scale time series for the ESU both have a trend slope not different from zero. The composite estimate for the Rogue Basin populations was not significantly different from zero ($p > 0.05$) over the past 12 years and significantly positive over the 35 years of the data set ($p = 0.01$). The continued lack of appropriate data remains a concern, although the implementation of the Coastal Monitoring Program (CMP) for California populations is an extremely positive step in the correct direction in terms of providing the types of information to assess and evaluate population and ESU viability. The lack of population spatial scale monitoring sites in Oregon is of great concern and increases the uncertainty when assessing viability. Additionally, it is evident that many independent populations are well below low-risk abundance targets, and several are likely below the high-risk depensation thresholds specified by the TRT and the Recovery Plan (NMFS 2014). Though population-level estimates of abundance for most independent populations are lacking, it does not appear that any of the seven diversity strata currently supports a single viable population as defined by the TRT's viability criteria, although all occupied.
>
> The SONCC Coho Salmon ESU is currently considered likely to become endangered. Of particular concern is the low number of adults counted entering the Shasta River in 2014-15. The lack of increasing abundance trends across the ESU for the populations with adequate data are of concern. Moreover, the loss of population spatial scale estimates from coastal Oregon populations is of great concern. The new information available since [the last status review], while cause for concern, does not appear to suggest a change in extinction risk at this time.

2.2.2.1.2 CCC Coho Salmon

The following summary is from Williams *et al.* 2016, the most recent biological viability report for CCC coho salmon.

Information on population status and trends for CCC coho salmon has improved considerably since the 2011 status review due to recent implementation of the CMP across significant portions of the ESU. Within the Lost Coast – Navarro Point stratum, current population sizes range from 4 percent to 12 percent of proposed recovery targets, with two populations (Albion River and Big River, respectively) at or below their high-risk depensation thresholds. Most independent populations show positive but non-significant population trends; however, the trend in the Noyo River has been positive for the past 5-6 years. Dependent populations within the stratum have declined significantly since 2011, with average adult returns ranging from 417 in Pudding Creek (42 percent of the recovery target) to no adult returns observed within Usal and Cottaneva creeks. Similar results were obtained immediately south within the Navarro Point – Gualala Point stratum, where two of the three largest independent populations, the Navarro and Garcia rivers, have averaged 257 and 46 adult returns, respectively, during the past six years (both populations are at or below their high-risk depensation threshold). Data from the three dependent populations within the stratum (Brush, Greenwood and Elk creeks) suggest little to no adult coho salmon escapement since 2011. In the Russian River and Lagunitas Creek watersheds, which are the two largest within the Central Coast strata, recent coho salmon population trends suggest limited improvement, although both populations remain well below recovery targets. Likewise, most dependent populations within the strata remain at very low levels, although excess broodstock adults from the Russian River and Olema Creek were recently stocked into Salmon Creek and the subsequent capture of juvenile fish indicates successful reproduction occurred. Finally, recent sampling within Pescadero Creek and San Lorenzo River, the only two independent populations within the Santa Cruz Mountains strata, suggest coho salmon have likely been extirpated within both basins. A bright spot appears to be the recent improvement in abundance and spatial distribution noted within the strata's dependent populations; Scott Creek experienced the largest coho salmon run in a decade during 2014/15, and researchers recently detected juvenile coho salmon within four dependent watersheds where they were previously thought to be extirpated (San Vincente, Waddell, Soquel and Laguna creeks).

Summarizing the information to inform the larger ESU, most independent CCC coho salmon populations remain at critically low levels, with those in the southern Santa Cruz Mountains strata likely extirpated. Data suggests some populations show a slight positive trend in annual escapement, but the improvement is not statistically significant. Overall, all CCC coho salmon populations remain, at best, a slight fraction of their recovery target levels, and, aside from the Santa Cruz Mountains strata, the continued extirpation of dependent populations continues to threaten the ESU's future survival and recovery.

2.2.2.2 CC Chinook Salmon

The following summary is from Williams *et al.* 2016, the most recent biological viability report for CC Chinook salmon.

> The lack of long-term population-level estimates of abundance for Chinook salmon populations continues to hinder assessment of status, though the situation has improved with implementation of the CMP in the Mendocino Coast Region and portions of Humboldt County. The available data, a mixture of short-term (6-year or less) population estimates or expanded redd estimates and longer-term partial population estimates and spawner/redd indexes, provide no indication that any of the independent populations (likely to persist in isolation) are approaching viability targets. In addition, there remains high uncertainty regarding key populations, including the Upper and Lower Eel River populations and the Mad River population, due to incomplete monitoring across the spawning habitat of Chinook salmon in these basins (O'Farrell *et al*. 2012). Because of the short duration of most time series for independent populations, little can be concluded from trend information. The longest time series, video counts in the Russian River, indicates the population has remained steady during the 14-year period of record. The longer time series associated with index reaches or partial populations suggest mixed patterns, with some showing significant negative trends (Prairie Creek, Freshwater Creek, Tomki Creek), one showing a significant positive trend (Van Arsdale Station), and the remainder no significant trends.
>
> At the ESU level, the loss of the spring-run life history type represents a significant loss of diversity within the ESU, as has been noted in previous status reviews (Good *et al*. 2005, Williams *et al*. 2011). Concern remains about the extremely low numbers of Chinook salmon in most populations of the North-Central Coast and Central Coast strata, which diminishes connectivity across the ESU. However, the fact that Chinook salmon have regularly been reported in the Ten Mile, Noyo, Big, Navarro, and Garcia rivers represents a significant improvement in our understanding of the status of these populations in watersheds where they were thought to have been extirpated. These observations suggest that spatial gaps between extant populations are not as extensive as previously believed.

In summary, Williams *et al.* (2016) concludes "there is a lack of compelling evidence to suggest that the status of these populations has improved or deteriorated appreciably since the previous status review" and that "the new available information does not appear to suggest there has been a change in the extinction risk of this ESU."

2.2.2.3 Steelhead

2.2.2.3.1 NC Steelhead

The following summary is from Williams *et al.* 2016, the most recent biological viability report

for NC steelhead.

> The availability of information on steelhead populations in the NC steelhead DPS has improved considerably in the past 5 years, due to implementation of the CMP across a significant portion of the DPS. Nevertheless, significant information gaps remain, particularly in the Lower Interior and North Mountain Interior diversity strata, where there is very little information from which to assess status (Figure 2). Overall, the available data for winter-run populations—predominately in the North Coastal, North-Central Coastal, and Central Coastal strata— indicate that all populations are well below viability targets, most being between 5% and 13% of these goals…for the two Mendocino Coast populations with the longest time series, Pudding Creek and Noyo River, the 13-year trends have been negative and neutral, respectively (Williams *et al.* 2016). However, the short-term (6-year) trend has been generally positive for all independent populations in the North-Central Coastal and Central Coastal strata, including the Noyo River and Pudding Creek (Williams *et al.* 2016). Data from Van Arsdale Station likewise suggests that, although the long-term trend has been negative, run sizes of natural-origin steelhead have stabilized or are increasing (Williams *et al.* 2016). Thus, we have no strong evidence to indicate conditions for winter-run have worsened appreciably since the last status review.
>
> Summer-run populations continue to be of significant concern because of how few populations currently exist. The Middle Fork Eel River population has remained remarkably stable for nearly five decades and is closer to its viability target than any other population in the DPS (Williams *et al.* 2016). Although the time series is short, the Van Duzen River appears to be supporting a population numbering in the low hundreds. However, the Redwood Creek and Mattole River populations appear small, and little is known about other populations including the Mad River and other tributaries of the Eel River (*i.e.*, Larabee Creek, North Fork Eel, and South Fork Eel).
>
> In summary, the available information for winter-run and summer-run populations of NC steelhead do not suggest an appreciable increase or decrease in extinction risk since publication of the last status reviews…most populations for which there are population estimates available remain well below viability targets; however, the short-term increases observed for many populations, despite the occurrence of a prolonged drought in northern California, suggests this DPS is not at immediate risk of extinction.

2.2.2.3.2 CCC Steelhead

The following summary is from Williams *et al.* 2016, the most recent biological viability report for CCC steelhead.

> Steelhead populations in the CCC steelhead are the most poorly monitored salmonid populations in the North-Central California Coast Recovery Domain. Population-level estimates of adult abundance are entirely lacking for 28 populations that constitute the North Coastal, Interior, Coastal San Francisco Bay, and Interior San Francisco Bay diversity strata. Only in the Santa Cruz Mountain stratum has implementation of the CMP been initiated, and here only recently. Thus, with the exception of the life cycle monitoring station in Scott Creek, estimates of abundance span only 1-3 years for populations in this DPS. More limited monitoring efforts have produced data for a few partial populations, but the lack of data continues to make it extraordinarily difficult to assess the status and trends of populations in the DPS. The scarcity of information on steelhead abundance in the CCC steelhead DPS continues to make it difficult to assess whether conditions have changed appreciably since the previous status review of Williams *et al*. (2011), which concluded that the population was likely to become endangered in the foreseeable future. In the North Coastal and Interior strata, steelhead still appear to occur in the majority of watersheds, though in the Russian River basin, the ratio of hatchery fish to natural origin fish returning to spawn remain largely unknown and continues to be a source of concern. New information from 3 years of CMP implementation in the Santa Cruz Mountain stratum indicates that population sizes are perhaps higher than previously thought. However, the downward trend in the Scott Creek population, which has the most robust estimates of abundance, is a source of concern. The status of populations in the two San Francisco Bay diversity strata remains highly uncertain, and it is likely that many populations where historical habitat is now inaccessible due to dams and other passage barriers are at high risk of extinction.
>
> In summary, while data availability for this DPS remains poor, we find little new evidence to suggest that the extinction risk for this DPS has changed appreciably in either direction since publication of the last status review.

2.2.2.3.3 S-CCC Steelhead DPS

The following summary is from Williams *et al.* 2016, the most recent biological viability report for S-CCC steelhead.

> There has been a steady 15-year decline in abundance of anadromous adults in the Carmel River, the one population in the southern domain with a reasonably long history of monitoring. This decline is somewhat surprising since it coincides with a concerted effort to restore habitat in the river system and to improve numbers through a rescue/captive-rearing operation. The decline indicates an increase in extinction risk in the S-CCC steelhead DPS, though it is likely that abundance in other populations show different patterns, and possible that such patterns would show that risk is holding steady or even improving (*i.e.*, lower extinction risk). Currently, viability cannot be adequately assessed due to lack of implementation of

the CMP.

2.2.3 Factors for Decline (ESU or DPS Scale)

2.2.3.1 Timber Harvest

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 does not usually wash 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, LWD originating from mature coniferous forests 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 LWD 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 that reduce the ability of juvenile fish to feed. These changes in habitat have led to widespread decreases in the carrying capacity of streams that support salmonids.

2.2.3.2 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 chronic, or episodic. 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 rain splash), 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 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 percent 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.

2.2.3.3 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).

2.2.3.4 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 elevated water temperatures. Reductions in water quantity can reduce the carrying capacity of the affected stream reach by reducing the amount of available habitat, including by causing discontinuous flow and

subsequent disconnected pools. Where warm return flows enter the stream, fish may seek reaches with cooler water, thus increasing competitive pressures in these areas.

Habitat blockages have occurred in relation to road construction as discussed previously. In addition, 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 blocked by dams is likely greatest for steelhead because steelhead were more extensively distributed upstream than Chinook or coho salmon. Because 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).

2.2.3.5 Predation

Predation likely did not play a major role in the decline of salmon populations; however, it may have substantial impacts at local levels. For example, Higgins *et al.* (1992) and CDFG (1994) reported that Sacramento River pikeminnow (*Ptychocheilus grandis*) accidentally introduced to the Eel River basin are a major competitor and predator of the native salmonids found there.

2.2.3.6 Disease

Disease has not been identified as a major factor in the decline of ESA-listed salmonids. 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. 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, when this natural habitat is altered or degraded, outbreaks can occur. For example, ceratomyxosis, which is caused by *Ceratomyxa shasta*, has been identified as one of the most significant diseases for juvenile salmon in the Klamath Basin due to its prevalence and impacts there (Nichols *et al.* 2007) that are related to reduced flows and increased water temperatures.

2.2.3.7 Commercial and Recreational Fisheries

Salmon and steelhead once supported extensive tribal, commercial, and recreational fisheries. NMFS has identified over-utilization as a significant factor in their decline. This harvest strongly affected salmonid populations because, each year, it removed adult fish from the ESU before they spawned, reducing the numbers of offspring in the next generation. In modern times, steelhead are rarely caught in ocean salmon fisheries. Directed ocean Chinook salmon fisheries are currently managed by NMFS to achieve Federal conservation goals for west coast salmon in the Pacific Coast Salmon Fishery Management Plan (FMP). The goals specify the numbers of adults that must be allowed to spawn annually, or maximum allowable adult harvest rates. In

addition to the FMP goals, salmon fisheries must meet requirements developed through NMFS' intra-agency section 7 consultations, including limiting the incidental mortality rate of ESA-listed salmonids.

2.2.3.8 Climate Change

Global climate change presents a potential threat to salmonids and their critical habitats. Impacts from global climate change are already occurring in California. For example, average annual air temperatures, heat extremes, and sea level have all increased in California over the last century (Kadir *et al.* 2013). Snowmelt from the Sierra Nevada Mountains has declined (Kadir *et al.* 2013). However, total annual precipitation amounts have shown no discernable change (Kadir *et al.* 2013). Listed salmonids may have already experienced some detrimental impacts from climate change. NMFS believes the impacts on listed salmonids to date are likely fairly minor because natural, and local, climate factors likely still drive most of the climatic conditions steelhead experience, and many of these factors have much less influence on steelhead abundance and distribution than human disturbance across the landscape.

The threat to listed salmonids from global climate change will increase in the future. Modeling of climate change impacts in California suggests that average summer air temperatures are expected to continue to increase (Lindley *et al.* 2007, Moser *et al.* 2012). Heat waves are expected to occur more often, and heat wave temperatures are likely to be higher (Hayhoe *et al.* 2004, Moser *et al.* 2012. Kadir *et al.* 2013). Total precipitation in California may decline; critically dry years may increase (Lindley *et al.* 2007, Schneider 2007, and Moser *et al.* 2012). Wildfires are expected to increase in frequency and magnitude (Westerling *et al.* 2011, Moser *et al.* 2012).

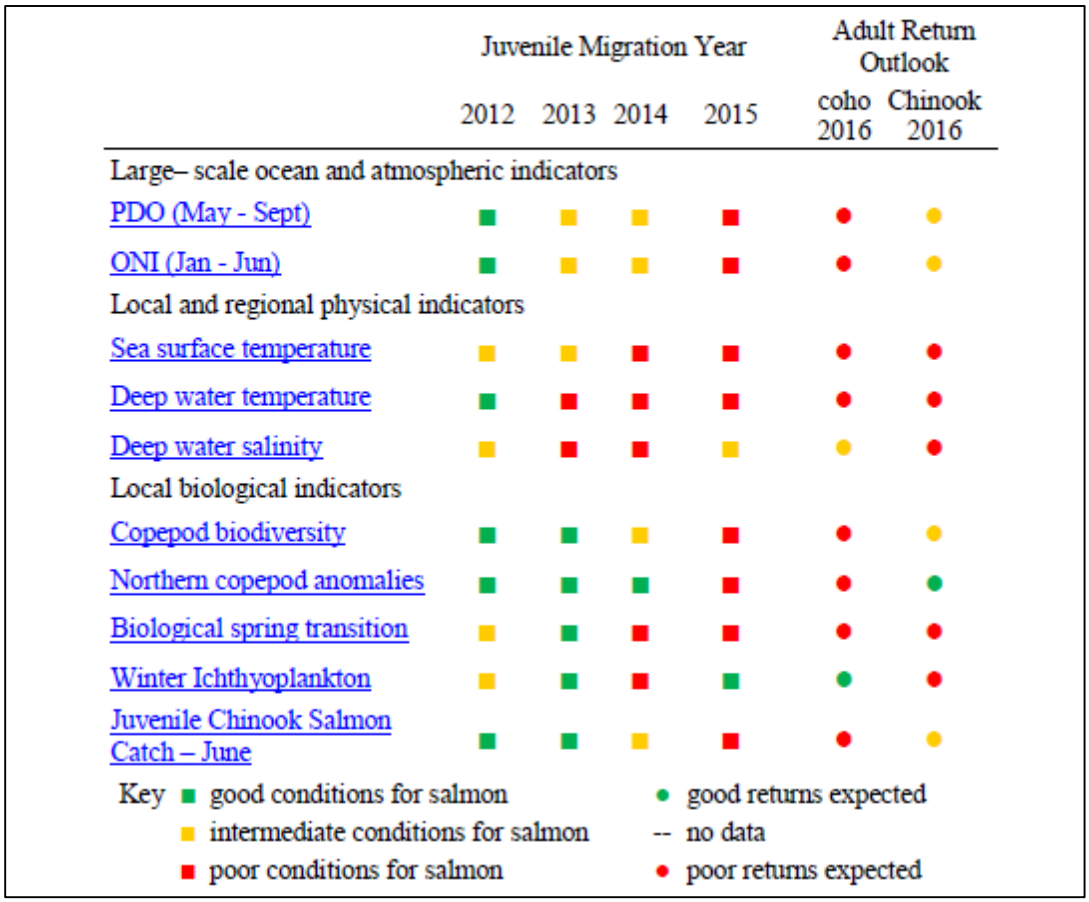
For Northern California, most models project heavier and warmer precipitation. Extreme wet and dry periods are projected, increasing the risk of both flooding and droughts (DWR 2013). Estimates show that snowmelt contribution to runoff in the Sacramento/San Joaquin Delta may decrease by about 20 percent per decade over the next century (Cloern *et al.* 2011). Many of these changes are likely to further degrade listed salmonid habitat by, for example, reducing stream flow during the summer and raising summer water temperatures. Estuaries may also experience changes detrimental to salmonids. Estuarine productivity is likely to change based on changes in freshwater flows, nutrient cycling, and sediment amounts (Scavia *et al.* 2002, Ruggiero *et al.* 2010). In marine environments, ecosystems and habitats important to juvenile and adult salmonids are likely to experience changes in temperatures, circulation, water chemistry, and food supplies (Brewer and Barry 2008, Feely 2004, Osgood 2008, Turley 2008, Abdul-Aziz *et al*. 2011, and Doney *et al*. 2012). The projections described above are for the mid to late 21st Century. In shorter time frames, climate conditions not caused by the human addition of carbon dioxide to the atmosphere are more likely to predominate (Cox and Stephenson 2007, Santer *et al.* 2011).

2.2.3.9 Ocean Conditions

Variability in ocean productivity affects 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).

Predictions for adult returns of coho salmon and Chinook salmon in 2016 are poor and intermediate, respectively, (Table 3) given the primarily poor conditions (as reflected in ocean ecosystem indicator ratings) for juvenile coho salmon survival in the ocean in 2015, and the intermediate conditions for juvenile Chinook salmon in the ocean in 2016 (Peterson *et al.* 2015, Table 3). The poor conditions reflect warmer than average sea surface and deep-sea temperatures associated with a relative lack of lipid-rich species of zooplankton, and krill biomass that was the lowest in the last 20 years (Peterson *et al.* 2015). These warm ocean conditions are attributed to a strengthening El Niño in addition to anomalously warm conditions (the "warm blob") that began in 2013 (Peterson *et al.* 2015).

Table 3. Ocean ecosystem indicators of the Northern California Current. Colored squares indicate positive (green), neutral (yellow), and negative (red) conditions for salmonids entering the ocean each year. In the two columns to the far right, colored dots indicate the forecast of adult returns based on ocean conditions in 2015 (coho salmon) and 2014 (Chinook salmon).



The smolt to adult return rate for coho salmon at Freshwater Creek, a tributary of Humboldt Bay in Northern California, was less than 3 percent from 2011 to 2013 (Anderson *et al.* 2015). Bradford *et al.* (2000) found that the average coastal coho salmon population would be unable to sustain itself when marine survival rates fall below about 3 percent. Ocean conditions are not necessarily the only influence of marine survival; however, if marine survival is below 3 percent, the SONCC coho salmon ESU will have difficulty sustaining itself. Therefore, poor ocean conditions and low marine survival poses a significant threat to the SONCC coho salmon ESU. This is likely the case for other ESUs and DPSs that use the California Current.

2.2.3.10 Drought

The following language is taken from Williams *et al.* 2016, which provides the most recent description of the effects of recent drought conditions on listed salmonids in California.

> California has experienced well below average precipitation in each of the past four

water years (2012, 2013, 2014, and 2015), record high surface air temperatures the past two water years (2014 and 2015), and record low snowpack in 2015. Some paleoclimate reconstructions suggest that the current four-year drought is the most extreme in the past 500 or perhaps more than 1000 years. Anomalously high surface temperatures have made this a "hot drought," in which high surface temperatures substantially amplified annual water deficits during the period of below average precipitation. Four consecutive years of drought and the past two years of exceptionally high air, stream, and upper-ocean temperatures have together likely had negative impacts on the freshwater, estuary, and marine phases for many populations of Chinook salmon, coho salmon, and steelhead.

2.2.3.11 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 a deficit of MDN 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).

2.2.4 Critical Habitat

2.2.4.1 Critical Habitat Description

NMFS is responsible for designating critical habitat for species listed under its jurisdiction. In designating critical habitat, NMFS considers the following requirements of the species: (1) space for individual and population growth, and for normal behavior; (2) food, water, air, light, minerals, or other nutritional or physiological requirements; (3) cover or shelter; (4) sites for breeding, reproduction, or rearing offspring; and, generally, (5) habitats that are protected from disturbance or are representative of the historic geographical and ecological distributions of this species (see 50 CFR 424.12(b)). In addition to these factors, NMFS focuses on the known physical and biological features (PBFs) within the designated area that are essential to the conservation of the species and that may require special management considerations or protection. Section 4 of the ESA requires that economic, national security and other relevant impacts are taken into consideration when designating critical habitat. Moreover, section 7 of the ESA requires that Federal agencies (via consultation with NMFS) ensure any action they authorize, fund, or carry out will not result in the destruction or adverse modification of critical habitat. Designated critical habitat for all the species listed below overlaps with the action area.

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.

2.2.4.1.1 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 upstream of certain dams that block access to historic habitats of listed salmonids. Critical habitat corresponds to all the water, riverbed, 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. PBFs 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).[5] The current condition of critical habitat for SONCC coho salmon is discussed below in the Conservation Value of the Critical Habitat section.

2.2.4.1.2 Chinook Salmon and Steelhead

NMFS designated critical habitat for CC Chinook salmon and NC, CCC, and S-CCC steelhead on September 2, 2005 (70 FR 52488). The method and criteria used to define critical habitat focused on identifying the physical or biological features of habitat that are essential to the conservation of the species. These specific PBFs 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 ESUs/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

[5] These PBFs were originally called PCEs, or Primary Constituent Elements. Regulations have subsequently replaced PCEs with PBFs, or Physical and Biological Features. The shift in terminology does not change the approach used in conducting a "destruction or adverse modification" analysis, which is the same regardless of whether the original designation identified primary constituent elements, physical or biological features, or both.

the benefits of designation. Native American lands and U.S. Department of Defense lands were also excluded.

2.2.4.2 Conservation Value of Critical Habitat

The PBFs of designated critical habitat for SONCC and CCC coho salmon, 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 because the same land management practices persist in many locations.

2.2.4.3 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.

2.2.4.3.1 Coho Salmon

The condition of SONCC coho salmon and CCC coho salmon critical habitat, specifically its ability to provide for their conservation, is degraded from conditions known to support viable salmon populations. NMFS has determined that present depressed population conditions are, in part, the result of the following historical and ongoing land management practices affecting critical habitat: logging, agricultural and mining activities, urbanization, stream channelization, dams, freshwater and estuarine wetland loss, and water withdrawals for irrigation. All of these factors were identified when SONCC coho salmon were listed as threatened under the ESA, and all factors continue to negatively affect this ESU.

2.2.4.3.2 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, 10 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 biological and physical features for spawning, rearing, and migration in approximately 1,634 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.

2.2.4.3.3 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.

2.2.4.3.4 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.

2.3 Environmental Baseline

The “environmental baseline” includes the past and present impacts of all Federal, state, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section

7 consultation, and the impact of state or private actions which are contemporaneous with the consultation in process (50 CFR 402.02).

2.3.1 Status of Species and Critical Habitat in 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 coho salmon, Chinook 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.

2.3.2.1. North Coast Area

This area includes all coastal streams entering the Pacific Ocean from the Oregon/California Border south to Bear Harbor in Mendocino County, including portions of the following counties: Del Norte, Siskiyou, Humboldt, Trinity, and Mendocino. The area includes the following USGS HUC-8s (4^{th} 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, although agriculture and medical marijuana has become prolific and could be the dominant land use in some areas. The area includes the California portion of the SONCC coho salmon ESU and the northern portion of the CC Chinook salmon ESU and NC steelhead DPS ESU, and contains designated critical habitat for all three species. 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).

More detail about the current condition of habitat and threats in each watershed can be found in the recovery plan for SONCC coho salmon (NMFS 2014) and the public draft recovery plan that includes NC steelhead and CC Chinook salmon (NMFS 2015).

2.3.2.1.1. Smith River

SONCC coho salmon are the only listed salmonid occurring in the Smith River. The SONCC coho salmon recovery plan (NMFS 2014) identified the key limiting stresses and threats affecting each population. Key limiting stresses and threats are those stresses and threats that are the most pressing factors limiting recovery of populations. Stresses are the physical, biological, or chemical conditions and associated ecological processes that may impede SONCC coho salmon recovery, and threats are those activities or impacts that cause or contribute to stresses. Impaired estuarine function and lack of floodplain and channel structure are the key limiting stresses, and channelization and diking and agricultural practices are the key limiting threats, that most affect coho salmon recovery in this basin (NMFS 2014). The dominant land uses are agriculture and timber harvest (NMFS 2014).

Until recently, there has been very little information about the status of the Smith River coho salmon population. Spawner surveys and juvenile distribution surveys started in fall 2011. There were, on average, 279 coho salmon redds in the Smith River from 2011 to 2015, which were limited to the Mill Creek watershed (Garwood *et al.* 2014, Walkley and Garwood 2015). Given the observed average sex ratio (F:M) of 1:1.4 (Garwood *et al.* 2014, Walkley and Garwood 2015), the likely number of adult coho salmon is well below the moderate risk target of 1,300 (NMFS 2014), placing the population at high risk of extinction. It should be noted that this conclusion is based on less than the twelve years of data needed for a delisting decision.

2.3.2.1.2. Klamath and Trinity Rivers

SONCC coho salmon are the only ESA-listed salmonid occurring in the Klamath River basin. There are nine coho salmon populations in this basin: Lower Klamath River, Middle Klamath River, Upper Klamath River, Salmon River, Scott River, Shasta River, Lower Trinity River, Upper Trinity River, and South Fork Trinity River. Timber harvest and agriculture are the dominant land uses in most of the populations (NMFS 2014).

Altered hydrologic function, or not having enough water at the right time, is a key limiting stress that affects much of the basin, as does simplified instream and off-channel habitat (NMFS 2014). The most prevalent key limiting threats affecting the basin are dams/diversions and agricultural practices (NMFS 2014).

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 (*i.e.*, low dissolved oxygen, increased algal blooms, *etc.*) 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.

The average number of adult coho salmon counted at the video weir on the Scott River over the last eight years was 810, while the average number of spawners counted at the Shasta River video weir over the last 14 years was 127 (Williams *et al.* 2016). Of particular concern is the small number of spawners estimated to have passed the weir on the Shasta River in 2014 (46), of which only four were likely three year old fish (Williams *et al.* 2016). The estimated numbers of spawners observed recently at these locations are below the moderate risk thresholds (Scott 1,000 adults and Shasta 576 adults; NMFS 2014), putting these populations at high risk of extinction. The Lower Klamath, Middle Klamath, Upper Klamath, Salmon, Lower Trinity, and South Fork Trinity river coho salmon populations are estimated at a high risk of extinction (NMFS 2014).

2.3.2.1.3. Redwood Creek

Coho salmon, Chinook salmon, and steelhead are the listed salmonid species that occur in Redwood Creek. The dominant land uses in Redwood Creek are timber harvest and agriculture (NMFS 2014). The key limiting stresses for coho salmon are a lack of floodplain and channel structure and impaired estuarine function, while the key limiting threats are channelization/ diking and roads (NMFS 2014). The degraded condition of the estuary, disconnection of the creek from floodplain habitat, impaired summer water temperatures, and lack of habitat complexity, including reduced shelter and cover elements, are all factors limiting Chinook salmon and steelhead abundance (NMFS 2015. In addition, steelhead populations are constrained by an in-river sport fishery for hatchery steelhead and by limited deep holding pools (NMFS 2015).

On average, 529 coho salmon redds, 921 Chinook salmon redds and 154 winter steelhead redds have been counted annually over the last four years[6] in Redwood Creek (Table 4; Williams *et al.* 2016). Based on these numbers, the total number of adult coho salmon and Chinook salmon is likely above the moderate risk thresholds (Table 4), placing them at moderate risk of extinction. In contrast, steelhead appear to be below the moderate risk threshold, placing this population at high risk of extinction (Table 4). Based on population estimates over a 14-year period of record that ended in 2012, there were an average of 297 adult coho salmon, 272 adult Chinook salmon and 40 adult steelhead annually in Prairie Creek, a tributary of Redwood Creek (Williams *et al.* 2016). Chinook salmon abundance has shown a significant negative trend ($p=0.015$), while steelhead abundance showed a slight positive but non-significant trend ($p=0.545$) over this period (Williams *et al.* 2016). A partial population estimate of summer steelhead carried out since 1981 found, on average, 10 individuals (Table 4). There has been a negative but non-significant ($p = 0.720$) trend over the entire period of record. The recent (16-year) trend has been positive and marginally significant ($p = 0.077$); however, the population remains at critically low abundance (Williams *et al.* 2016).

[6] These redds were counted during surveys targeted at the spawning period of coho salmon, so this number does not include redds made and destroyed before that survey began, or made after the survey ended.

Table 4. Spawner targets and results of monitoring surveys for Chinook salmon, winter steelhead, and summer steelhead in Redwood Creek and Prairie Creek.

			Average			Estimated average	
Species	**Location**	**Spawner target**[a]	**Number redds**[b] **2011-2014**	**Number adults 1981-2014**	**Location**	**Number redds**[b] **2011-2014**	**Number adults 1998-2012**
Coho salmon	Redwood Creek	4,900 (604)	529	n/a	Prairie Creek	409	297[c]
Chinook salmon		3,400 (464)	921	n/a		206	272[c]
Winter steelhead		5,400 (1,512)	154	n/a		156	40[c]
Summer steelhead		2,500	n/a	10[d]		n/a	n/a

[a] *Low extinction risk threshold over (moderate extinction risk threshold); NMFS 2014 and NMFS 2015*

[b] *Anderson and Ward 2015.*

[c] *Based on AUC estimates. Surveys were discontinued after 2012 when basin-wide surveys for Redwood Creek were initiated; Duffy 2012, Williams et al. 2016.*

[d] *Estimates are from dive counts of a standardized reach of 27 km and thus represent only a partial population estimate; Williams et al. 2016.*

2.3.2.1.4 Mad River

Three ESA-listed salmonids occur in the Mad River: coho salmon, Chinook salmon, and steelhead. In the Mad River, the dominant land uses are timber harvest and gravel mining (NMFS 2014). The key limiting stresses for coho salmon are a lack of floodplain and channel structure and altered sediment supply, and the key limiting threats are roads and gravel extraction (NMFS 2014). Strays from Mad River Hatchery likely reduce the overall productivity of the steelhead population (NMFS 2015). Excessive turbidity during the winter months, along with reduced habitat complexity, have reduced the quality and extent of steelhead and Chinook salmon rearing habitat (NMFS 2015). Inadequate stream shading and higher water temperatures also negatively affect steelhead habitat. Gravel scouring events likely play a role in poor Chinook salmon spawner success during years of high precipitation (NMFS 2015). A smaller, simplified estuary has reduced the quality and extent of rearing habitat for Chinook salmon in the Mad River (NMFS 2015).

The paucity of channel structure is reflected in habitat surveys within the Mad River watershed, which detail the low amount and small size of existing LWD (primarily 1-2 foot diameter

pieces). Given the current vegetation age structure and past logging history along streams, recruitment of adequately sized woody debris to many tributaries is not likely to occur for several decades. The Mad River watershed is section 303(d) listed for turbidity and sedimentation due to silviculture, resource extraction, and nonpoint sources (CRWQCB 2012). Hydrologically connected road sediments are the principle source of fine sediment.

Little monitoring data are available for the Mad River. In a survey of several index reaches that extended from 1981 to 2013, the maximum average number of adult coho salmon in any reach was seven (NMFS 2014). Coho salmon are likely currently at high risk of extinction because the number of spawners is likely below the high-risk threshold, while Chinook salmon and steelhead are likely at moderate risk of extinction as the number of spawners likely exceeds the moderate risk threshold (NMFS 2014, NMFS 2015).

2.3.2.1.5 Humboldt Bay

All three listed salmonids (SONCC coho salmon, NC steelhead, and CC Chinook salmon) occur in Humboldt Bay. Similar to other nearby watersheds, fish habitat in Humboldt Bay and its tributaries has suffered from the effects of past timber harvest. Currently, the dominant land use is timber production and harvest in the upper portions of tributary watersheds. Agriculture and urban, residential, and industrial development are the dominant land uses in the middle and lower portions of the tributary watersheds. Most land in the upper watershed is owned by commercial timber companies. Urban, residential, and industrial development is concentrated in the floodplains of tributaries to Humboldt Bay including Freshwater Creek.

The key limiting stresses to coho salmon in this population are lack of floodplain and channel structure and impaired estuary/mainstem function, and the key limiting threats are channelization/diking and roads (NMFS 2014). For steelhead and Chinook salmon, the concerns are similar: combined effects of excess sediment filling pools along with the lack of structure to regulate sediment transport or reduce scour significantly reduces the complexity of the instream habitat (NMFS 2015). These species also historically depended on the rich stream-estuary ecotone, and the loss of those areas has further limited rearing opportunities (NMFS 2015).

An estimate of coho salmon spawner abundance over the past 14 years in Freshwater Creek, a Humboldt Bay tributary, shows a trend that is not significantly different than zero ($p > 0.07$) over the 13-year period (Williams *et al.* 2016). The trend in the number of adult Chinook salmon counted at the Freshwater Creek weir has been negative and significant ($p<0.001$) (Williams *et al.* 2016). The steelhead trend has been negative but not significantly so ($p = 0.108$) (Williams *et al.* 2016). The estimated average annual number of adult coho salmon, Chinook salmon, and steelhead in Freshwater Creek over the 14 year period of record shows that coho salmon are the most abundant ESA-listed salmonid in the population area, followed by winter steelhead which are less than a third as abundant and Chinook salmon, which are the least abundant salmonid with numbers reaching less than 10 percent of coho salmon counts (Table 5; Anderson *et al.* 2015). Based on the number of coho salmon redds in Humboldt Bay (Table 5; Anderson and Ward 2015), the number of spawners is likely above the moderate risk threshold but below the

low risk threshold, placing this population at moderate risk of extinction. Based on the same information for steelhead and Chinook salmon, both of these species are currently at high risk of extinction as the number of spawners is below the moderate risk threshold.

Table 5. Spawner targets and results of monitoring surveys for coho salmon, Chinook salmon, and winter-run steelhead in the Humboldt Bay watershed and Freshwater Creek.

			Estimated Average		**Estimated Average**	
Species	**Location**	**Spawner target[a]**	**Number redds 2011-2015[c]**	**Location**	**Number redds 2001-2015[c]**	**Number adults 2000-2015[d,e]**
Coho salmon	Humboldt Bay	5,700 (764)	1172	Fresh-water Creek	295	573
Chinook salmon		2,600 (76)	4[b]		4	35
Winter steelhead		4,100 (203)	93		20	169

[a] Low extinction risk threshold over (moderate extinction risk threshold); NMFS 2014 and NMFS 2015.

[b] These redds were counted during a survey targeted at the spawning period and space of coho salmon, so this number may not include the entirety of the steelhead spawning period and space.

[c] Anderson and Ward 2016.

[d] Anderson et al. 2015.

[e] Estimated number of adults based on fish/redd expansions from life cycle monitoring stations.

2.3.2.1.6. Eel River

Coho salmon, Chinook salmon, and steelhead occur in the Eel River basin. Degraded floodplain and channel structure is a key limiting stress for coho salmon in the majority of the basin, and a high or very high stress in the entire basin, due to simplified instream and off-channel habitat resulting from past and current land-use practices. Altered hydrologic function is a key limiting stress to coho salmon in much of the basin due to the Potter Valley Project (see below) and to localized diversions to support marijuana cultivation as well as other uses. An equally prevalent key limiting stress to coho salmon across the basin is impaired water quality, primarily high water temperature, arising from degraded riparian forest conditions and from diversions. The key limiting threats affecting most of the basin are dams/diversions and roads.

Within the Eel River basin, the current conditions with the worst ratings for Chinook salmon across populations were the "quality and extent of the estuary", "habitat complexity (large wood and shelter)", and "gravel quality and quantity" (NMFS 2015. Based on high or very high ratings across watersheds, the threat of greatest concern for CC Chinook salmon was "disease, predation

and competition" due to the introduction of Sacramento pikeminnow and its predation upon and competition with several Chinook salmon life stages (NMFS 2015). Other threats identified were "channel modification", "water diversion and impoundments," and "roads and railroads" (NMFS 2015). While not technically a resource extraction or legal action, marijuana cultivation occurs throughout the Eel River Watershed, and diverts water from the Mad River and its tributaries, dumps chemicals and waste into the environment, damages stream channels (*e.g*., streambank and channel alterations), and disturbs soil and forest resources (Bauer *et al.* 2015). Marijuana cultivation reduces stream flows, increases chemical pollution, and potentially increases stream temperatures (Bauer *et al.* 2015). Cultivation of medical marijuana has become widespread in the Eel River basin, and is a likely cause of many of the water diversions in the area.

The current conditions most frequently rated as poor/fair across Eel River populations for NC steelhead were "large wood and shelter" and "gravel quality and quantity" (NMFS 2015). Other current conditions that rated poorly for at least two populations were "percent primary pools and pool/riffle/flatwater ratios," and "baseflow and passage flows" (NMFS 2015). The "quality and extent of the estuary" was rated poor for all populations and life stages, due to substantial loss of habitat and impaired quality in that area (NMFS 2015). The highest-rated threat across watersheds was "roads and railroads," with seven of ten populations rated high. The threats rated high or very high in at least two Eel River basin populations were "water diversions and impoundments" and "channel modification."

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. The average annual suspended sediment load in the Eel River 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 affect salmonid populations by degrading essential freshwater habitat as well as harming individual fish health and modifying behavior.

Water diversion within the Eel River basin has occurred since the early 1900s at the Potter Valley facilities. Roughly 160,000 acre-feet (219 cfs average) are diverted at Cape Horn Dam, through a screened diversion, to the Russian River basin annually. Flow releases from the Potter Valley facilities have both reduced the quantity of water in the mainstem Eel River, particularly during spring and fall low-flow periods, as well as dampened the within-year and between-year flow variability that is representative of unimpaired watersheds. Water diversions to support marijuana cultivation place a high demand on a limited amount of water. Together, 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 (NMFS 2002).

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 South Fork Eel River provides some 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 microhabitat for juvenile and adult salmonids. Spawner surveys on the South Fork Eel River's Sproul Creek have occurred since 1975. There is a negative trend when the entire 39-year period of record is considered, and a positive trend in the more recent 16 years, but neither trend is statistically significant (P=0.212 and p=0.235, respectively)(Williams *et al.* 2016). In the Upper Eel River, index survey counts at Tomki Creek have averaged 554 (range 3-3,666) over the 34 year period of record, but over the last sixteen years they have averaged only 78 (range 5-226). "The long-term trend in these counts is negative ($p < 0.001$); however, the short-term trend has been positive though marginally significant ($p = 0.060$), primarily because of three relatively strong years in succession from 2010–2011 to 2012–2013. . . it is unclear whether the recent positive trend reflects increases in wild spawners, redistribution of fish associated with changes in flow releases from upstream dams, or legacy effects of past hatchery plantings (Williams *et al.* 2016)." A similar story (i.e., long-term trend negative, short-term trend slightly positive) exists for NC steelhead above the Van Arsdale counting station (Williams *et al.* 2016). All salmon and steelhead populations within the Eel River watershed remain well below their target abundance levels.

Based on the number of coho salmon, Chinook salmon, and steelhead redds in the South Fork Eel River (Table 6), the number of spawners of all three species is likely above the moderate risk threshold but below the viability threshold, placing these populations at moderate risk of extinction, although this conclusion is not based on the twelve years of data needed for a delisting decision (Table 6). In addition, the coho salmon in the Lower Eel/Van Duzen River, the Middle Mainstem Eel River, and the Mainstem Eel River are all at high risk of extinction (NMFS 2014). For coho salmon, the amount of habitat in the remaining populations (North Fork Eel, Middle Fork Eel, Upper Mainstem Eel) is too small to expect them to function as independent populations, so no extinction risk is calculated (NMFS 2014). For Chinook salmon and steelhead, the number of spawners in the North Fork Eel River, Middle Fork Eel, and Upper Mainstem Eel Rivers are likely below the moderate risk threshold, based on the fair to poor

ratings for "population abundance and spatial structure" (NMFS 2015), likely putting them at high risk of extinction.

Table 6. Spawner targets and estimated average number redds for 2010-2014 for coho salmon, Chinook salmon, and steelhead in the South Fork Eel River.

Species	Location	Spawner target[a]	Estimated Average Number Redds 2010-2014[b]
Coho salmon	South Fork Eel River	9,300 (1,856)	1,347
Chinook salmon		7,300 (365)	773
Winter steelhead		19,000 (952)	643[c]

[a] Low extinction risk threshold over (moderate extinction risk threshold); NMFS 2014 and NMFS 2015. Target for steelhead includes fish produced by the Lower Eel River population area.
[b] Source: Ricker et al. 2015a-d.
[c] These redds were counted during a survey targeted at the spawning period and space of coho salmon, so this number may not include the entirety of the steelhead spawning period and space.

2.3.2.1.7. Mattole River

SONCC coho salmon, NC steelhead, and CC Chinook salmon all occur in the Mattole River watershed. The main land uses are timber harvest and rural residential development, Medical marijuana cultivation has become prolific and could be the dominant land use in some areas. The key limiting stresses for coho salmon are a lack of floodplain and channel structure and altered hydrologic function, , and the key limiting threats are diversions and urban, residential, and industrial development. Concerns for Chinook salmon and steelhead include lack of channel complexity, excessive water extraction during late spring and summer low flows, low stream shade and low large woody debris recruitment to streams, high sediment production levels, high summer water temperatures, shallow channels, and simplified habitat (NMFS 2015. In addition, juvenile Chinook salmon are limited by poor habitat conditions in the estuary during dry years when water flow in the Mattole River is reduced and the period of mouth closure is extended (NMFS 2015).

With the establishment of rural residences and smaller ranches, water use has increased over the last 50 years. Currently, much of the demand for residential and agricultural use is accommodated through in-stream diversions or shallow wells, which diminish streamflows during summer low-flow periods. Much of the demand occurs in the southern sub-basin where the last known stronghold of coho salmon spawning occurs. Additionally, the southern sub-basin has experienced increasing levels of marijuana cultivation. Many of these operations require

water sources during the summer, which coincides with juvenile coho salmon rearing. Water withdrawals in the mid- to late-summer likely play a factor in drying of stream reaches and stranding of juvenile salmon in the late summer. Unscreened water diversions using motorized pumps may entrain or impinge juvenile coho salmon.

Based on methodology adopted in 2012, an average of 47 coho salmon redds have been documented in the Mattole River during the two years of sampling described in the status review (Williams *et al.* 2016), compared to the 1,000 spawners needed for moderate risk of extinction, which means this population is at high risk of extinction, although this conclusion is not based on the twelve years of data needed for a delisting decision (NMFS 2014). The number of Chinook salmon redds averaged 250[7] over two years (Williams *et al.* 2016), putting the spawning population above the moderate risk threshold of 178. Similarly, there were 298 steelhead redds on average over 2 years (Williams *et al.* 2016); given that there are at least two fish per redd, the number of adult steelhead that made those redds was above the 535 needed for a moderate risk of extinction, putting the Mattole population of this species at moderate risk of extinction.

2.3.2.2. North Central Coast Area

The North Central Coast area includes all coastal California streams entering the Pacific Ocean in Mendocino, Sonoma, and Marin counties, excluding streams draining into San Francisco and San Pablo bays. The North Central Coast Area includes portions of three ESUs/DPSs (CCC coho salmon, NC steelhead, and CCC steelhead) and five USGS HUC-8s (4th field HUCs) (Big-Navarro-Garcia, Bodega Bay, Gualala-Salmon, Russian, and Tomales-Drakes Bay). Forestry and agriculture are the dominant land-uses 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.

2.3.2.2.1. Big, Navarro, and Garcia Rivers

This HUC-8 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; 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 largely attributable to forestry activities (NMFS 2015). Agriculture has likely contributed to

[7]These redds were counted during a survey targeted at the spawning period of coho salmon, so this number does not include the entire spawning period of steelhead.

depressed habitat 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 the naturally erosive geology, the mountainous and rugged terrain, and legacy impacts from historically large storms (*e.g.*, 1964, 1982). Estuaries throughout the HUC have likely decreased in size due to sedimentation and flood control actions (*e.g.*, diking and channelization). All of the larger watersheds within this HUC are included on the 2012 Clean Water Act section 303(d) list of water quality limited segments (CSWRCB 2012), and have TMDLs in place that address sediment pollution.

This HUC is within the CCC coho salmon ESU, CC Chinook salmon ESU, and NC steelhead DPS. Salmonid abundance has declined throughout the HUC. Steelhead are widespread yet reduced in abundance, and coho salmon have a patchy distribution with populations significantly reduced from historic levels (Weitkamp *et al*. 1995; Busby *et al*. 1996; CRWQCB 2001). The most recent status review noted positive but non-significant population trends for coho salmon within the Ten Mile River, Big River, and Albion River over the last several years, but overall, but most populations remain below or near depensation levels (Williams *et al.* 2016). Small numbers of Chinook salmon continue to appear within the Ten Mile, Noyo, Navarro and Big rivers, although these numbers remain well below depensation thresholds for each population (Williams *et al.* 2016). Recent estimates of NC steelhead abundance within the North-Central Coast Stratum have generally improved during the past several years; yet similar to Chinook and coho salmon, many of these steelhead populations remain at or below population depensation levels. On a positive note, both the Big River and Ten Mile River populations have experienced positive growth trends during the past six years (Williams *et al.* 2016). Likewise, Garcia River steelhead escapement has averaged 326 adults annually for the past 6 years, and the population trend is also positive (although insignificantly so).

2.3.2.2.2. Gualala-Salmon River

This HUC-8 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 forestlands 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 and illicit marijuana cultivation has become more common within the basin (NMFS 2014). Gravel mining is largely a historic activity, although a rather large gravel mining operation near the confluence of the Wheatfield Fork remains (Matt Goldsworthy, personal communication, 2016). 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 2012 Clean Water Act section 303(d) list of water quality limited segments (CSWRCB 2012). The pollution factors for the Gualala River are sedimentation, temperature, DO, and a host of chemical pollutants; forestry, agriculture, and land

development are listed as the potential sources for those factors. In 2001, a TMDL for sediment 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) concluded that the Gualala River contains no known remaining viable coho salmon populations; no population data exists from the past 5 years, and NMFS suspects the number of coho salmon in the Gualala River is very low (Williams *et al.* 2016). Recent steelhead data suggests the Gualala River may contain the largest remaining steelhead population within the CCC DPS (Williams *et al.* 2016). 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).

2.3.2.2.3. Russian River

This HUC-8 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 that block access to anadromous fish habitat: Coyote Valley Dam and Warm Springs Dam. Steiner Environmental Consulting (SEC) (1996) cites 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 2013 Clean Water Act section 303(d) list of water quality limited segments (CSWRCB 2012). The pollution factors for the Russian River vary by sub-watershed, but commonly include sediment, temperature, dissolved oxygen, various nutrients, and many chemical pollutants 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 Chinook salmon, 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 1999). 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. Recent monitoring data indicate the coho salmon population in the lower Russian River (Dry Creek downstream, inclusive) ranged from 206 to 536 adult fish during the past four years (Williams *et al.* 2016). The Russian River population of Chinook salmon has shown no discernable trend in population abundance during the past 14-year period, with an average annual escapement counted at the Mirabell counting facility of 3,257 fish (Williams *et al.* 2016). The lack of adequate spawner surveys within the Russian River precludes the estimation of wild steelhead escapement within the basin; however, hatchery returns suggest the vast majority of returning fish are of hatchery origin. Current population abundance for all three species remains a mere fraction of their target recovery levels.

2.3.2.2.4 Bodega Bay

This HUC-8 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 primary 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 2012 Clean Water Act section 303(d) list of water quality limited segments for elevated levels of nutrients and sediment (CSWRCB 2012). The pollution factors for these streams are sedimentation, nutrients, invasive species, 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 in two watersheds: Salmon Creek and Valley Ford Creek (Brown and Moyle 1991; Hassler *et al*. 1991; Weitkamp *et al*. 1995). Excess coho salmon broodstock fish from Warm Springs Hatchery have been released into Salmon Creek during the past several years in an attempt to re-establish a self-sustaining run within the watershed (Williams *et al.* 2016). NMFS found no historical coho salmon collections from watersheds of this HUC between Valley Ford Creek and Tomales Bay. 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).

2.3.2.2.3. Tomales-Drakes Bay

This HUC-8 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 2012 Clean Water Act section 303(d) list of water quality limited segments (CSWRCB 2012); 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, NMFS 2015). 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.

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). 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).

This HUC is within the CCC coho salmon ESU and CCC steelhead DPS. With the exception of Lagunitas Creek, the abundance of coho salmon is very low throughout the HUC. Lagunitas Creek may have the largest populations of coho salmon remaining in the CCC coho salmon ESU. Although Lagunitas Creek is presumed to have a relatively stable and healthy population of coho salmon, at least when compared with other CCC coho salmon streams, NMFS (2001) noted that this stream has experienced a recent reduction in coho salmon abundance. Small persistent populations of coho salmon are in Pine Gulch Creek and Redwood Creek. Anecdotal evidence of a once thriving coho salmon and steelhead run in Walker Creek exists. Yet Adams *et al.* (1999) and CDFG (2002) thought the species was extirpated from the watersheds of this HUC as recently as fifteen years ago. In an attempt to increase population spatial distribution, excess coho salmon broodstock from Warm Spring hatchery were introduced into Walker Creek from 2008-2014, and observations of juvenile coho salmon following those plantings indicate successful spawning by those released broodstock fish (Williams *et al.* 2016).. Small numbers of Chinook salmon are often encountered within Lagunitas Creek, which is outside the current CC ESU boundary that ends at the Russian River. NMFS is currently considering extending the CC ESU boundary to include these fish (Williams *et al.* 2016).

2.3.2.3 San Francisco Bay Area

The San Francisco Bay Area encompasses the region between the Golden Gate Bridge and the confluence of the San Joaquin and Sacramento rivers. All of the watersheds in this area drain into 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 HUC-8s (4^{th} field HUCs): San Pablo Bay, Suisun Bay, San Francisco Bay, and Coyote. Anthropogenic factors affecting listed salmonids in these HUCs are related primarily to urbanization, though agriculture is another prevalent land use in the San Pablo Bay and Suisun HUCs. Urban development is extensive within this area and has negatively affected the quality and quantity of salmonid habitat. Human population within the San Francisco Bay Area is approximately six million, representing the fourth most populous metropolitan area in the United States, and continued growth is expected (www.census.gov). In the past 150 years, the diking and filling of tidal marshes has decreased the surface area of the greater San Francisco Bay by 37 percent. More than 500,000 acres of the estuary's historic tidal wetlands have been converted for farm, salt pond, and urban uses (San Francisco Estuary Project 1992). These changes have diminished tidal marsh habitat, increased pollutant loadings to the estuary, and degraded shoreline habitat due to the installation of docks, shipping wharves, marinas, and miles of rock riprap for erosion protection. Most tributary streams have lost habitat through channelization, riparian vegetation removal, water development, and reduced water quality. Dams blocking anadromy are present on many streams and are used for water supply, aquifer recharge, or recreational activities. Streams have been affected by surface water diversion and groundwater withdrawal. Channelization for flood

control, roadway construction, and commercial/residential development have further affected the quality and quantity of available salmonid habitat. Most watersheds within this area are listed under the 2012 Clean Water Act section 303(d) list of impaired water bodies for high levels of industrial pollutants (*e.g.*, polychlorinated biphenyl, dichlorodiphenyltrichloroethane, furan compounds, *etc.*), reflecting the impacts of urban and industrial development (CSWRCB 2012). 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.

2.3.2.3.1. 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. In addition, 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 2012 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 2012). 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 Presidio, 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 Presidio, Corte Madera Creek, and Pinole Creek watersheds are protected in parks or open space preserves. Recent surveys confirm steelhead presence in tributaries of San Pablo Bay (*e.g.*, Napa River and Petaluma River), but are insufficient to equivocally describe population trends or suggest a status change (Williams *et al.* 2016). Coho salmon are thought to be extirpated from San Pablo Bay tributaries (NMFS 2012).

2.3.2.3.2. 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 2012 Clean Water Act section 303(d) list of impaired water bodies for high levels of Diazinon attributable to urban runoff (CSWRCB 2012).

Suisun Creek, Green Valley Creek, and an unnamed tributary to Cordelia Slough currently support small populations of CCC steelhead (Williams *et al.* 2016); 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 (Williams *et al.* 2016).

2.3.2.3.3 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 2012 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 2012). 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 2012). Alameda Creek, Mount 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 parkland 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. Most other drainages that historically supported steelhead presently do not (Leidy *et al.* 2005).

2.3.2.3.4. 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 2012 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 2012). 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 2012). 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 a 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. Unfortunately, no robust data sets exists within interior San Francisco Bay watersheds that would allow conclusions to be drawn regarding current population status or trends (Williams *et al.* 2016).

2.3.2.4. 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 HUC-8s (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.

2.3.2.4.1. 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.*, Brussels 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 2012 Clean Water Act section 303(d) list of water quality limited segments (CSWRCB 2012). 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). 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). Aside from artificial coho production supporting the Scott Creek population (and producing strays), the species appears extirpated, or nearly so, within other surrounding watersheds (Williams *et al.* 2016). 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. Pescadero Creek likely supports the most viable steelhead population in this HUC (Titus *et al.* 2002). Recent population surveys suggest a few to several hundred adult steelhead return to the largest watersheds within this HUC (San Gregorio and Pescadero) (Williams *et al.* 2016).

2.3.2.4.2. 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, and 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 2012 Clean Water Act section 303(d) list of water quality limited segments (CSWRCB 2012). 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 within the 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. A coho salmon captive broodstock program operates on Scott Creek at Kingfisher Flat Hatchery, one of two such broodstock programs within the CCC coho salmon ESU (the other is at Warm Springs Hatchery in the Russian River). 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.

2.3.2.4.3 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 2012 Clean Water Act section 303(d) list of water quality limited segments (CSWRCB 2012). 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 2012 Clean Water Act section 303(d) list of water quality limited segments (CSWRCB 2012). 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 2012 Clean Water Act section 303(d) list of water quality limited segments (CSWRCB 2012) 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.

2.3.2.4.4. 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 2012). 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.

2.3.2.4.5. 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 2012 Clean Water Act section 303(d) list of water quality limited segments (CSWRCB 2012) due to a variety of pollutants from several sources. The Salinas River is also on the 2012 Clean Water Act section 303(d) list of water quality limited segments (CSWRCB 2012) 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 significantly affected 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.

2.3.2.4.6 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 2012). S-CCC steelhead use of this HUC is believed to be extremely limited due to infrequent and inadequate winter flow regimes in the HUC and the mainstem Salinas River. Critical habitat of S-CCC steelhead was not designated for the Estrella River HUC. Historic occurrences of steelhead have been documented, but it is unknown if steelhead persist in this HUC.

2.3.2.4.7. 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 is on the 2012 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 that hinder migration, water withdrawals for domestic use, agricultural, and golf course use, and channel modifications for flood control purposes.

2.3.2.4.8. 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.

2.4 Effects of the Action

Under the ESA, "effects of the action" means the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline (50 CFR 402.02). Indirect effects are those that are caused by the proposed action and are later in time, but still are reasonably certain to occur.

The goal of the recovery plans for the listed salmonids is for ESUs and DPSs to eventually reach a low risk of extinction. In order to achieve this, all population groups (also called diversity strata) that make up the ESU or DPS must be at low risk of extinction. In order for population groups to be at low risk of extinction, the populations within them must achieve their extinction risk goals. If the effects to individual populations are large enough, those populations could suffer an increased extinction risk, which would negatively affect achievement of the target extinction risks for their diversity strata and their ESUs or DPS.

In-water project activities will occur during the summer low-flow period (June 15 – November 1, or the first rainfall), after most or all smolts have left streams and rivers but before most adults return. YOY and 1+ coho salmon, YOY Chinook salmon, and YOY and several age classes of steelhead are the life stages that are most likely to be present at Project sites. Adult Summer run steelhead who rear in deep pools during the summer months, as well as early migrating adult fall

Chinook salmon, may also be present in low numbers in the downstream portions of the action area. Project activities that may adversely affect these species or their designated critical habitats include fish relocation, stream dewatering, increased mobilization of sediment, removal of riparian vegetation, and chemical contamination. Dewatering and fish relocation activities will directly affect listed salmonids because a small percentage of individuals may be injured or killed by the activity. The effects from increased sediment mobilization into streams and riparian alteration are usually indirect effects, where habitat impacts may affect individual listed species after the project is implemented.

2.4.1. Insignificant and Discountable Effects

Although project types listed above have select projects that may adversely affect listed species; these project types may also have select projects that produce effects that are not likely to adversely affect listed species or their critical habitats. This section will focus on only the subset of projects where the effects are expected to be insignificant or discountable as explained further below.

2.4.1.1. 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, equipment will be used primarily outside the active channel. In addition, the minimum distance between instream project sites and the maximum number of instream projects covered by the RGP would effectively limit potential aggregated effects of heavy equipment disturbance on listed salmonids. Because of the program sideboards, limited heavy equipment use in the wetted channel, and low levels of acoustic impacts caused by projects, the noise, motion, and vibration and disturbance are expected to cause insignificant effects to listed species and their critical habitat.

2.4.1.2 Disturbance to Riparian Vegetation

Most proposed fisheries restoration actions (other than those targeted at riparian habitat improvement) are expected to avoid disturbing riparian vegetation by using the proposed minimization measures (Section 1.3.2.2). In general, the restorative nature of the FRGP 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 must be removed as part of a larger restoration project (e.g., shrub removed to create access to place large wood structure), NMFS expects the loss of riparian vegetation to be small, and limited to mostly shrubs and an occasional tree. As much understory brush and as many trees as feasible will be retained, emphasizing shade producing and bank-stabilizing vegetation. The riparian vegetation types most likely to be affected are willows and other shrubs, which generally reestablish quickly (usually within one season). In addition, NMFS expects the revegetation of disturbed riparian areas (and planting ratio of two new plants for each plant removed) to further minimize the

small, temporary loss of vegetation. Therefore, NMFS anticipates the incidental, temporary loss of riparian vegetation to cause only insignificant effects to individuals and critical habitat.

2.4.1.3 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 effects to individuals and their critical habitats. In addition to toxic chemicals associated with construction equipment, water that is exposed to 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 Flosi *et al.* (2010) (and described in Section 1.3.2.2), which address and minimize pollution risk from equipment operation and cement construction. Therefore, water quality degradation from toxic chemicals associated with project construction is expected to be insignificant.

2.4.1.4 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 effects to listed species because these activities typically occur in diversion ditches where increased mobilization of sediment is unlikely to reach the stream channel.

2.4.1.5 Riparian Habitat Restoration

Riparian habitat restoration techniques and associated mitigation measures (mitigation measures can be found in Section 1.3.2.2), as outlined within the Restoration Manual (Flosi *et al.* 2010) and in CDFW (2015a), are not likely to adversely affect listed salmonids or their habitat. Riparian restoration may involve ground disturbance adjacent to streams, especially when creating holes to place plants and when removing exotic plants. This disturbance could lead to decreased root strength of remaining plants, reduced soil cohesion, and sediment delivery to streams. However, NMFS expects the magnitude and intensity of this ground disturbance to be small, isolated to the riparian area, and temporary. Where exotic plants are removed, they will be replaced with native plants, which are expected to improve soil cohesion, re-establish root strength, and stabilize exposed sediment as they become established. Because the majority of work will occur during the summer growing season (a few container plants require winter planting), riparian plantings should be sufficiently established to anchor the restoration worksite and minimize the detrimental effects described above prior to the following winter storm season. Every plant removed will be replaced with two new plants, improving the success of revegetation efforts. In addition, all vegetation planting will likely occur on stream banks and floodplains adjacent to the wetted channel and not in flowing water (which would disturb more sediment and immediately introduce it to the stream), and sediment delivery to waterways from

plantings on non-submerged soil will be minimized by use of such erosion-control materials as erosion matting and straw baffles. The detrimental effects of riparian restoration are therefore expected to be insignificant.

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 bank full width of the active channel and the subsequent increase in pool area in streams (Magilligan and McDowell 1997).

2.4.1.6 Crowding at relocation sites

In some instances, relocated fish may endure short-term stress from crowding at relocation sites. Relocated fish may also have to compete with other salmonids for available resources such as food and habitat. However, most relocated fish will likely choose not to remain in the relocation sites and will move either upstream or downstream as soon as possible to areas that have either more habitat or lower fish densities. The effects of competition are expected to quickly diminish as fish disperse. Therefore, the effect of increased competition after fish relocation is expected to be insignificant.

2.4.2 Adverse Effects

2.4.2.1 Dewatering and Fish Relocation

2.4.2.1.1 Effects to fishes

Based on monitoring data since 2004, up to 24 percent of FRGP restoration projects implemented each year in the action area required dewatering (Table 7). The dewatering process includes: 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 flow to the project site upon project completion. The maximum length of contiguous stream reach that will be dewatered for any one project is 500 feet.

Table 7. Number and percentage of FRGP projects that required dewatering each year (CDFG 2014, 2013, 2012, 2011, 2010, 2009; Collins 2005).

Year	# Dewatering Sites*	# Ongoing or Completed Projects	Percentage of Projects that Involved Dewatering
2004	19	143	13
2005	25	149	17
2006	19	136	14
2007	19	147	13
2008	17	120	14
2009	8	101	8
2010	10	223	4
2011	24	118	20
2012	20	102	20
2013	13	86	15
2014	19	79	24
* Based on number of fish relocation sites			

Because the proposed dewatering and relocation will occur during the summer 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. Few juvenile Chinook salmon are expected to be in the action area at that time because instream activities will occur after most have migrated to the ocean. A small number of juvenile Chinook salmon, especially with a "stream-type" life history strategy, as well as adult summer steelhead and half-pounder steelhead, may 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 are very low (California Department of Fish and Game (CDFG) 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012 and CDFW 2013, 2014, and 2015b). No adult or half-pounder steelhead have been found during past FRGP dewatering, although one adult Chinook salmon was found in a dewatered area permitted under a previous RGP, but the Chinook salmon was outside of the range of the CC 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 that typically enter streams following heavy rains in October/November.

Juvenile coho salmon, steelhead, and to a much lesser extent, Chinook salmon (due to the timing of Chinook salmon juvenile occurrence), could be killed or injured if crushed during placement of the temporary barriers, such as cofferdams, though direct mortality is expected to be minimal because most juveniles will avoid the barrier-construction area. 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 that are not caught during the relocation efforts would be killed from either construction activities or desiccation. These fish would likely be juveniles because adults, given their size, are unlikely to be missed during sampling efforts.

The number of fish lost to dewatering activities is difficult to predict, because observing and documenting "left behind" fish is problematic (*i.e.*, fish not captured are often hidden from sight, or are preyed upon before being noticed). NMFS expects that the number of coho salmon, Chinook salmon, or steelhead killed as a result of crushing (when barriers are placed) or desiccation during site dewatering activities is very low, based upon the low percentage of projects that require dewatering (*i.e.*, generally up to 25 percent of projects), efforts to capture the fish before dewatering, the small area affected during dewatering at each site, and the low number of juveniles typically found in degraded habitat conditions common to proposed restoration sites. Given the required expertise of fish relocation biologists working on FRGP projects, NMFS expects that the percentage of fish missed by the biologists that will later die from crushing or desiccation will be no more than 1 percent of those fish captured at any given Project site. Utilizing past RGP12 sampling data to inform a "worst case" estimation of fish lost due to dewatering at the ESU/DPS scale, NMFS applied the 1percent loss to the highest capture amount for each salmon ESU and steelhead DPS (see Table 8).

All project sites that require dewatering will include efforts to relocate fish. CDFW personnel (or designated agents) will capture and relocate fish (and amphibians) away from the work site of the restoration project. Fish within the immediate project area will be captured by seine, dip net, and/or electrofishing. Captured fish will be transported to a suitable instream location and released there. 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 dip netting 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, Nielsen 1998, Habera *et al.* 1999, Nordwall 1999, Snyder 2003). However, the effects of electrofishing are

expected to be low because CDFW personnel or their designated agents will capture the fish following NMFS (NMFS 2000) and CDFW (Flosi *et al.* 2010) electrofishing guidelines. Data on fish relocation activities associated with habitat restoration projects since 2004 show that average mortality rates are predominantly below 3 percent for salmonids (Collins 2004, NOAA Restoration Center 2012).[8] NMFS expects that fish loss due to relocation efforts will be very small, no more than 3 percent of those fish captured at any given Project site. To inform a "worst case" estimate of fish that may be lost at the ESU/DPS scale, NMFS utilized past RGP12 sampling data and applied the 3 percent loss to the highest annual capture amounts documented for each salmon ESU and steelhead DPS during the past 11 years (see Table 8).

[8] Since 2004, a maximum of 15 ESA-listed juvenile steelhead have been injured and 26 killed annually. Likewise, the maximum number of juvenile coho salmon injured or killed each year from all fish relocation activities associated with RGP 12 restoration projects was 3 and 11, respectively.

Table 8: Estimated maximum past injury or death of juveniles per ESU or DPS resulting from projects authorized under RGP12 in the years between 2005 and 2015, based on observed capture numbers and estimated mortality rates resulting from dewatering and relocation.

	Number Collected					
	Coho Salmon		Chinook salmon	Steelhead		
Year	SONCC	CCC	CC	NC	CCC	S-CCC
2005	344	46	0	590	817	0
2006	185	65	3	2269	14	0
2007	267	0	18	5887	0	0
2008	267	0	0	5559	0	0
2009	1	0	0	14	1	0
2010	3	0	0	13	2	0
2011	445	107	0	1488	625	0
2012	1088	200	0	2232	411	0
2013	3	1	2	11	5	0
2014	4	5	0	17	5	0
2015	0	274	0	54	243	0
Maximum No. Juveniles Captured in Any Year	1088	274	18	5887	817	0[9]
1 Percent Mortality (Dewatering)	11	3	1	59	8	0
3 Percent Mortality (Relocation)	33	9	1	177	25	0

Once juveniles enter the ocean, marine survival is generally low. For example, in Freshwater Creek, a tributary to Humboldt Bay, the smolt to adult return estimates were all less than 5 percent from 2006 to 2013 and were as low as 0.7 percent (Anderson *et al.* 2015). Assuming marine survival of 5 percent, the number of adult equivalents that would have resulted from the maximum number of juvenile fish killed in any year is low: two SONCC coho salmon adults, one CCC coho salmon adult, no CC Chinook salmon adults, twelve NC steelhead adults, two CCC steelhead adults, and no S-CCC steelhead adults. Given that all of these numbers are for entire ESUs or DPSs, not all of these adults within an ESU or DPS would have come from one watershed; rather, they would have been spread across the populations that make up each ESU or DPS, minimizing the impact to any particular population.

[9] As no S-CCC steelhead were relocated from 2005 to 2015, likely reflecting the relative scarcity of this species, there was no impact of relocation on this DPS.

In summary, fish relocation activities are anticipated to only affect a small number of rearing juvenile coho salmon and/or steelhead within a small project reach at and near each affected 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. Due to low marine survival rates, the number of adult equivalents that would have resulted from these juveniles is low.

2.4.2.1.2 Effects to critical habitat

Benthic (*i.e.*, bottom dwelling) aquatic macroinvertebrates may be temporarily lost or their abundance reduced when stream habitat is dewatered (Cushman 1985). Effects to aquatic macroinvertebrates resulting from stream flow diversions and dewatering will be minor due to the relatively small section of stream dewatered (less than 500 feet) and the expected rapid recolonization (about one to two months) of disturbed areas by macroinvertebrates following reintroduction of water (Cushman 1985, Thomas 1985, Harvey 1986). Macroinvertebrate production upstream and downstream of the dewatered area will likely be unaffected. Based on the foregoing, the loss of aquatic macroinvertebrates and short-term loss of dewatered habitat resulting from dewatering activities is expected to be insignificant. Ephemeral and smaller intermittent drainages will likely be dry at the time of work and so will not be dewatered.

2.4.2.2 Increased Mobilization of Sediment within the Stream Channel

2.4.2.2.1 Effects to fishes

Instream habitat restoration, road decommissioning, streambank stabilization, and fish passage improvement projects involve various degrees of earth disturbance, and inherent with earth disturbance is the potential to increase background instream suspended sediment loads for a short period during and following project completion. In general, sediment-related impacts are expected during the summer construction season (June 15-November 1), as well as during the initial peak-flow winter storm event that mobilizes project-related sediment. 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. Adult Chinook salmon, coho salmon, and steelhead may also be exposed to increased turbidity once sediment is mobilized by initial high winter flows. Increased mobilization of sediment into streams and increased turbidity at the project site are expected to extend up to 1,500 feet downstream.

Sediment may affect salmonids in several ways. High concentrations of suspended sediment can disrupt normal feeding behavior and efficiency (Cordone and Kelly 1961, Bjorn *et al*. 1977, Berg and Northcote 1985), reduce growth rates (Crouse *et al*. 1981), and increase plasma cortisol levels (Servizi and Martens 1992). High turbidity concentrations can lower dissolved oxygen in the water column, reduce respiratory function, lower disease resistance, and even cause fish

mortality (Sigler *et al.* 1984, Berg and Northcote 1985, Gregory and Northcote 1993, Velagic 1995, Waters 1995). Even small pulses of turbid water may cause salmonids to disperse from established territories (Waters 1995), which can displace fish into less suitable habitat and/or increase competition and predation, thus decreasing survival. In addition, increased sediment deposition can fill pools and reduce the amount of cover available to fish, decreasing the survival of juvenile salmonids (Alexander and Hansen 1986).

Most of the research discussed above focused on turbidity levels significantly higher than the levels likely to result from the proposed restoration activities, especially with implementation of the proposed minimization measures (Section 1.3.2.2). 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. Past monitoring of newly replaced culverts[10] 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, the intensity of turbidity downstream of newly replaced culverts increased an average of 19 percent when compared to measurements directly above the culvert. However, the range of increases within the eleven monitored culverts was large (n=11; range 123 percent to -21 percent). Monitoring results from one and two year-old culverts were much less variable (n=11; range: 12 percent to -9 percent), with an average increase in downstream turbidity of 1 percent. Although the culvert monitoring results show decreasing sediment effects as projects age from year one to year three, 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 Martens 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 1993). However, only one of the Humboldt County measurements exceeded 100 NTU (NF Anker Creek, year one), whereas the majority (81 percent) of downstream readings were less than 20 NTU. Importantly, proposed minimization measures (Section 1.3.2.2), some of which were not included in the culvert work analyzed by Humboldt County (2002, 2003, 2004), 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 temporary, minor physiological and behavioral effects, such as dispersing salmonids from established territories, and potentially increasing interspecific and intraspecific competition, as well as temporarily increasing predation risk for the small number of affected juveniles.

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[10]When compared to other instream restoration projects (*e.g.*, bank stabilization, instream structure placement, etc.), the mobilization of the upstream sediment wedge during the winter following construction likely represents the largest sediment release associated with the proposed action. Thus, we have chosen to focus on this aspect as a "worst case" scenario when analyzing potential sediment effects from instream projects.

2.4.2.2.2 Effects to critical habitat

Once suspended sediment settles out of the water column and deposits on the streambed, it may degrade instream habitat quality and diversity. Increased sediment loads can dramatically alter channel morphology. Pools may fill, channels may widen (Lisle 1982), riparian vegetation may become buried, streambank heights may increase, and floodplain and flood prone areas may become disconnected (Kelsey 1980, Lisle 1982, Roberts and Church 1986). These alterations in geomorphology (*i.e.,* excess sediment buildup, changes in proportion of fines) can increase the frequency and magnitude of localized flood events. It may take decades before channels impacted by large aggradation events can fully recover (Madej *et al.* 2009). Lowland river systems are particularly susceptible to the effects of excess sedimentation owing to their low energy and limited ability to recover to their natural form (Kemp *et al.* 2011). In spawning gravels, deposited fine sediment fills interstitial spaces between particles, reducing intergravel flow and inhibiting alevin movement, thereby decreasing survival rates (Kondolf 2000 and Greig *et al.* 2005). Excess fine sediment smothers habitat used by benthic organisms, decreasing the production of algae and macroinvertebrates that are an important food source for fry, juveniles, and smolts (Suttle *et al.* 2004, Cover *et al.* 2008). It can also decrease habitat availability and cover thereby increasing predation risks. However, streams subject to infrequent episodes adding small volumes of sediment to the channel may not experience dramatic morphological changes (Rogers 2000).

Suspended sediment levels, and by extension sediment deposition levels, that result from the proposed action will likely be much less severe than those evaluated in the scientific literature. The effects of mobilized sediment are expected to be relatively minor and spatially isolated due to the relatively small volume of sediment released and the minimization measures (Section 1.3.2.2) and sideboards that will be followed. For example, projects to improve fish passage require removal of at least 80 percent of the upstream sediment wedge, keeping this sediment from waterways. For restoration actions located in upslope or riparian areas, sediment mobilization will be minimized through road outsloping, reseeding and mulching disturbed areas, and other erosion control measures. These erosion control measures are expected to prevent a majority of the sediment from reaching fish bearing streams.

NMFS does not expect sediment effects to accumulate downstream of restoration sites within a given watershed. 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). Due to the proposed sediment minimization measures (Section 1.3.2.2), 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 planned 1,500-foot buffer between instream projects (which also describes how far the sediment effects are expected to extend downstream) is likely large enough to preclude sediment effects from accumulating at downstream project sites, and is the 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 additive sediment-related effects. Assuming projects will 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, the occurrence of restoration projects in close proximity to each other 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, because most project-related sediment will 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 the Humboldt County data (Humboldt County 2004).

2.5 Cumulative Effects

"Cumulative effects" are those effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation (50 CFR 402.02). Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

Listed salmonid species may be affected by numerous future non-federal activities, such as timber harvest, road construction, residential development, and agriculture, which are described in the *Environmental Baseline* section. A search of upcoming timber harvest plans on the CalFire website (http://www.fire.ca.gov/ResourceManagement/THPStatusUpload/THPStatusTable.html) confirms that timber harvesting will likely continue for up to seven years. NMFS assumes these activities, and similar resultant effects, on listed salmonid species will continue through the five-year period of this opinion.

Marijuana cultivation occurs throughout many of the watersheds in the action area, and diverts water from rivers and tributaries, introduces chemicals and waste into the environment, damages stream channels (*e.g.*, streambank and channel alterations), potentially increases stream temperatures, and disturbs soil and forest resources (Bauer *et al.* 2015). Such impacts will likely result in sediment delivery to streams (Bauer *et al.* 2015).

Habitat restoration actions carried out by state or private entities without Federal involvement are expected to have similar impacts to those described in this opinion, and would contribute to cumulative sediment impacts.

The sideboards on the total number of sediment-producing projects per watershed are conservative in recognition of the potential of the additive effects of these sediment-producing activities.

2.6 Integration and Synthesis

The Integration and Synthesis section is the final step in our assessment of the risk posed to species and critical habitat as a result of implementing the proposed action. In this section, we

add the effects of the action (Section 2.4) to the environmental baseline (Section 2.3) and the cumulative effects (Section 2.5), taking into account the status of the species and critical habitat (section 2.2), to formulate the agency's biological opinion as to whether the proposed action is likely to: (1) reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing its numbers, reproduction, or distribution; or (2) reduce the value of designated or proposed critical habitat for the conservation of the species.

2.6.1 Listed Species

2.6.1.1 Coho Salmon

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 occurred 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.* 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, therefore the likelihood of both survival and recovery are reduced compared to an ESU at low risk of extinction..

2.6.1.2 Steelhead

Steelhead populations throughout central and northern California have also decreased in abundance, but are still widely distributed in most coastal areas of their DPS. 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. Therefore, the likelihood of both survival and recovery are reduced compared to an ESU at low risk of extinction..

2.6.1.3 Chinook Salmon

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 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 the long-term risk of extinction, and is likely to contribute to the short-term risk of extinction in the foreseeable future. The ESU's geographic distribution has been moderately reduced, but especially for southern populations in general and spring-run Chinook salmon populations in particular. Based on the above information, recent status reviews and available information indicate CC Chinook salmon are likely to become endangered in the foreseeable future. Therefore, the likelihood of both survival and recovery are reduced compared to an ESU at low risk of extinction.

2.6.2 Critical Habitat

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: water diversions, 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 from upland areas, loss of shade (higher water temperatures), and loss of nutrient inputs (61 FR 56138).

2.7 Conclusion

Although projects authorized by the RGP are intended to restore anadromous salmonid habitat, small amounts of take of listed salmonids will likely result from fish relocation and de-watering activities and the temporary effects of sediment mobilization, modified hydrology, and other minor impacts. Adverse effects to listed salmonids at these sites are primarily expected to be in the form of short-term behavioral effects with minimal mortality. Short-term impacts to salmonid habitat from restoration activities will be minimal and localized at each project site. The temporal and spatial limits (*i.e.*, sideboards) included in the proposed action will preclude significant additive effects. 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 numerous minimization measures (Section 1.3.2.2) that will be utilized during implementation. NMFS anticipates the effects of individual restoration projects will not significantly reduce the number of returning listed salmonid adults.

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 FRGP'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. The restoration projects are intended to restore degraded salmonid habitat and associated riparian zones; improve instream cover, pool habitat, and spawning gravel; 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 will provide improvements to salmonid habitat over the long term. 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 tum lead to improved abundance, productivity, spatial structure, and diversity within each affected watershed population. As individual population viability improves, the viability of the diversity strata and ESUs/DPSs will improve as well.

After reviewing and analyzing the current status of the listed species and critical habitat, the environmental baseline within the action area, the effects of the proposed action, effects of interrelated and interdependent activities, and cumulative effects, it is NMFS' 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 or destroy or adversely modify the designated critical habitat for these species.

2.8 Incidental Take Statement

Section 9 of the ESA and Federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a 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 regulation to include significant habitat modification or degradation that actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding, or sheltering (50 CFR 222.102). "Incidental take" is defined by regulation as takings that result from, but are not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or applicant (50 CFR 402.02). Section 7(b)(4) and section 7(o)(2) provide that taking that is incidental to an otherwise lawful agency action is not considered to be

prohibited taking under the ESA if that action is performed in compliance with the terms and conditions of this incidental take statement.

2.8.1 Amount or Extent of Take

In the biological opinion, NMFS determined that incidental take would occur as follows:

NMFS estimates that a small number (up to 3 percent) of juvenile coho salmon, steelhead, and Chinook salmon may be injured or killed during relocation activities in the areas to be dewatered. A small number of fish (1 percent of fish present) will avoid capture. These fish will be exposed to dewatering and construction activities at the project site and will be injured or killed by crushing or desiccation. Table 9 lists the estimated annual take for each ESU/DPS, as first presented in the Effects Section.

Table 9: Maximum annual future take amounts based on observed capture numbers from 2005 to 2015, and estimated mortality rates, resulting from dewatering and relocation.

	Coho Salmon		Chinook salmon	Steelhead		
	SONCC	**CCC**	**CC**	**NC**	**CCC**	**S-CCC**
Maximum No. Juveniles Captured in Any Year 2005-2015	1088	274	18	5887	817	408[11]
1 Percent Mortality (Dewatering)	11	3	1	59	8	4
3 Percent Mortality (Relocation)	33	9	1	177	25	12

The total extent of take is associated with projects at least 1,500 feet apart and limited at each project site to no more than 500 contiguous feet of stream channel and to the maximum annual number of instream projects conducted under the proposed RGP for each size of HUC 10 watershed (Table 10).

[11] As no S-CCC steelhead were relocated from 2005 to 2015, likely reflecting the relative scarcity of this species, there was no impact of relocation on this DPS. However, it is possible that the number of fish in this DPS may improve over the period of the proposed action, or different locations may be utilized than during the past 11 years, so take is allowed for this DPS based on half of the take observed in the adjacent CCC steelhead DPS.

Table 10. Maximum number of projects to be carried out in each HUC-10 per year, based on the size of the HUC-10.

Size of HUC-10 watershed (mi^2)	Maximum number of instream projects per year
<50	2
51-100	3
101-150	4
151-250	5
251-350	6
351-500	9
>500	12

2.8.2 Effect of the Take

In the biological opinion, NMFS determined that the amount or extent of anticipated take, coupled with other effects of the proposed action, is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat.

2.8.3 Reasonable and Prudent Measures

"Reasonable and prudent measures" are nondiscretionary measures that are necessary or appropriate to minimize the impact of the amount or extent of incidental take (50 CFR 402.02).

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, and S-CCC steelhead:

1. Take measures to minimize harm and mortality to listed salmonids resulting from fish relocation, dewatering, or instream construction activities.

2. Take measures to ensure that individual restoration projects authorized annually through the RGP will minimize take of listed salmonids, and monitor and report take of listed salmonids on individual projects to better assess the effects and benefits of salmonid restoration projects authorized through the RGP.

3. Utilize information collected from the implementation, effectiveness, and validation monitoring to reduce impacts on listed salmonids and advance restoration science.

2.8.4 Terms and Conditions

The terms and conditions described below are non-discretionary, and the Corps or any applicant must comply with them in order to implement the reasonable and prudent measures (50 CFR 402.14). The Corps or any applicant has a continuing duty to monitor the impacts of incidental take and must report the progress of the action and its impact on the species as specified in this incidental take statement (50 CFR 402.14). If the entity to whom a term and condition is directed does not comply with the following terms and conditions, protective coverage for the proposed action would likely lapse.

1. The following term and condition implements reasonable and prudent measure 1:

    a. Fish relocation data must be provided annually as described in Term and Condition 2b(i) below. Any injuries or mortality from a fish relocation site that exceeds 3 percent[12] 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:

    a. The Corps and/or CDFW shall provide NMFS annual notification of all new or ongoing projects that are authorized through the RGP for that year. The notification shall be submitted at least 14 days prior to project implementation and must include raw data, presented in spreadsheet form, documenting specific project information: The name of project, project type (FRGP code), location of project (creek, HUC-10 (5th field) watershed, city or town, and county) and the size (square miles) of the HUC-10 for each project. In addition, a summary of the number of projects of sediment-producing project types (see opinion for list) per HUC-10 of each size shall be provided, also due at least 14 days prior to project implementation. See table below for template.

[12] 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.

Size of HUC-10 watershed (mi^2)	Maximum number of sediment-producing projects per year	Planned number of sediment-producing projects for year x
<50	2	
51-100	3	
101-150	4	
151-250	5	
251-350	6	
351-500	9	
>500	12	

The annual notification shall be submitted to the following NMFS offices:

National Marine Fisheries Service
North Central California Office
777 Sonoma Avenue, Room 325
Santa Rosa, California 95404

National Marine Fisheries Service
Northern California Office
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 CDFW 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, HUC-10, affected species, and ESU/DPS:

   i. Raw data documenting the number and species, HUC-10, and ESU or DPS of each fish relocated, injured, or killed (including adult salmonids or half-pounder steelhead) shall be provided in spreadsheet form. Any injuries or mortality from a fish relocation site that exceeds 3.0 percent of the affected listed species shall have an explanation describing why. In addition, a summary of the number of fish relocated, injured or killed for each ESU/DPS shall be provided. See table below for template.

ESU or DPS	Number Fish Relocated in Year x (e.g., 2017)	Number Fish Injured in Year x	Number of Fish Killed in Year x
SONCC coho salmon			
etc.			

ii. Raw data presented in spreadsheet form documenting the number of new or ongoing sediment-producing projects carried out in given year per HUC-10, including both new and ongoing projects. A summary of the number of projects from all sediment-producing project types for each size of HUC-10, along with the size of each HUC-10, shall be provided. See table below for template.

Size of HUC-10 watershed (mi^2)	Maximum number of sediment-producing projects per year	Actual number of sediment-producing projects for year x
<50	2	
51-100	3	
101-150	4	
151-250	5	
251-350	6	
351-500	9	
>500	12	

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

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

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

vi. The distance (miles) of road decommissioned.

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

Submit this report annually by March 1 to the following NMFS offices:

National Marine Fisheries Service 777 Sonoma Avenue, Room 325 Santa Rosa, California 95404	National Marine Fisheries Service 1655 Heindon Road Arcata, California 95521

3. The following term and condition implement reasonable and prudent measure 3:

a. Within one year, develop a team of NMFS and CDFW to review the results of implementation, effectiveness, and validation monitoring and assess if there are opportunities to reduce impacts on listed salmonids and/or advance restoration science.

2.9 Conservation Recommendations

Section 7(a)(1) of the ESA directs Federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of the threatened and endangered species. Specifically, conservation recommendations are suggestions regarding discretionary measures to minimize or avoid adverse effects of a proposed action on listed species or critical habitat or regarding the development of information (50 CFR 402.02).

NMFS suggests the following conservation recommendations:

1. The Corps and/or CDFW 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. Such planting will help increase the value of critical habitat to threatened and endangered species. 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 three plantings to one removed woody plant.

2. 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. Following these recommendations will help improve the value of critical habitat of listed species by improving habitat quality, and will enhance recovery of the listed species that utilize the habitat.

3. The Corps and/or CDFW should incorporate project data into a format compatible with the CDFW/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. The Corps and/or CDFW should make reports, assessments, and surveys more readily accessible to the public via their website (*e.g.*, Grant Program website and/or Calfish.org). Such activities would enhance information sharing between entities carrying out habitat restoration, leading to

more efficient and effective habitat restoration and promoting recovery of listed species that use the habitat.

In order for NMFS to keep 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.

2.10 Reinitiation of Consultation

This concludes formal consultation for the Corps Issuance of an RGP to the CDFW for implementation of the FRGP program in coastal Northern and Central California.

As 50 CFR 402.16 states, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained or is authorized by law and if: (1) the amount or extent of incidental taking specified in the incidental take statement is exceeded, (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion, (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this opinion, or (4) a new species is listed or critical habitat designated that may be affected by the action.

2.11 "Not Likely to Adversely Affect" Determinations

NMFS does not anticipate the proposed action will take southern DPS Pacific eulachon. Adult eulachon spawning has been documented in the Mad River, Redwood Creek, and the Klamath River. Critical habitat for spawning and migration extends from 11 to 13 miles upstream in these rivers (NMFS 2010). Spawning begins and ends in April in the Mad River and Redwood Creek, and begins in December and ends in May in the Klamath River (NMFS 2010). Restoration actions may occur within tributaries that drain into San Francisco Bay, where green sturgeon migrate and rear as the pass from upstream spawning areas to marine foraging habitat. Sediment may be released into the Klamath River, Mad River, Redwood Creek, and San Francisco Bay tributaries during restoration action, but as stated in the Effects Section, sediment impacts to critical habitat from restoration actions are expected to be minor and short-lived, and are unlikely to cumulatively combine within downstream habitat when multiple projects occur in one watershed. This reasoning also applies to potential impacts in downstream estuarine habitat. Furthermore, any minor sediment effects that do convey to the estuary environment or the Klamath River will quickly dissipate within the larger spatial area of the receiving water body. Thus, based upon this analysis, NMFS concurs with the Corps determination that the proposed action is not likely to adversely affect Pacific eulachon or its critical habitat because its effects are expected to be insignificant.

NMFS does not anticipate the proposed action will take southern DPS Green Sturgeon (*Acipenser medirostris*). Within the action area, Green Sturgeon may occur within San Francisco Bay and the Klamath River and estuary, downstream of Ishi Pishi Falls near the town of Orleans. Restoration actions may occur within tributaries that drain into San Francisco Bay and the

Klamath River/estuary, and sediment may be released into these water bodies from restoration actions. However, any impacts to critical habitat or Green Sturgeon are expected to be minor and short-lived due to the proposed minimization measures (Section 1.3.2.2) and project "sideboards," and are unlikely to cumulatively combine as they extend downstream (see Effects Section). Furthermore, any minor sediment effects that do convey to the estuary environment or the Klamath River will quickly dissipate within the larger spatial area of the receiving water body. Thus, based upon this analysis, NMFS concurs with the Corps determination that the proposed action is not likely to adversely affect Green Sturgeon or its critical habitat because its effects are expected to be insignificant.

NMFS does not anticipate the proposed action will take Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon California or Central Valley steelhead, or affect their critical habitat. These species typically spawn and rear within the Sacramento/San Joaquin river system upstream of the action area, and do not enter riverine habitat that drains into San Francisco Bay. Sediment arising from restoration actions in San Francisco Bay tributaries may enter estuarine habitat, but the likelihood this sediment would significantly impact juvenile salmonids or their habitat is very low and are expected to be minor and short-lived due to the proposed minimization measures (Section 1.3.2.2) and project "sideboards". Furthermore, sediment impacts are unlikely to cumulatively combine as they extend downstream (see Effects Section). Finally, any minor sediment effects that do convey to the estuary environment will likely quickly dissipate within the larger spatial area of the receiving water body. Thus, based upon this analysis, NMFS concurs with the Corps determination that the proposed action is not likely to adversely affect Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon or California Central Valley steelhead, or their critical habitats, because its effects are expected to be insignificant.

3. MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT ESSENTIAL FISH HABITAT CONSULTATION

Section 305(b) of the MSA directs Federal agencies to consult with NMFS on all actions or proposed actions that may adversely affect EFH. The MSA (section 3) defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." Adverse effect means any impact that reduces quality or quantity of EFH, and may include direct or indirect physical, chemical, or biological alteration of the waters or substrate and loss of (or injury to) benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality or quantity of EFH. Adverse effects on EFH may result from actions occurring within EFH or outside of it and may include site-specific or EFH-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810). Section 305(b) also requires NMFS to recommend measures that can be taken by the action agency to conserve EFH.

This analysis is based, in part, on descriptions of EFH for Pacific coast salmon (PFMC 1999) contained in the fishery management plan developed by the Pacific Fishery Management Council and approved by the Secretary of Commerce.

3.1 Essential Fish Habitat Affected by the Project

Pacific Coast Salmon EFH

3.2 Adverse Effects on Essential Fish Habitat

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 1,500 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; the chance of spills is low based on the minimization measures (Section 1.3.2.2) to be implemented when heavy construction equipment is used, and to reduce the impact of a spill should one occur.

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 (Section 1.3.2.2) utilized during project implementation. The temporal scale (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 10 in the associated biological opinion]) 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 activities is expected to improve the function and value of EFH within the watersheds; short-term adverse effects will be offset by anticipated long-term benefits.

3.3 Essential Fish Habitat Conservation Recommendations

NMFS recommends that Conservation Recommendation 1 and 2 (in section 2.9 of the associated biological opinion), regarding the replanting of disturbed riparian vegetation, be implemented by the Corps or the applicant in order to address the adverse effects of ground disturbance leading to sediment release and loss of riparian vegetation.

3.4 Statutory Response Requirement

As required by section 305(b)(4)(B) of the MSA, the Corps must provide a detailed response in writing to NMFS within 30 days after receiving an EFH Conservation Recommendation. Such a response must be provided at least 10 days prior to final approval of the action if the response is

inconsistent with any of NMFS' EFH Conservation Recommendations unless NMFS and the Federal agency have agreed to use alternative time frames for the Federal agency response. The response must include a description of measures proposed by the agency for avoiding, mitigating, or offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with the Conservation Recommendations, the Federal agency must explain its reasons for not following the recommendations, including the scientific justification for any disagreements with NMFS over the anticipated effects of the action and the measures needed to avoid, minimize, mitigate, or offset such effects (50 CFR 600.920(k)(1)).

In response to increased oversight of overall EFH program effectiveness by the Office of Management and Budget, NMFS established a quarterly reporting requirement to determine how many conservation recommendations are provided as part of each EFH consultation and how many are adopted by the action agency. Therefore, we ask that in your statutory reply to the EFH portion of this consultation, you clearly identify the number of conservation recommendations accepted.

3.5 Supplemental Consultation

The Corps must reinitiate EFH consultation with NMFS if the proposed action is substantially revised in a way that may adversely affect EFH, or if new information becomes available that affects the basis for NMFS' EFH Conservation Recommendations (50 CFR 600.920(l)).

4. DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

The Data Quality Act (DQA) specifies three components contributing to the quality of a document. They are utility, integrity, and objectivity. This section of the opinion addresses these DQA components, documents compliance with the DQA, and certifies that this opinion has undergone pre-dissemination review.

4.1 Utility

Utility principally refers to ensuring that the information contained in this consultation is helpful, serviceable, and beneficial to the intended users. The intended user of this opinion is the Corps. Other interested users could include the CDFW and residents of 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. Individual copies of this opinion were provided to the Corps. This opinion will be posted on the Public Consultation Tracking System web site (https://pcts.nmfs.noaa.gov/pcts-web/homepage.pcts). The format and naming adheres to conventional standards for style.

4.2 Integrity

This consultation was completed on a computer system managed by NMFS in accordance with relevant information technology security policies and standards set out in Appendix III, 'Security

of Automated Information Resources,' Office of Management and Budget Circular A-130; the Computer Security Act; and the Government Information Security Reform Act.

4.3 Objectivity

Information Product Category: Natural Resource Plan

Standards: This consultation and supporting documents are clear, concise, complete, and unbiased; and were developed using commonly accepted scientific research methods. They adhere to published standards including the NMFS ESA Consultation Handbook, ESA regulations, 50 CFR 402.01 et seq., and the MSA implementing regulations regarding EFH, 50 CFR 600.

Best Available Information: This consultation and supporting documents use the best available information, as referenced in the References section. The analyses in this opinion and EFH consultation contain more background on information sources and quality.

Referencing: All supporting materials, information, data and analyses are properly referenced, consistent with standard scientific referencing style.

Review Process: This consultation was drafted by NMFS staff with training in ESA and MSA implementation, and reviewed in accordance with West Coast Region ESA quality control and assurance processes.

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