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 95404-4731

July 1, 2020 **Refer to NMFS No:** WCRO-2020-00688

Lieutenant Colonel John Cunningham
Chief, Regulatory Division
U.S. Department of the Army
San Francisco District, Corps of Engineers
450 Golden Gate Avenue, 4th Floor, Suite 0134
San Francisco, California 94102-3406

Re: Endangered Species Act Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the U.S. Army Corps of Engineers' Programmatic Bio-Engineered Bank Stabilization Permitting Program

Dear Colonel Cunningham:

Thank you for your letter of January 10, 2020, requesting initiation of consultation with NOAA's National Marine Fisheries Service (NMFS) pursuant to section 7 of the Endangered Species Act of 1973 (ESA) (16 U.S.C. 1531 et seq.) for U.S. Army Corps of Engineers' (Corps) Programmatic Bio-Engineered Bank Stabilization Permitting Program (Program). Thank you, also, for your request for consultation pursuant to the essential fish habitat (EFH) provisions in Section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA)(16 U.S.C. 1855(b)) for this action.

The enclosed biological opinion is based on our review of the Corps' Program, and describes NMFS' analysis of potential effects on threatened North Coast (NC), Central California Coast (CCC), and South-Central California Coast (S-CCC) steelhead (*Oncorhynchus mykiss*); threatened Southern Oregon/Northern California Coasts (SONCC) and endangered CCC coho salmon (*O. kisutch*); threatened Coastal California (CC) Chinook salmon (*O. tshawytscha*); and their designated critical habitat, in accordance with Section 7 of the ESA. In the enclosed biological opinion, NMFS concludes the Program is not likely to jeopardize the continued existence of these ESA-listed salmon or steelhead, nor is it likely to adversely modify their critical habitat. However, NMFS anticipates take of these species will occur as a result of the Program, and thus, an incidental take statement that applies to the Program is included with the enclosed biological opinion.

NMFS also reviewed the likely effects of the proposed action on EFH, pursuant to section 305(b) of the MSA (16 U.S.C. 1855(b)). Based on our review, the Program will occur within an area identified as EFH for coho salmon and Chinook salmon, managed under the Pacific Coast Salmon Fishery Management Plan. The Program is proposed with design, staging, monitoring, and adaptive management strategies recommended by NMFS to avoid or minimize potential adverse effects to EFH, and with elements that promote species recovery. Thus, no EFH conservation recommendations are currently provided.

Please contact Rick Rogers at 707-578-8552 or rick.rogers@noaa.gov if you have any questions concerning this consultation, or if you require additional information.

Sincerely,

Alecia Van Atta
Assistant Regional Administrator
California Coastal Office

Enclosure

cc: Copy to ARN File # 151422WCR2020SR00050

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

U.S. Army Corps of Engineers' Programmatic Bio-Engineered Bank Stabilization Permitting Program

NMFS Consultation Number: WCRO-2020-00688
Action Agency: U.S. Army Corps of Engineers, San Francisco District

Table 1. Affected Species and NMFS' Determinations:

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

Table 2. Essential Fish Habitat (EFH) and NMFS' Determinations:

Fishery Management Plan That Identifies EFH in the Project Area	Does Action Have an Adverse Effect on EFH?	Are EFH Conservation Recommendations Provided?
Pacific Coast Salmon	Yes	No

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

Issued By:

Alecia Van Atta
Assistant Regional Administrator
California Coastal Office

Date: July 1, 2020

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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 (ITS) portions of this document in accordance with section 7(b) of the Endangered Species Act (ESA) of 1973 (16 USC 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 (DQA) (section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001, Public Law 106-554). A complete record of this consultation is on file at our Santa Rosa, California office.

1.2 Consultation History

In early 2019, NMFS broached the idea with the U.S. Army Corps of Engineers (Corps) of developing a programmatic approach for permitting bio-engineered bank stabilization projects. NMFS provided technical assistance to the Corps to develop the draft proposed action, and provided a suggested draft to the Corps on March 25, 2019. NMFS received initial comments back from the Corps via email dated April 22. 2019, and during a subsequent conference call with the Corps project lead on the same day. Final Corps' comments were transmitted via email on December 19, 2019. NMFS addressed the comments to the Corps' satisfaction, and the Corps utilized the resulting proposed action to request formal consultation on January 10, 2020.

1.3 Proposed Federal 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 permit bio-engineered streambank stabilization projects via section 10 of the Rivers and Harbors Act of 1899, and section 404 of the Federal Water Pollution Control Act, as amended (Clean Water Act (CWA)), for a period of five years (hereafter referred to as "the Bio-engineered Streambank Stabilization Program", or "Program"). The proposed permits issued under this Program apply to freshwater, riverine portions of the following counties that are within the regulatory jurisdictional boundaries of the Corps' San Francisco District: San Benito, San Luis Obispo, Monterey, Santa Cruz, San Mateo, Santa Clara, San Francisco, Alameda, Contra Costa, Solano, Napa, Marin, Sonoma, Mendocino, Humboldt, Del Norte, Shasta, Siskiyou, Trinity, Glen, and Lake.

The Corps proposes to permit applicants to stabilize streambanks so that public and private infrastructure is not lost or damaged due to the long-term effects of toe erosion, scour, subsurface entrainment, or mass streambank failure. Proposed streambank stabilization methods include the following, either alone or in combination: alluvium placement, large wood placement, vegetated riprap with large wood (LW), log or roughened rock toe[1], woody plantings, herbaceous cover, deformable soil reinforcement, coir logs, soil lifts, bank reshaping and slope grading, floodplain flow spreaders, floodplain roughness, and engineered log jams (ELJs). Where necessary, project site dewatering and fish capture/relocation are proposed.

Bank stabilization actions permitted by the Corps under this Program only apply to projects designed to protect critical infrastructure (*e.g.,* public water and sewer lines, power lines, transportation infrastructure, roads, bridges, *etc.*) and property (*e.g.,* homes, public/private business buildings, local government buildings, *etc.*). The Bio-engineered Streambank Stabilization Program does not apply to projects utilizing only rip-rap or other permanent non-vegetative, non-native materials; or projects not involving critical infrastructure. These excluded projects must undergo individual section 7 consultation if they may affect listed species or critical habitat.

Some actions may require supplemental conservation measures. For further information on supplemental measures, please "*Actions That Require Supplemental Conservation Measures"* further below in the proposed action.

The Corps proposes to apply the following guidance and requirements to all bank stabilization projects covered under the Bio-engineered Streambank Stabilization Program. Measures described under "*Program Administration*" will be used by the Corps as it manages the Bio-engineered Streambank Stabilization Program for both Regulatory and Civil Works authorities.

1.3.1 Program Administration

This proposed action includes a process designed to ensure that only activities that are properly part of the Bio-engineered Streambank Stabilization Program get treated as such, and also to provide a mechanism by which the Corps and NMFS can track the number and nature of projects proceeding under this Program. In sum, the review and verification process involves early notification to the Corps by project applicants, the Corps making a determination as to whether each project meets the criteria of the Bio-engineered Streambank Stabilization Program, and finally NMFS verifying that determination for each project. This verification process is not an ESA consultation and does not involve either agency making effect determinations or jeopardy/no jeopardy decisions about a project; rather, it provides a protocol by which the Corps makes decisions, and NMFS either agrees or disagrees that a proposed project can be included under the Bio-engineered Streambank Stabilization Program and associated ESA programmatic consultation.

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1 Rock toes are structural stabilization measures that protect streambanks at the stream bed/streambank interface where erosive forces are greatest. Rock toes horizontally line this interface, typically extending vertically from the maximum streambed scour depth up to the lower limit of vegetation (Cramer *et al.* 2003).

Initial Program Rollout

The Corps will partner with NMFS to provide an initial rollout of this Program for staff of both agencies to ensure that when projects are to be incorporated into the Program, the requirements of the Program are considered at the onset of each project, and incorporated into all phases of project design, and that any constraints, such as the need for fish passage or hydrologic engineering, are resolved early on and not attempted in haste as add-on features at the end of project design.

Corps Review, Verification, and Enrollment of Incoming Projects

Applicants wishing to implement streambank stabilization projects will contact the Corps regarding required permitting under section 404 of the Clean Water Act and section 10 of the Rivers and Harbors Act of 1899. The Corps will review and approve each project to be covered under the Program to ensure that the project: 1) occurs within the Corps' San Francisco District boundaries; 2) proposes an approved bio-engineered bank stabilization project-type (see Section 1.3.2); and 3) conforms to all requirements contained in the Program.

Electronic Notification

Once the Corps makes a determination that project inclusion under this Program is appropriate, the Corps will submit an Action Notification form to the "Bio-engineered Streambank Stabilization Program" mailbox (Corps.Bankstabprogrammatic.wcr@noaa.gov) at least 14 days prior to the start of construction.[2] A notification form template can be found in Appendix B, and instructions regarding form submittal appear in Appendix A.

NMFS Review

NMFS' review is initiated if the Corps' submittal contains sufficient detail for NMFS to verify that the proposed action is consistent with all provisions of the Program. Following NMFS agreement that the project conforms to the Program, the Corps may include the action in the Program. Within 14 days of NMFS review, NMFS will respond to the Corps via email as to whether or not NMFS agrees the project can be included in the Program.

Site Access

The Corps will retain the right of reasonable access to each project site to monitor compliance with the Program.

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[2] Due to their complexity and potential for failure, wing deflectors, stream barbs and full-spanning weirs require additional review by a NMFS engineer, and must be designed by a licensed professional. These projects must be submitted so that NMFS has 60 days to review and verify the project for inclusion under the Program.

1.3.2 Project Implementation

Project Design

The following streambank stabilization methods may be used individually or in combination: alluvium placement, large wood placement, vegetated riprap with large wood, ELJs, woody plantings, herbaceous cover in areas where the native vegetation does not include trees or shrubs, bank reshaping and slope grading, coir logs, deformable soil reinforcement, floodplain flow spreaders, floodplain roughness, wing deflectors, stream barbs and full-spanning weirs. In addition to the limits and requirements stated below, all project designs, both bio-engineered bank stabilization projects and mitigation projects, must be consistent with industry-accepted bio-engineering design guidance, such as that found in California Department of Fish and Wildlife - Salmonid Restoration Manual (fourth edition) (CDFG 2010) or Washington State Aquatic Habitat Guidelines Program: Integrated Streambank Protection Guidelines (Cramer *et al.* 2003).

The maximum linear length of streambank stabilized per individual project shall not exceed three-times the active channel width at the project site. To the extent feasible, use site design to retain natural vegetation, large wood, and permeable soils, limit compaction, and otherwise minimize the extent and duration of earthwork (*e.g.,* compacting, dredging, drilling, excavation).

In addition, the following best practices apply to all projects in the program:

- No large woody debris (LWD) or trees will be removed in active (wetted) channels. Trees outside the wetted channel may be removed for access routes for construction equipment. If trees need to be removed from other portions of the project site, do not remove native riparian trees or shrubs over 3 inches in diameter at breast height or reduce canopy cover provided by hardwoods or conifers. Replant any trees removed to achieve 1:1 successful revegetation by one of the following methods: a) trees removed can be replanted at 3:1, or b) site can be monitored for 2 years and replanted until 1:1 successful revegetation is achieved.
- Limit new access routes requiring tree removal and grading to no more than two. Access routes should not be along the top of the stream bank but relatively perpendicular (45 to 90 degrees is acceptable) to bank.
- Where available, use existing ingress or egress points, or perform work from the top of the stream banks.
- Check heavy equipment daily for leaks. Do not use equipment until leak is fixed.
- Refuel outside of active stream channel or above ordinary high water at designated sites.
- A Spill Prevention and Control Plan shall be created, and the Plan and all materials necessary to implement shall be accessible on site.
- No work during wet weather or where saturated ground conditions exist; if a 60% chance of a one half inch of rain or more within a 24-hour period is forecasted, then the site shall be treated with erosion control measures and construction operations will cease until 24 hours after rain has ceased.

- Petroleum products, chemicals, fresh cement, or water contaminated by the aforementioned shall not be allowed to enter flowing waters.
- Adequate erosion control supplies (gravel, straw bales, shovels, *etc.*) shall be stored on site.
- Any disturbed ground must receive appropriate erosion control treatment (mulching, seeding, planting, *etc.*) prior to the end of the construction season, prior to a cease of operations due to forecasted wet weather, and within seven days of Project completion. Operations will use all feasible techniques to prevent any sediment from entering a drainage system.
- Work pads, falsework, and other construction items will be removed from the 100 year floodplain by the end of the construction window.
- In areas expected or forecasted to get rainfall during the construction season, effective erosion control measures shall be in place at all times during construction activities. Construction within the 5-year floodplain may not begin until all temporary erosion controls (*e.g.,* straw bales, silt fences that are effectively keyed in) are in place, downslope of project activities within the riparian area. Erosion control structures shall be maintained throughout, and possibly after, construction activities. Sediment shall be removed from sediment controls once it has reached one-third of the exposed height of the control. Whenever straw bales are used, they shall be staked and dug into the ground 12 centimeters (cm). Catch basins shall be maintained so that no more than 15 cm of sediment depth accumulates within traps or sumps.
- Based on a field geomorphic assessment, the channel bed and banks shall be re-contoured after construction to achieve the anticipated natural self-sustaining pool-riffle morphology to the extent feasible.
- To minimize the potential for cumulative sediment impacts in downstream habitat, projects constructed during the same field season must be separated longitudinally (*i.e.*, upstream and downstream) by at least 350-meters.

In-Water Work Timing

Work within flowing water will occur only between June 15 and October 15. Work outside of the active channel that does not disturb soil and produce sediment run-off may be allowed year-round if agreed to by NMFS beforehand.

Actions That Require Supplemental Conservation Measures

The Corps or applicant will provide supplemental conservation measures for the following activities:

- Any action that constricts existing channel capacity.
- Any riprap revetment that extends rock above the streambank toe.
- Any riprap revetment that extends the use of riprap laterally into an area that was not previously revetted, if working on a previously hardened streambank stabilization site (*e.g.,* previously used riprap, shotcrete, cement retaining wall, *etc.*).

- Any riprap revetment that does not include adequate vegetation and LWD.
- Any action that displaces riparian or aquatic habitats[3] (including submerged aquatic vegetation) or otherwise prevents development of natural habitat processes, to be determined by the Corps with technical assistance from NMFS.[4]

The above actions cause higher degrees of environmental impacts than preferred bio-engineering approaches (*e.g.,* those found in CDFW 2010 and Cramer *et al.* 2003); supplemental conservation measures are intended to ameliorate these impacts by implementing further projects benefiting stream channel and riparian function. The preferred approach is for an applicant to provide in-kind, on-site supplemental conservation within the project area. The second option is to provide in-kind, off-site supplemental conservation within the same 5th field hydrologic unit code (HUC) watershed that the project is located in, as close to the project area as possible, and preferably within the same 6th field sub-watershed. If the in-kind approach is not feasible, the third option is to provide on-site, out-of-kind supplemental conservation measures. The last and least preferred option is either to: a) purchase credits from an appropriate, NMFS-approved mitigation/conservation bank or purchase credits from an approved in-lieu-fee sponsor; or b) provide off-site, out-of-kind supplemental conservation.

In all cases, the applicant will describe how they considered each option, and why any of the generally more preferred methods were not practicable and/or more effective for the proposed action. In some cases, banking or other generally less preferred approaches may be the only practical options due to site conditions and/or the scale of the proposed project.

Supplemental conservation measures could include, but are not limited to, the following:

- removing rock streambank revetments,
- adding LWD or other habitat structures,
- additional riparian planting, above that which compensates for construction impacts (see required "best practices" on page 8),
- reconnecting the stream with functional floodplain,
- creating or enhancing functional floodplain habitat,
- creating or enhancing off- or side-channel habitat,
- removing impervious surface,
- conservation bank transactions.

Similar to bank stabilization work, all supplemental conservation measures must adhere to proposed minimization measures identified within this proposed action, and must utilize

3 Pertains to riparian impacts above and beyond those associated with equipment access to the project site. Equipment access impacts require tree replacement as detailed under the "Best Practices" section on page 8.

4 At NMFS' discretion, NMFS may not agree to include a project in the Program, depending on NMFS' conclusions on the need for supplemental conservation measures.

acceptable bio-engineering designs and techniques (*e.g.,* as found in CDFW 2010 or Cramer *et al.* 2003).

The Corps will conduct pre-notification coordination with NMFS at least 14 days in advance of submitting the Action Notification Form (Appendix B) with a supplemental conservation plan. NMFS will verify supplemental conservation plans meet the criteria identified for the program and reprinted below.

Supplemental conservation plans will include:

- The name, address, and telephone number of a person responsible for designing this part of the action that NMFS may contact if additional information is necessary to complete the effects analysis.
- Description of practices that will be used to ensure no net loss of habitat function.

Supplemental conservation plans should be completed before, or concurrent with, construction, whenever possible.

Achieving a habitat loss compensation ratio greater than one-to-one (*e.g.,* 1.5 to 1.0) will be necessary to compensate for any time lags between the loss of conservation value in the project area and replacement of conservation value in the supplemental conservation area, uncertainty of conservation value replacement in the supplemental conservation area, or when the affected area has demonstrably higher conservation value than the supplemental conservation area. When practicable and environmentally sound, supplemental conservation measures should be near the project impact site, or within the same 6th field HUC sub-watershed and stream(s) occupied by the affected listed fish population(s) and age classes. Supplemental conservation should be completed and generate environmental benefits prior to or concurrent with the adverse impacts, or have an increased ratio as noted above.

To minimize delays and objections during the review process, Corps permit applicants are encouraged to seek the advice of NMFS during the planning and design of supplemental conservation plans. For complex projects, such technical assistance may improve the likelihood of supplemental conservation success and reduce permit-processing time.

For riprap, the primary habitat functions of concern are related to floodplain connectivity, forage, natural cover, and free passage. Acceptable compensation for those losses include removing or retrofitting existing riprap with vegetated riprap and LWD, or one or more other streambank stabilization methods included in the Bio-engineered Streambank Stabilization Program, and restoration of shallow water or off-channel habitats.

For displaced riparian and aquatic habitat, the primary habitat functions of concern are related to the physical and biological features essential to the long-term conservation of listed species. Those are water quality, water quantity, channel substrate, floodplain connectivity, forage, natural cover, space, and free passage. Examples of acceptable compensation for riparian and aquatic habitat losses includes planting trees or other woody vegetation in the riparian area at a stocking rate that will compensate for lost habitat function after considering the age, size, numbers, and diversity of lost vegetation; removing existing overwater structures or restoration of shallow-water, off-channel, or beach habitat by adding features such as submerged or overhanging large wood, aquatic vegetation, large rocks and boulders, side channels and undercut banks. This supplemental conservation is above and beyond any required revegetation addressing temporary construction-related impacts.

As part of NMFS' review, NMFS will verify that the proposed supplemental conservation adequately offsets permanent displacement of riparian or aquatic habitats and/or impacts that prevent development of natural habitat processes. Supplemental conservation actions will meet general construction criteria and other appropriate minimization measures (dependent on the type of proposed mitigation).

We considered whether or not the proposed action would cause any other activities and determined that it would not.

1.3.3 Program Reporting

Supplemental Conservation Measures Report

For each project requiring supplemental conservation measures, the Corps or their project applicant will submit a report detailing the design and implementation of completed efforts to the NMFS Santa Rosa Office by December 31 of the year that the Corps approves that the site restoration or other supplemental measures are complete.

Annual Program Report

The Corps' will submit a monitoring report to the NMFS Santa Rosa Office by May 1 each year. The reports will describe the Corps' efforts to carry out the Bio-engineered Streambank Stabilization Program during the previous year, including a summary of overall Program activity, a map showing the location of each action authorized or carried out under the Program, a summary of project metrics (*e.g.,* project locations/types, length of bank stabilization per project/cumulative, fish relocation summary, and before/after photo documentation), and any other data or analyses the Corps deems necessary or helpful to assess program success and habitat trends as a result of actions authorized under this opinion.

Revocation or Termination

The Corps may end the Program at any time or reinitiate consultation, if for example, it determines the Program is not being implemented as intended. Similarly, NMFS may recommend reinitiation of this consultation if the Corps, or the permittees if applicable, fail to provide all applicable notification, completion, site restoration/supplemental conservation reports or annual program reports, or attend the annual coordination meeting, or if any one of the reinitiation triggers (50 CFR 402.16) are met.

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, each Federal agency must ensure that its 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 habitats. If incidental take is reasonably certain to occur, section 7(b)(4) requires NMFS to provide an ITS that specifies the impact of any incidental taking and includes non-discretionary reasonable and prudent measures (RPMs) and terms and conditions to minimize such impacts.

2.1 Analytical Approach

This biological opinion includes both a jeopardy analysis and/or 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.

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 as a whole for the conservation of a listed species" (50 CFR 402.02). The designation(s) of critical habitat for (species) use(s) the term primary constituent element (PCE) or essential features. The new critical habitat regulations (81 FR 7214) replace this term with physical or biological features (PBFs). 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 PCEs, PBFs, or essential features. In this biological opinion, we use the term PBF to mean PCE or essential feature, as appropriate for the specific critical habitat.

The 2019 regulations define effects of the action using the term "consequences" (50 CFR 402.02). As explained in the preamble to the regulations (84 FR 44977), that definition does not change the scope of our analysis and in this opinion we use the terms "effects" and "consequences" interchangeably.

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

- Evaluate the range-wide status of the species and critical habitat expected to be adversely affected by the proposed action.
- Evaluate the environmental baseline of the species and critical habitat.

- Evaluate the effects of the proposed action on species and their habitat using an exposure-response approach.
- Evaluate cumulative effects.
- In the integration and synthesis, add the effects of the action and cumulative effects to the environmental baseline, and, in light of the status of the species and critical habitat, analyze whether the proposed action is likely to: (1) directly or indirectly 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, or (2) directly or indirectly result in an alteration that appreciably diminishes the value of critical habitat as a whole for the conservation of a listed species.
- If necessary, suggest a reasonable and prudent alternative to the proposed action.

2.2 Range-wide 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 extinction risk that the listed species face, based on parameters considered in documents such as recovery plans, status reviews, and listing decisions. This informs the description of the species' likelihood of both survival and recovery. The species status section also 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 PBFs that help to form that conservation value.

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

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

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

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

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

Threatened Central California Coast (CCC) steelhead

- Listing determination (71 FR 834; January 5, 2006)
- Critical habitat designation (70 FR 52488; September 2, 2005);

Threatened Southern-Central California Coast (S-CCC) steelhead

- Listing determination (62 FR 43937; August 18, 1997)
- Critical habitat designation (70 FR 52488; September 2, 2005).

2.2.1 Species Description and Life History

Coho Salmon

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

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

Female coho salmon choose spawning areas usually near the head of a riffle, just below a pool, where water changes from a laminar to a turbulent flow and small to medium gravel substrate are present. The flow characteristics surrounding the redd usually ensure good aeration of eggs and embryos, and flushing of waste products. The water circulation in these areas also facilitates fry emergence from the gravel. Preferred spawning grounds have: nearby overhead and submerged cover for holding adults; water depth of 4 to 21 inches; water velocities of 8 to 30 inches per second; clean, loosely compacted gravel (0.5 to 5 inch diameter) with less than 20 percent fine silt or sand content; cool water ranging from 39 to 50 degrees Fahrenheit (°F) with high dissolved oxygen of 8 milligrams per liter (mg/L); and inter-gravel flow sufficient to aerate the eggs. Lack of suitable gravel often limits successful spawning.

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

The eggs generally hatch after four to eight weeks, depending on water temperature. Survival and development rates depend on temperature and dissolved oxygen levels within the redd. According to Baker and Reynolds (1986), under optimum conditions, mortality during this period can be as low as 10 percent; under adverse conditions of high scouring flows or heavy siltation, mortality may be close to 100 percent. McMahon (1983) found that egg and fry survival drops sharply when fine sediment makes up 15 percent or more of the substrate. The newly-hatched fry remain in the redd from two to seven weeks before emerging from the gravel (Shapovalov and Taft 1954). Upon emergence, fry seek out shallow water, usually along stream margins. As they grow, juvenile coho salmon often occupy habitat at the heads of pools, which generally provide an optimum mix of high food availability and good cover with low swimming cost (Nielsen 1992). Chapman and Bjornn (1969) determined that larger parr tend to occupy the head of pools, with smaller parr found further down the pools. As the fish continue to grow, they move into deeper water and expand their territories until, by July and August; they reside exclusively in deep pool habitat. Juvenile coho salmon prefer: well shaded pools at least 3.3 feet deep with dense overhead cover, abundant submerged cover (undercut banks, logs, roots, and other woody debris); water temperatures of 54° to 59° F (Brett 1952, Reiser and Bjornn 1979), but not exceeding 73° to 77° F (Brungs and Jones 1977) for extended time periods; dissolved oxygen levels of 4 to 9 mg/L; and water velocities of 3.5 to 9.5 inches per second in pools and 12 to 18 inches per second in riffles. Water temperatures for good survival and growth of juvenile coho salmon range from 50° to 59° F (Bell 1973, McMahon 1983). Growth is slowed considerably at 64° F and ceases at 68° F (Bell 1973).

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

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

<u>Chinook salmon</u>

Chinook salmon return to freshwater to spawn when they are three to eight years old (Healey

1991). Some Chinook salmon return from the ocean to spawn one or more years before they reach full adult size, and are referred to as jacks (males) and jills (females). Chinook salmon runs are designated on the basis of adult migration timing; however, distinct runs also differ in the degree of maturation at the time of river entry, thermal regime and flow characteristics of their spawning site, and actual time of spawning (Myers *et al.* 1998). Both winter-run and spring-run Chinook salmon tend to enter freshwater as immature fish, migrate far upriver, and delay spawning for weeks or months. For comparison, fall-run Chinook salmon enter freshwater at an advanced stage of maturity, move rapidly to their spawning areas on the mainstem or lower tributaries of rivers, and spawn within a few days or weeks of freshwater entry (Healey 1991).

Fall-run CC Chinook salmon migrate upstream from September through November, with most migration occurring in September and October following early-season rain storms. Spawning largely occurs from early October through December, with a peak in late October. Adequate instream flows and cool water temperatures are more critical for the survival of spring-run Chinook salmon (compared to fall-run or winter-run Chinook salmon) due to over-summering by adults and/or juveniles. Chinook salmon generally spawn in gravel beds that are located at the tails of holding pools (Bjornn and Reiser 1991). Adult female Chinook salmon prepare redds in stream areas with suitable gravel composition, water depth, and velocity. Optimal spawning temperatures range between 42° to 57° F. Redds vary widely in size and location within the river. Preferred spawning substrate is clean, loose gravel, mostly sized between 1 and 10 cm, with no more than 5 percent fine sediment. Gravels are unsuitable when they have been cemented with clay or fine particles or when sediments settle out onto redds, reducing inter-gravel percolation (62 FR 24588). Minimum inter-gravel percolation rate depends on flow rate, water depth, and water quality. The percolation rate must be adequate to maintain oxygen delivery to the eggs and remove metabolic wastes. Chinook salmon require a strong, constant level of subsurface flow, as a result, suitable spawning habitat is more limited in most rivers than superficial observation would suggest. After depositing eggs in redds, most adult Chinook salmon guard the redd from 4 to 25 days before dying.

Chinook salmon eggs incubate for 90 to 150 days, depending on water temperature. Successful incubation depends on several factors including dissolved oxygen levels, temperature, substrate size, amount of fine sediment, and water velocity. Maximum survival of incubating eggs and pre-emergent fry occurs at water temperatures between 42° and 56° F with a preferred temperature of 52° F. CC Chinook salmon fry emerge from redds during December through mid-April (Leidy and Leidy 1984).

After emergence, Chinook salmon fry seek out areas behind fallen trees, back eddies, undercut banks, and other areas of bank cover (Everest and Chapman 1972). As they grow larger, their habitat preferences change. Juveniles move away from stream margins and begin to use deeper water areas with slightly faster water velocities, but continue to use available cover to minimize predation risk and reduce energy expenditure. Fish size appears to be positively correlated with water velocity and depth (Chapman and Bjornn 1969, Everest and Chapman 1972). Optimal temperatures for both Chinook salmon fry and fingerlings range from 54° to 57° F, with maximum growth rates at 55° F (Boles 1988). Chinook salmon feed on small terrestrial and aquatic insects and aquatic crustaceans. Cover, in the form of rocks, submerged aquatic vegetation, logs, riparian vegetation, and undercut banks provide food, shade, and protect juveniles from predation. CC Chinook salmon will rear in freshwater for a few months and outmigrate during April through July (Myers *et al.* 1998).

Steelhead

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

Steelhead can be divided into two reproductive ecotypes, based upon their state of sexual maturity at the time of river entry and the duration of their spawning migration: stream maturing and ocean maturing. Stream maturing steelhead enter fresh water in a sexually immature condition and require several months to mature and spawn, whereas ocean maturing steelhead enter fresh water with well-developed gonads and spawn shortly after river entry. These two reproductive ecotypes are more commonly referred to by their season of freshwater entry (*i.e.,* summer [stream maturing] and winter [ocean maturing] steelhead). The timing of upstream migration of winter steelhead, the ecotype most likely encountered during the proposed action, is typically correlated with higher flow events occurring from late October through May. In central and southern California, significant river outflow is also often required to breach sandbars that block access from the ocean; for this reason, upstream steelhead migration in these areas can be significantly delayed, or precluded entirely during extremely dry periods. Adult summer steelhead migrate upstream from March through September; however, results from past capture/relocation efforts (NOAA Restoration Center 2015) in the action area suggest the chance of encountering adult summer steelhead during the Program's "work window" is extremely low and thus unlikely to occur. In contrast to other species of *Oncorhynchus*, steelhead may spawn more than one season before dying (iteroparity); although one-time spawners represent the majority.

Because rearing juvenile steelhead reside in freshwater all year, adequate flow and temperature are important to the population at all times [California Department of Fish and Game (CDFG) 1997]. Outmigration appears to be more closely associated with size than age. In Waddell Creek, Shapovalov and Taft (1954) found steelhead juveniles migrating downstream at all times of the year, with the largest numbers of young-of-year and age 1+ steelhead moving downstream during spring and summer. Smolts can range from 5.5 to 8 inches in length. Steelhead outmigration timing is similar to coho salmon (NMFS 2016).

Survival to emergence of steelhead embryos is inversely related to the proportion of fine sediment in the spawning gravels. However, steelhead are slightly more tolerant than other salmonids, with significantly reduced survival when fine materials of less than 0.25 inches in diameter comprise 20 to 25 percent of the substrate. Fry typically emerge from the gravel two to three weeks after hatching (Barnhart 1986).

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

Water temperature can influence the metabolic rate, distribution, abundance, and swimming ability of rearing juvenile steelhead (Barnhart 1986, Bjornn and Reiser 1991, Myrick and Cech 2005). Optimal temperatures for steelhead growth range between 50° and 68° F (Hokanson *et al.* 1977, Wurtsbaugh and Davis 1977, Myrick and Cech 2005). Variability in the diurnal water temperature range is also important for the survivability and growth of salmonids (Busby *et al.* 1996).

Suspended sediment concentrations, or turbidity, also can influence the distribution and growth of steelhead (Bell 1973, Sigler *et al.* 1984, Newcombe and Jensen 1996). Bell (1973) found suspended sediment loads of less than 25 milligrams per liter (mg/L) were typically suitable for rearing juvenile steelhead.

2.2.2 Species Status

<u>SONCC coho salmon</u>

Although long-term data on coho salmon abundance are scarce, the available evidence from short-term research and monitoring efforts indicate that spawner abundance has declined since the last status review for populations in this ESU (Williams *et al.* 2016). In fact, most of the 30 independent populations in the ESU are at high risk of extinction because they are below or likely below their depensation threshold, which can be thought of as the minimum number of adults needed for survival of a population.

The distribution of SONCC coho salmon within the ESU is reduced and fragmented, as evidenced by an increasing number of previously occupied streams from which SONCC coho salmon are now absent (Good *et al.* 2005, Williams *et al.* 2011, and Williams *et al.* 2016). Extant populations can still be found in all major river basins within the ESU (70 FR 37160). However, extirpations, loss of brood years, and sharp declines in abundance (in some cases to zero) of SONCC coho salmon in several streams throughout the ESU indicate that the SONCC coho salmon's spatial structure is more fragmented at the population-level than at the ESU scale. The genetic and life history diversity of populations of SONCC coho salmon is likely very low and is inadequate to contribute to a viable ESU, given the significant reductions in abundance and distribution.

CCC coho salmon

Historically, the CCC coho salmon ESU was comprised of approximately 76 coho salmon populations. Most of these were dependent populations that needed immigration from other nearby populations to ensure their long term survival. Eleven functionally independent populations and one potentially independent population of CCC coho salmon existed (Spence *et al.* 2008, Spence *et al.* 2012). Most of the populations in the CCC coho salmon ESU are currently are not viable, hampered by low abundance, range constriction, fragmentation, and loss of genetic diversity.

Brown *et al.* (1994) estimated that annual spawning numbers of coho salmon in California ranged between 200,000 and 500,000 fish in the 1940's. Abundance declined further to 100,000 fish by the 1960's, then to an estimated 31,000 fish in 1991. More recent abundance estimates vary from approximately 600 to 5,500 adults (Good *et al.* 2005). CCC coho salmon have also experienced acute range restriction and fragmentation. Adams *et al.* (1999) found that in the mid 1990's, coho salmon were present in 51 percent (98 of 191) of the streams where they were historically present, and documented an additional 23 streams within the CCC coho salmon ESU in which coho salmon were found for which there were no historical records. Recent genetic research has documented reduced genetic diversity within subpopulations of the CCC coho salmon ESU (Bjorkstedt *et al.* 2005), likely resulting from inter-breeding between hatchery fish and wild stocks.

Available data from the few remaining independent populations suggests population abundance continues to decline, and many independent populations that in the past supported the species abundance and geographic distributions have been extirpated. This suggests that populations that historically provided support to dependent populations via immigration have not been able to provide enough immigrants to support dependent populations for several decades.

None of the five CCC coho salmon diversity strata defined by Bjorkstedt *et al.* (2005) currently support viable coho salmon populations. According to Williams *et al.* (2016), recent surveys suggest CCC coho salmon abundance has improved slightly since 2011 within several independent populations (including Lagunitas Creek), although all populations remain well below their high-risk dispensation thresholds identified by Spence *et al.* (2008). The Russian River and Lagunitas Creek populations are relative strongholds for the species compared to other CCC coho salmon populations, the former predominantly due to out-planting of hatchery-reared juvenile fish. The overall risk of CCC coho salmon extinction remains high, and the most recent status review reaffirmed the ESU's endangered status (Rogers 2016).

NC Steelhead

With few exceptions, NC steelhead are present wherever streams are accessible to anadromous fish and have sufficient flows. The most recent status review by Williams *et al.* (2016) reports that 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 previous status review update in 2011 (Williams *et al.* 2011). Williams *et al.* (2016) found that population abundance was very low relative to historical estimates, and recent trends are downwards in most stocks.

NC steelhead remain broadly distributed throughout their range, with the exception of habitat upstream of dams on both the Mad River and Eel River, which has reduced the extent of available habitat. Extant summer-run steelhead populations exist in Redwood Creek and the Mad, Eel (Middle Fork) and Mattole Rivers. The abundance of summer-run steelhead was considered "very low" in 1996 (Good *et al.* 2005), indicating that an important component of life history diversity in this DPS is at risk. Hatchery practices in this DPS have exposed the wild population to genetic introgression and the potential for deleterious interactions between native stock and introduced steelhead. However, abundance and productivity in this DPS are of most concern, relative to NC steelhead spatial structure and diversity (Williams *et al.* 2011). The most recent status review for NC steelhead (Seghesio and Wilson 2016) concludes NC steelhead, despite recent conservation efforts, remain impacted by many of the factors that led to the species being listing as threatened. Low streamflow volume, illegal cannabis cultivation, and periods of poor ocean productivity continue to depress NC steelhead population viability.

<u>CCC steelhead</u>

Historically, approximately 70 populations of steelhead existed in the CCC steelhead DPS (Spence *et al.* 2008, Spence *et al.* 2012). Many of these populations (about 37) were independent, or potentially independent, meaning they had a high likelihood of surviving for 100 years absent anthropogenic impacts (Bjorkstedt *et al.* 2005). The remaining populations were dependent upon immigration from nearby CCC steelhead DPS populations to ensure their viability (McElhaney *et al.* 2000, Bjorkstedt *et al.* 2005).

While historical and present data on abundance are limited, CCC steelhead numbers are substantially reduced from historical levels. A total of 94,000 adult steelhead were estimated to spawn in the rivers of this DPS in the mid-1960s, including 50,000 fish in the Russian River -the largest population within the DPS (Busby *et al.* 1996). Recent estimates for the Russian River are on the order of 4,000 fish (NMFS 1997). Abundance estimates for smaller coastal streams in the DPS indicate low but stable levels with recent estimates for several streams (Lagunitas, Waddell, Scott, San Vicente, Pudding, and Caspar creeks) of individual run sizes of 500 fish or less (62 FR 43937). Some loss of genetic diversity has been documented and attributed to previous among-basin transfers of stock and local hatchery production in interior populations in the Russian River (Bjorkstedt *et al.* 2005). In San Francisco Bay streams, reduced population sizes and fragmented habitat condition has likely also depressed genetic diversity in these populations.

A recent viability assessment of CCC steelhead concluded that populations in watersheds that drain to San Francisco Bay are highly unlikely to be viable, and that the limited information available did not indicate that any other CCC steelhead populations were demonstrably viable (Spence *et al.* 2008). Although there were average returns (based on the last ten years) of adult CCC steelhead during 2007/08, research monitoring data from the 2008/09 and 2009/10 adult CCC steelhead returns show a decline in returning adults across their range compared to the previous ten years. The most recent status update concludes that steelhead in the CCC DPS remain "likely to become endangered in the foreseeable future", as new and additional information does not appear to suggest a change in extinction risk (Howe 2016).

S-CCC Steelhead

Populations of S-CCC steelhead throughout the DPS have exhibited a long-term negative trend since at least the mid-1960s. In the mid-1960s, total spawning population was estimated at 17,750 individuals (Goode *et al.* 2005). Available information shows S-CCC steelhead population abundance continued to decline from the 1970s to the 1990s (Busby *et al.* 1996) and more recent data indicate this trend continues (Good *et al.* 2005). Current S-CCC steelhead run-sizes in the five largest river systems in the DPS (Pajaro River, Salinas River, Carmel River, Little Sur River, and Big Sur River) are likely reduced from 4,750 adults in 1965 (CDFG 1965) to less than 500 returning adult fish in 1996. More recent estimates for total run-size do not exist for the S-CCC steelhead DPS (Goode *et al.* 2005) as few comprehensive or population monitoring programs are in place.

The S-CCC steelhead DPS consists of 12 discrete sub-populations representing localized groups of interbreeding individuals, and none of these sub-populations currently meet the definition of viable (Boughton *et al.* 2006; Boughton *et al.* 2007). Most of these sub-populations are characterized by low population abundance, variable or negative population growth rates, and reduced spatial structure and diversity. The sub-populations in the Pajaro River and Salinas River[5] watersheds are in particularly poor condition (relative to watershed size) and exhibit a greater lack of viability than many of the coastal populations.

Although steelhead are present in most of the streams in the S-CCC DPS (Good *et al.* 2005), their populations remain small, fragmented, and unstable (more subject to stochastic events) (Boughton *et al.* 2006). In addition, severe habitat degradation and the compromised genetic integrity of the some populations pose a serious risk to the survival and recovery of the S-CCC steelhead DPS (Good *et al.* 2005). During the winter of 2010/11, adult returns appeared to rebound toward the numbers seen at the beginning of the decade. This is largely based on a significant increase in adult returns counted at the San Clemente Dam on the Carmel River[6], and a notable increase in the number of observed adults in Uvas Creek in the Pajaro River watershed. However, these increases in adult returns have not persisted in recent years, suggesting poor recovery following the 2011-2015 state-wide drought that severely limited population productivity.

In the 2011 status update, NMFS concluded there was no evidence to suggest the status of the S-CCC steelhead DPS has changed appreciably since the publication of the previous status review (Goode *et al.* 2005) and, therefore, S-CCC steelhead remain listed as threatened (Williams *et al.* 2011). The most recent status review (Williams *et al.* 2016) concludes that this DPS shows no

5 The Technical Review Team only identified multiple populations in the Salinas River system for the purposes of DPS viability analysis. However, for the purposes of the threat analysis (and corresponding recovery actions), the Pajaro River was broken into the Uvas Creek tributary and the remainder of the Pajaro River system (which includes the mainstem and other tributaries). Uvas Creek was singled out because of its importance and the large number of threats.

6 http://www.mpwmd.dst.ca.us/fishcounter/fishcounter.htm

appreciable change in viability metrics since the last status review.

CC Chinook salmon

The CC Chinook salmon ESU was historically comprised of approximately 32 Chinook salmon populations (Bjorkstedt *et al.* 2005). Many of these populations (about 14) were independent, or potentially independent, meaning they had a high likelihood of surviving for 100 years absent anthropogenic impacts. The remaining populations were likely more dependent upon immigration from nearby independent populations than dependent populations of other salmonids (Bjorkstedt *et al.* 2005).

In 1965, CDFG (1965) estimated escapement for this ESU at over 76,000 spawning adults. Most were in the Eel River (55,500), with smaller populations in Redwood Creek (5,000), Mad River (5,000), Mattole River (5,000), Russian River (500) and several smaller streams in Humboldt County (Myers *et al.* 1998). Currently available data indicate abundance is far lower, suggesting an inability to sustain production adequate to maintain the ESU's populations. The one exception is the Russian River population, where escapement typically averages a few thousand adults (SCWA 2017).

CC Chinook salmon populations remain widely distributed throughout much of the ESU. Notable exceptions include the area between the Navarro River and Russian River and the area between the Mattole and Ten Mile River populations (Lost Coast area). Concerns regarding the lack of population-level estimates of abundance, the loss of populations from one diversity stratum[7], as well poor ocean survival contributed to the conclusion that CC Chinook salmon are "likely to become endangered" in the foreseeable future (Good *et al.* 2005, Williams *et al.* 2011, Williams *et al.* 2016). Yet, some encouraging news from the NMFS 2016 CC Chinook status review is the recent discovery of spawning adults in several smaller, coastal Mendocino County tributaries, which suggests ESU spatial diversity is likely better than previously thought (Seghesio and Wilson 2016).

2.2.3 Status of critical habitat

In designating critical habitat, NMFS considers, among other things, 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; and 5) habitats that are protected from disturbance or are representative of the historic geographical and ecological distributions of this species (50 CFR 424.12(b)). In addition to these factors, NMFS also focuses on Physical or Biological Features (PBF) and/or essential habitat types within the designated area that are essential to the conservation of the species and that may require special management considerations or protection (81 FR 7214).

The designations of critical habitat for the species described above previously used the term primary constituent element or essential features. The new critical habitat regulations (81 FR

7 A diversity stratum is a grouping of populations that share similar genetic features and live in similar ecological conditions.

7414) replace this term with PBFs. 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 essential features. In this biological opinion, we use the term PBF to mean PCE or essential feature, as appropriate for the specific critical habitat.

In designating critical habitat, NMFS considers, among other things, 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; and 5) habitats that are protected from disturbance or are representative of the historic geographical and ecological distributions of this species (50 CFR 424.12(b)). In addition to these factors, NMFS also focuses on PBFs and/or essential habitat types within the designated area that are essential to conserving the species and that may require special management considerations or protection.

PBFs for CCC, NC, S-CCC steelhead and CC Chinook salmon critical habitat, and their associated essential features within freshwater include:

- freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning, incubation and larval development;
- freshwater rearing sites with:
  - water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility;
  - water quality and forage supporting juvenile development; and
  - natural cover such as shade, submerged and overhanging large wood, log jams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks.
- freshwater migration corridors free of obstruction and excessive predation with water quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival.

For SONCC and CCC coho salmon critical habitat, the following essential habitat types were identified: 1) juvenile summer and winter rearing areas; 2) juvenile migration corridors; 3) areas for growth and development to adulthood; 4) adult migration corridors; and 5) spawning areas. Within these areas, essential features of coho salmon critical habitat include adequate: 1) substrate, 2) water quality, 3) water quantity, 4) water temperature, 5) water velocity, 6) cover/shelter, 7) food, 8) riparian vegetation, 9) space, and 10) safe passage conditions (64 FR 24029).

The condition of SONCC and CCC coho salmon; CC Chinook salmon; and CCC, NC, and S-CCC steelhead critical habitat, specifically its ability to provide for their conservation, has been degraded from conditions known to support viable salmonid populations. NMFS has determined that currently depressed population conditions are, in part, the result of the following human-induced factors affecting critical habitat[8]: logging, agriculture, mining, urbanization, stream channelization, dams, wetland loss, and water withdrawals (including unscreened diversions for irrigation). Impacts of concern include altered stream bank and channel morphology, elevated water temperature, lost spawning and rearing habitat, habitat fragmentation, impaired gravel and wood recruitment from upstream sources, degraded water quality, lost riparian vegetation, and increased erosion into streams from upland areas (Weitkamp *et al.* 1995; Busby *et al.* 1996; 64 FR 24049; 70 FR 37160; 70 FR 52488). Diversion and storage of river and stream flow has dramatically altered the natural hydrologic cycle in many of the streams within the ESU. Altered flow regimes can delay or preclude migration, dewater aquatic habitat, and strand fish in disconnected pools, while unscreened diversions can entrain juvenile fish.

2.2.4 Additional Threats to CC Chinook Salmon; SONCC and CCC Coho Salmon; and CCC, NC, and S-CCC Steelhead, and their Critical Habitat

One factor affecting the range-wide status of the steelhead, salmon, and their aquatic habitat at large is climate change. 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). Snow melt from the Sierra Nevada has declined (Kadir *et al.* 2013). However, total annual precipitation amounts have shown no discernable change (Kadir *et al.* 2013). Most ESUs and DPSs 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. In addition, The ESUs and DPSs considered in this opinion, for the most part, are not dependent on snowmelt driven streams and, thus, not as affected by declining snow packs as, for example, California Central Valley species.

The threat to listed salmon and steelhead 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, Moser *et al.* 2012). Wildfires are expected to increase in frequency and magnitude (Westerling *et al.* 2011, Moser *et al.* 2012).

Shifting climate patterns across coastal California may impair salmon and steelhead population productivity in the future. For example, in the San Francisco Bay region, warm temperatures generally occur in July and August, but as climate change takes hold, the occurrences of these

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

events will likely begin in June and could continue to occur in September (Cayan *et al.* 2012). Climate simulation models project that the San Francisco region will maintain its Mediterranean climate regime, but will also experience a higher degree of variability of annual precipitation during the next 50 years. The greatest reduction in precipitation is projected to occur in March and April, with the core winter months remaining relatively unchanged (Cayan *et al.* 2012).

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 *et al.* 2004, Osgood 2008, Turley 2008, Abdul-Aziz *et al.* 2011, 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).

2.3 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 and riparian areas affected by the implementation of bio-engineered bank stabilization projects authorized and permitted under the Corp's Programmatic Bio-Engineered Bank Stabilization Permitting Program. The action area corresponds to the San Francisco Corps District boundaries, and includes the following California counties: Alameda, Contra Costa, Del Norte, Glenn, Humboldt, Lake, Marin, Mendocino, Monterey, Napa, San Benito, San Francisco, San Luis Obispo, San Mateo, Santa Clara, Santa Cruz, Siskiyou, Solano, Sonoma, and Trinity (Figure 1). Projects can occur anywhere within these counties; but due to the limitation that they protect infrastructure or physical structures, or replace previous streambank stabilization, most projects will likely occur in urban or "developed" areas where instream habitat and natural channel function are typically impaired.

2.4 Environmental Baseline

The "environmental baseline" refers to the condition of the listed species or its designated critical habitat in the action area, without the consequences to the listed species or designated critical habitat caused by the proposed action. 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 consultations, and the impact of State or private actions which are contemporaneous with the consultation in process. The consequences to listed species or designated critical habitat from ongoing agency activities or existing agency facilities that are not within the agency's discretion to modify are part of the environmental baseline (50 CFR 402.02).

Figure 1: Geographic areas within the action area

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 coastal drainages to Douglas fir (*Pseudotsuga menziesii*) intermixed with hardwoods in the foothills, to ponderosa pine (*Pinus ponderosa*) and Jeffery pine (*P. jefferyi*) stands common within the upper elevations. Areas of grasslands (*e.g.*, oak woodland habitat) are also found along the main ridge tops and south facing slopes of the watersheds.

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

2.4.1 Status of, and factors affecting, the species and critical habitat in the Action Area

This section provides a synopsis of the four geographic areas of consideration, the ESUs and watersheds present within each area, specific recent information on the status of salmon and steelhead, and a summary of the factors affecting the listed species within the action area. The best information presently available demonstrates that a multitude of factors, past and present, have contributed to the decline of west coast salmonids (NMFS 2012, 2013, 2014, 2016). The following is a summary of the factors affecting the environment of the species or critical habitat within each watershed.

<u>North Coast Area</u>

This area includes all coastal streams entering the Pacific Ocean from Oregon/California Border south to Bear Harbor in Mendocino County, and includes the following USGS 4th field HUCs: Upper Klamath, Lower Klamath, Shasta, Scott, Smith, Salmon, Trinity, South Fork Trinity, Mad-Redwood, Lower Eel, South Fork Eel, Middle Fork Eel, and Upper Eel. Urban development within the North Coast Area is found primarily on the estuaries of the larger streams, though there are some small towns and rural residences throughout the area. Most projects associated with the proposed action are expected to take place in these "urban" areas. Although forestry is the dominant land-use throughout the area, there exists limited agriculture. The area includes the California portion of the SONCC coho salmon ESU, the northern portion of the CC Chinook salmon ESU, and the northern portion of the NC steelhead DPS, and contains designated critical habitat for all three species.

Generally speaking, excessive fine sediment and poor water quality/quantity are the predominant factors limiting salmonid survival and recovery throughout the North Coast area. Past logging and road building practices caused extensive hillside erosion within the Klamath River, Mad River, Redwood Creek, Eel River and Mattole River watersheds. During the same period, massive floods, such as the 1964 incident, accelerated existing erosion rates, which caused fine sediment deposition and pool aggradation that remains to this day. Poor water quality and low streamflow volume impacts much of the region, although the cause of these conditions varies based upon location. Agricultural water demand in the upper Klamath River, Shasta River, and Scott River watersheds has depressed SONCC coho salmon abundance and spatial diversity. Mainstem Klamath River reservoirs block fish passage, interrupt natural river hydrology, and support aquatic disease outbreaks by warming and enriching (via eutrophication) stored water prior to its release downstream (NMFS 2014). The lack of bedload-moving winter discharge and warm spring river flows has allowed a native salmon pathogen (*C. Shasta*) to flourish, significantly depressing smolt coho salmon survival during their downstream migration. Further south within the Eel and Mattole drainage, illegal cannabis cultivation has denuded hillsides, drained summer baseflow from streams, and polluted waterways with chemical pesticides and fertilizers. State regulation of legal cannabis growers and increased enforcement targeting illegal operators will likely minimize cannabis-related impacts in the future, whereas an ambitious plan to remove the Klamath River dams will greatly improve salmonid population abundance, distribution, and productivity in the coming decades.

Compared to areas toward the southern end of the action area, the watersheds of the North Coast contain salmon and steelhead populations that, while currently remaining far from their respective recovery targets, exhibit greater abundance and spatial diversity. SONCC coho salmon populations are struggling in the Klamath Basin, where important tributary populations (*e.g.,* Shasta and Scott) are at risk of losing weak brood-year classes. For example, of particular concern is the low adult coho salmon return to the Shasta River during 2014-15 (Weeder and Ruddy 2016). CC Chinook salmon appear to be recovering from poor survival rates during California's 2011-2015 drought, but most populations in the North Coast Area remain well below recovery thresholds for population abundance. NC steelhead remain well distributed throughout the North Coast, but population abundance remains well below viability thresholds (Seghesio and Wilson 2016).

<u>North Central Coast Area</u>

The North Central Coast area includes all coastal California streams entering the Pacific Ocean in Mendocino, Sonoma, and Marin counties, excluding streams draining into San Francisco and San Pablo bays. The North Central Coast Area includes portions of four ESUs/DPSs (CCC coho salmon, CC Chinook, NC steelhead, and CCC steelhead) and five USGS 4th field HUCs (Big-Navarro-Garcia, Bodega Bay, Gualala-Salmon, Russian, and Tomales-Drakes Bay). Forestry is the dominant land-use throughout the northern part of this area (north of the Russian River). Agriculture and urbanization are more predominant in the Russian River and areas south, and it is within these and other urban areas where most bio-engineering bank stabilization projects are expected to occur.

Excessive sedimentation, low LWD abundance and recruitment, and elevated water temperature are issues limiting salmonid habitat throughout watersheds draining the Mendocino County coast, and are generally attributable to historic and ongoing forestry activities. Timber harvest transitions to agriculture and urban development as the dominant land-use south of the Gualala River watershed.

Within the Russian River watershed, Coyote Valley Dam and Warm Springs Dam block access to upstream anadromous fish habitat, alter sediment transport dynamics, and degrade water flow and temperature. Steiner Environmental Consulting (1996) cite unpublished data from the CSWRCB that estimates there were over 500 small, private dams within the watershed that cause similar problems; a number of those dams have been removed in the last two decades. Historically, the Don Clausen Fish Hatchery, operated at Warm Springs Dam, 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. Beginning in 2004, a consortium of federal agencies, state agencies, and local non-profit groups began the Russian River Coho Salmon Captive Broodstock Program at the same hatchery, which raises and releases hatchery-reared juvenile coho salmon into local watersheds.

Most of the watersheds feeding Tomales and Drakes bay are small, with the exception of Walker Creek and Lagunitas Creek; both tributaries flow into Tomales Bay, a prominent artifact of the San Andreas Rift Zone. 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). The construction of Kent Reservoir and Nicasio Reservoir blocked access to half of the historical salmonid habitat within the Lagunitas Creek watershed. Similarly, Soulejoule Reservoir precludes access to a significant amount of headwater stream habitat within the remainder of the watershed (NMFS 2012, NMFS 2016). Overwinter habitat is limiting within Lagunitas Creek, due largely to poor large woody debris recruitment and limited floodplain engagement (NMFS 2016). Within Walker Creek, high fine sediment concentrations lower pool depth and density, while also embedding spawning gravel.

Steelhead are generally widely distributed throughout North Central Coast Area basins, although abundance levels are far below recovery targets. Chinook salmon persist in small numbers along the Mendocino Coast; however, a robust, stable population exists in the Russian River, supported largely by reservoir releases into the mainstem river and Dry Creek. Coho salmon persist in very small numbers throughout the area, with the exception of the smaller watersheds between Salmon Creek and Tomales Bay where no historical account of their existence exists. Sampling between 2009 and 2013 documented coho salmon adult spawning and juvenile rearing throughout Salmon Creek (Sonoma County) and its five main tributaries (Gold Ridge Resource Conservation District 2013). NMFS found no historical coho salmon collections from watersheds of this HUC between Valley Ford Creek and Tomales Bay. A broodstock hatchery operates at the Warm Springs Hatchery (Russian River), stocking captively-bred juvene coho salmon into tributaries of the lower Russian River, Olema Creek, and Walker Creek. Lagunitas Creek has a relatively stable and healthy population of coho salmon, at least when compared with other CCC coho salmon streams (NMFS 2012; Rogers 2016). Small, persistent populations of coho salmon exist in Pine Gulch Creek and Redwood Creek. The Walker Creek population of CCC coho salmon is at high risk of extirpation (NMFS 2012).

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. Urban development is extensive within this area and has negatively affected the quality and quantity of salmonid habitat; it is within these areas where most projects associated with the proposed action will likely take place. Human population within the San Francisco Bay Area is approximately seven million (2010 census), representing the fourth most populous metropolitan area in the United States, and continued growth is expected. 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, which has 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 most streams and are used for water supply, aquifer recharge, or recreational activities. Surface water diversions and groundwater withdrawals have affected streams. Channelization for flood control, roadway construction, and commercial/residential development has further affected the quality and quantity of available salmonid habitat. Most watersheds within this area are listed under the 2014-16 Clean Water Act section 303(d) list of impaired water bodies for high levels of diazinon, reflecting the impacts of urbanization. Agricultural and industrial chemicals and by-products are other factors limiting water quality throughout the area (CSWRCB 2014). These human induced changes have substantially degraded natural productivity, biodiversity, and ecological integrity in streams throughout the area.

Presently, small populations of CCC steelhead occur in Arroyo Corte Madera del Presido, Corte Madera Creek, Napa River, Sonoma Creek, Petaluma River, Novato Creek, Pinole Creek, Coyote Creek, Guadalupe River, San Francisquito Creek, and Stevens Creek (NMFS 2016). Further south, small numbers of CCC steelhead occur in a few watersheds that drain into South San Francisco Bay: Coyote Creek, Guadalupe River, San Francisquito Creek, and Stevens Creek. Also, small populations of CCC steelhead are found in Codornices Creek, San Leandro Creek, and San Lorenzo Creek below dams located in the east bay hills (NMFS 2016). Alameda Creek historically supported the largest CCC steelhead population draining into San Francisco Bay, but diversion facilities, water storage reservoirs, and channelization have all but eliminated fish passage into the watershed.

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, and includes coastal watersheds supporting CCC coho salmon, CCC steelhead and S-CCC steelhead.

In general, summer stream flow volume decreases from north to south within the Central Coast Area. In addition to the highly urbanized areas of San Francisco, Pacifica, Half Moon Bay, Santa Cruz, the Monterey Peninsula, Hollister, Gilroy, Salinas, and San Luis Obispo, portions of the Central Coast Area are experiencing low density rural residential development. In the Central Coast, the majority of bank stabilization projects carried out under this consultation will take place in these urban and developing areas. 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. Anthropogenic factors affecting listed salmonids in these the central coast area include water impoundments, urbanization, surface water diversion and groundwater withdrawal, in-channel sediment extraction, agriculture, flood control projects, and logging (NMFS 2013). Agriculture has had the greatest impact on the Pajaro and Salinas HUCs, while logging and urbanization have had the greatest impact on watersheds further north, such as the San Lorenzo River. Reservoirs on the San Lorenzo, Pajaro, Salinas, and Carmel rivers block fish passage, regulate downstream flows, and alter the downstream movement of sediment and wood. Due to pollutants linked to urban development and agriculture, most waterbodies in the Central Coast area are included on the 2014-16 Clean Water Act section 303(d) list of water quality limited segments (CSWRCB 2014).

Long-term data on the abundance of coho salmon in coastal tributaries of San Mateo and Santa Cruz counties 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. While coho salmon abundance has fallen significantly as compared to historical numbers, recent surveys suggest a wider distribution and greater abundance of coho salmon than thought during past status reviews (Rogers 2016).

Steelhead are widely distributed throughout Central Coast area, although similarly greatly reduced from levels seen several decades ago (NMFS 2016). Two of the largest tributaries of the Salinas River, the San Antonio and Nacimiento rivers, have been dammed, eliminating steelhead access to valuable spawning and rearing habitat and severely modifying stream flow (NMFS 2013). Other anthropogenic activities severely impacting steelhead habitat include in-channel sediment extraction, channel modification, and water withdrawals for agricultural use (NMFS 2013). Aside from the Big Sur and Little Big Sur rivers, which flow through California State Park land and contain relatively intact habitat, most coastal streams south of Carmel are short and steep drainages supporting small S-CCC steelhead populations.

2.4.2 Previous Section 7 Consultations and Section 10 Permits in the Action Area

Given the large spatial area where individual bio-engineered bank stabilization projects may occur, many past Section 7 consultations and Section 10 permits have occurred within the action area. The majority of the consultations were informal and did not adversely affect listed species. A low number (less than 50) of formal biological opinions are produced each year that authorize take and have terms and conditions that minimize take of listed anadromous fish. Jeopardy opinions have been issued within a few watersheds in the action area (i.e., Klamath, Russian River, and Eel River). For each, modifications were made to dam operations to avoid jeopardizing listed species and adversely modifying critical habitat. In the case of the Russian River, modifications were made to estuarine breaching operations as well.

2.5 Effects of the Action

Under the ESA, "effects of the action" are all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action (see 50 CFR 402.17). In our analysis, which describes the effects of the proposed action, we considered 50 CFR 402.17(a) and (b).

2.5.1 Effects on Chinook Salmon, Coho Salmon and Steelhead

Construction Impacts

During the late-summer construction season, juvenile coho salmon and steelhead are likely to be present within the action area. Fish within the work areas will be captured (by seining or electrofishing) and relocated by a qualified biologist prior to construction. There is always the potential for injury or mortality when capturing and relocating juvenile salmonids. Fish collecting gear, whether passive (Hubert 1983) or active (Hayes *et al.* 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. Based upon past results from two, multi-year programmatic biological opinions implementing capture/relocation activities, we believe, on average, 100 steelhead, and 100 coho salmon juveniles will be potentially captured and relocated at each project site[9] requiring fish relocation.

Based upon the past frequency of bank stabilization projects occurring within the action area, we estimate that up to 20 individual bio-engineered bank stabilization projects and supplemental conservation measures (combined)[10] may occur under the proposed action each year. Assuming half the projects require fish relocation[11], up to 1,000 juvenile NC steelhead (*i.e.,* 100 fish/project x 10 projects requiring capture/relocation), 1,000 CCC steelhead, and 1,000 S-CCC steelhead may be captured and relocated per year. Similarly, no more than 1,000 SONCC coho salmon and 1,000 CCC coho salmon will be captured and relocated. Over the 5-year period of this programmatic biological opinion, the number of juvenile fish captured and relocated will not

9 Fish relocation data compiled from 6 years of CDFW Fisheries Restoration Grant Program operations (CDFW 2013, 2014, 2015, 2016, 2017, and 2018) and ten years of NOAA Restoration Center operations (NOAA Restoration Center 2015).(

10 Few supplemental conservation measures are expected per year due to the added expense and effort that falls upon the Corps permittee. Similar to bio-engineered bank stabilization project, these supplemental restoration projects must follow accepted bio-engineering techniques (*i.e.,* CDFW 2010 or Cramer *et al.* 2003). NMFS expects the few supplemental actions will, in essence, result in similar impacts to individual salmonid species, as well as critical habitat, and thus are aggregated along with bio-engineering bank stabilization projects for purposes of this effects analysis.

11 Unlike grant-funded restoration projects whose past distribution favored northern California, we expect bank stabilization actions conducted under the proposed action to have a more even distribution between northern and central California. Due to differences in climate and hydrology between the two regions, many projects occurring in central California will likely take place in a seasonally dry channel, obviating the need for fish rescue/relocation. For this reason, we assumed that half of the potential 20 projects per year would not require fish relocation.

exceed the following totals per species: 5,000 NC, CCC, and S-CCC steelhead, and 5,000 SONCC and CCC coho salmon. For each coho salmon ESU or steelhead DPS, no more than 2 percent[12] will perish during relocation efforts during each season.

Due to their relatively limited residence time in freshwater, juvenile Chinook salmon are much less likely to be encountered during fish relocation efforts (only 3 juvenile Chinook salmon were captured/relocated during the CDFW and NOAA RC data period noted above). However, the possibility remains that a few juvenile Chinook salmon maybe captured per year. Thus, NMFS expects that up to 10 juvenile CC Chinook salmon may be captured and relocated each year, and no more than one individual will perish.

Generally speaking, fish relocated to new areas may experience crowded conditions, depending on the number relocated, the number of fish inhabiting the new area, and the condition and amount of available habitat. Relocated fish may also face increased competition for available resources such as food and habitat. Some of the fish released at a relocation site may choose not to remain in the area and may move either upstream or downstream to areas with better habitat and lower fish densities -- as each fish moves, competition remains either localized to a small area or quickly diminishes as fish disperse. Relocated fish could experience competition from fish already residing within the new habitat, but this outcome is unlikely primarily because the dewatering period for Program projects is expected to be short (typically a few days to a week). By the time the effects of increased competition are realized by individual fish, the project will likely have concluded and the isolated work area will have been re-watered. Thus, relocated fish will likely have re-established access to newly improved habitat (*i.e.,* the bio-engineered streambank) prior to the harmful impacts from competition having materialized. However, to minimize the likelihood of competition-related effects, the Corps will ensure released fish are well distributed into available habitat. Based on the foregoing, a decline in juvenile steelhead or salmon fitness resulting from inter- and intraspecific competition following relocation is unlikely.

Constructing and removing dewatering berms, as well as any streambed disturbance resulting from bio-engineered bank stabilization work, will likely disturb the existing streambed and streambank. These impacts can dislodge and mobilize previously armored and sequestered streambed and streambank sediment, creating turbid water quality when the action area re-waters the following fall. 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).

Compared to the sediment impact of a culvert replacements, which often involve disturbing a significant volume of road fill that spans an entire stream channel, the disturbance of the small

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12 Past fish relocation data (*e.g.,* CDFW 2013, 23014, 2015, 2016, 2017, 2018; and NOAA Restoration Center 2015) suggest fish injury or mortality rates above 2 percent are rare.

areas[13] of streambank and channel proposed by this project will likely result in a much smaller turbidity response. In addition, each project will be required to control erosion and revegetate disturbed soils. Thus, downstream sediment effects from the proposed bio-engineered bank stabilization projects are expected to extend downstream for a distance much lower than the range presented by LaChance *et al.* (2008), likely no further than a few hundred feet below the project site. Considering the results of LaChance *et al.* (2008) and the 350 meter required separation between projects in a given season, sediment impacts from individual projects are not expected to combine. These turbidity impacts are not expected to affect the individual fitness of any listed fish given the low amounts and short duration of any turbidity events resulting from projects implemented under this program.

Construction operations in, over, and near surface water have the potential to release contaminants into surface waters. Projects similar to those implemented under the Program have the potential to introduce oils and hydrocarbons from construction equipment into surface waters. Oils and hydrocarbons can contain a wide variety of polynuclear aromatic hydrocarbons (PAHs), and metals. PAHs can alter salmonid egg hatching rates and reduce egg survival as well as harm the benthic organisms that are a salmonid food source (Eisler 2000). Some of the effects that metals can have on salmonids are: immobilization and impaired locomotion, reduced growth, reduced reproduction, genetic damage, tumors and lesions, developmental abnormalities, behavior changes (avoidance), and impairment of olfactory and brain functions (Eisler 2000). These effects have the potential to harm exposed fish and temporarily degrade habitat.

The Program includes measures each project must follow to address spills and prevent the introduction of contaminants into waters in the action area: work areas will be isolated; no equipment is proposed to be fueled or otherwise serviced within the stream bed; spill containment materials will be present on site; and proper handling and disposal of all construction waste will occur (spill prevention and control plan). Due to these measures, conveyance of toxic chemicals into waters from projects implemented under the Program is not expected, and the potential for toxic materials from projects to kill or injure, listed salmonids is considered to be negligible.

Impacts from Habitat Alteration

The long-term impacts from channelization (see section 2.5.2 below) likely portend a long-term continuation of impaired juvenile steelhead, coho salmon, and Chinook salmon abundance at the bank stabilization sites over successive generations, relative to what would be expected under natural stream conditions and channel function. The dynamic through which these effects occur is reasonably straightforward. Some individual fish likely grow slower due to less food supplied by the channelized stream, as compared to a natural stream bank. If these smaller fish are unable to move to areas with better resources for growth, they likely experience lower survival upon

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13 While most projects are expected to involve short sections of streambank (*e.g.,* less than 100' linear length), the Program does not have any length limit other than streambank length must be less than 3X the active channel width. One could argue that longer bank stabilization projects will produce greater amounts of sediment, and thus a larger number of individual fish may be exposed. However, given the larger active channel (and correspondingly greater channel capacity) realized per the "3X active channel width" requirement, any potential increase in sediment will be equivalently diluted by the greater volume of streamflow flowing the channel. Thus, the dissipation rate of turbidity effects will likely be similar for all sizes of projects, and is expected to dissipate within 350 meters downstream.

ocean entry (Holtby *et al.* 1990), especially if unfavorable ocean conditions exist. As a result, these smaller fish are less likely to return and spawn.

However, the proposed bio-engineered approach (*e.g.,* riparian planting and instream wood placement that create natural cover elements) will improve habitat condition relative to what currently exists within the channelized action area (Zika and Peter 2002). We expect substantially more juvenile fish will be able to successfully rear in these areas after bio-engineering bank stabilization improves habitat conditions. Successful rearing includes a likelihood of returning to spawn relatively similar to fish rearing in other areas of the watersheds where these bank stabilization projects occur. This improvement does not fully counter-balance the ongoing impact on habitat function and future juvenile population growth caused by extending channelization into the foreseeable future, but instead compensates for it to a fair degree at the site level. Translating this remaining impact into actual injury/death at the individual fish level, is inherently difficult, given the indeterminate nature of future programmatic actions (*e.g.,* project location, project technique, current onsite habitat quality, current population dynamics of impacted fish, *etc.*), necessitating the use of a habitat-based proxy.

The habitat proxy we chose to estimate the extent of fish loss is the length of bio-engineered streambank restored per project (streambank length must be less than 3x the active channel width), and the number of projects implemented per year (20). Because these sites are very small relative to the stream area available to rearing juveniles throughout the action area, and because of the compensation noted above, NMFS expects overall reductions in juvenile fish numbers to be minimal.

2.5.2 Effects on Critical Habitat

Generally speaking, PBFs of critical habitat[14] for both ESA-listed steelhead and salmon found within the action area include sites for migration, spawning, and rearing. Bio-engineered bank stabilization projects can impact designated critical habitat by creating or elevating turbid conditions, degrading streambank and floodplain habitat, and precluding natural fluvial and geomorphic channel dynamics. Toxic materials from construction equipment may also be introduced into streams.

<u>Construction Impacts</u>

Projects carried out under the Program will, in most cases, require stream-channel dewatering prior to construction activity (no work is allowed in a flowing stream). As part of the dewatering action, temporary berms or dams, in coordination with a flow bypass mechanism, will likely be used to isolate the dewatered construction area. Blocking entry into the dewatered channel will prevent juvenile salmon from occupying this habitat, as well as prevent fish from migrating through the project area. However, as explained earlier, these impacts are expected to only last for a few days, and, as a result, any effect on the value of critical habitat is expected to be miniscule.

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14 See page 7 for a detailed listing of steelhead PBFs and coho salmon essential habitat types.

Constructing and removing dewatering berms, as well as any streambed disturbance resulting from bio-engineered bank stabilization work, will likely disturb the existing streambed and streambank. These impacts can dislodge and mobilize previously armored and sequestered streambed and streambank sediment, creating turbid water quality when the action area re-waters the following fall. 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). Compared to the sediment impact of a culvert replacements, which often involve disturbing a significant volume of road fill that spans an entire stream channel, the disturbance of the small areas[15] of streambank and channel proposed by this project will likely result in a much smaller turbidity response. Downstream sediment effects from the proposed bio-engineered bank stabilization projects are expected to extend downstream for a distance much lower than the range presented by LaChance *et al.* (2008), likely no further than a few hundred feet below the project site. Considering the results of LaChance *et al.* (2008) and the 350 meter required separation between projects in a given season, sediment impacts from individual projects are not expected to combine. These turbidity impacts are not expected to appreciably or permanently alter the ability of the habitat to support the PBFs described above, given the short duration and limited distance of elevated turbidity expected.

Impacts on Habitat Form and Function

The proposed project will also alter existing physical habitat along streambanks. However, these alterations will likely improve habitat function for the most part, as explained below. Bank stabilization impacts the physical habitat in two general ways – by changing a dynamic, unrestrained stream that constantly evolves via hydrologic and geomorphic processes into a fixed, simplified channel (more on this later), and by altering the physical land/water interface (i.e. streambank) that provides shelter, food, and other ecosystem benefits to aquatic species, including juvenile salmonids. Unlike the common, favored approach of lining the entire streambank with rock rip rap that results in a habitat interface lacking suitable juvenile fish habitat (Schmetterling *et al.* 2001), the proposed bio-engineering methods will instead utilize natural material (*e.g.,* live plantings, logs and rootwads, boulders) to craft a streambank that will resist lateral erosion while providing complex rearing, feeding and sheltering habitat. Also, projects carried out under the proposed action will be limited to those that protect critical infrastructure or property, or streambanks that have previously been stabilized, suggesting that work sites will largely occur in urban areas where streambank habitat is currently degraded following decades of urban encroachment and stream channelization. Replacing this poor habitat with bio-engineered stabilization and riparian planting will likely improve existing habitat at project sites, improving salmonid growth and survival (Zika and Peter 2002).

15 While most projects are expected to involve short sections of streambank (*e.g.,* less than 100' linear length), the Program does not have any length limit other than streambank length must be less than 3X the active channel width. One could argue that longer bank stabilization projects will produce greater amounts of sediment, and thus greater impacts to fish habitat. However, given the larger active channel (and correspondingly greater channel capacity) realized per the "3X active channel width" requirement, any potential increase in sediment will be equivalently diluted by the greater volume of streamflow flowing the channel. Thus, the dissipation rate of turbidity effects will likely be similar for all sizes of projects, and is expected to dissipate within 350 meters downstream.

Of greater concern than ephemeral turbidity or streambank habitat impacts is the long-term preclusion of natural fluvial and geomorphic processes that will likely result from the Project's additive impact with other streambank stabilization. In most low gradient streams, the channel will naturally "meander", eroding laterally to dissipate its hydraulic energy while creating a sinuous longitudinal course. Stream meandering efficiently regulates the erosive forces by lengthening the channel and reducing stream gradient, thus controlling the ability of the stream to entrain and transport available sediment. Meandering streams also create and maintain both the hydraulic and physical components of instream habitat used by fish and other aquatic species. For instance, specific to salmon and steelhead, a meandering, unconstrained stream channel sorts and deposits gravel and other substrate necessary for optimal food production and spawning success, maintains a healthy and diverse riparian corridor that supplies LWD to the channel, and inundates adjacent floodplain habitat during appropriate winter/spring flows (Spence *et al.* 1996).

While the bio-engineered bank stabilization projects carried out under the proposed action will benefit degraded salmonid habitat by manually improving it, the achieved habitat quality and persistence will likely fall short of that achieved naturally through dynamic channel processes. Because of the perpetual nature of most bank stabilization structures, any impacts experienced by species with typically short life-spans (3 years for coho, typically 3-4 for steelhead and Chinook) will likely manifest as a continued depression in juvenile carrying capacity at the site level.

However, as noted above, the proposed bio-engineered approach (*e.g.,* riparian planting and instream wood placement that create natural cover elements) will improve habitat condition relative to what currently exists within the channelized action area (Zika and Peter 2002). We expect substantially more juvenile fish will be able to successfully rear in these areas after bio-engineering bank stabilization improves habitat conditions. Successful rearing includes a likelihood of returning to spawn relatively similar to fish rearing in other areas of the watersheds where these bank stabilization projects occur. This improvement does not fully counter-balance the ongoing impact on habitat function and carrying capacity caused by extending channelization into the foreseeable future, but instead compensates for it to a fair degree at the site level.

Construction operations in, over, and near surface water have the potential to release contaminants into surface waters. As described above, the Program includes measures each project must follow to address spills and prevent the introduction of contaminants into waters in the action area: work areas will be isolated; no equipment is proposed to be fueled or otherwise serviced within the stream bed; spill containment materials will be present on site; and proper handling and disposal of all construction waste will occur (Spill Prevention and Control Plan). Due to these measures, conveyance of toxic chemicals into waters from projects implemented under the Program is not expected, and the potential for toxic materials from projects to degrade salmonid critical habitat is considered to be negligible.

The proposed action includes a list of specific project design "alternatives" that would cause critical habitat impacts above and beyond those described above in the effects analysis, generally by increasing streambed incision through channel constriction; increasing the areal extent, or further compromising habitat complexity, at the riprap/aquatic habitat interface; or displacing habitat or suppressing its development. For the expected few projects covered under this proposed action that would cause additional impacts, Supplemental Conservation Measures, described in section 1.3.2., will be required. These measures must fully off-set and counterbalance any resulting additional critical habitat impacts. As a result, including projects requiring Supplemental Conservation Measures within the proposed action will likely have no significant additional impacts on critical habitat or listed fish in the action area.

2.6 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.

Non-Federal activities that are reasonably certain to occur within the action area include those described in the environmental baseline and likely to continue into the future: agricultural practices, water withdrawals/diversions, mining, state or privately sponsored habitat restoration activities on non-Federal lands, road work, timber harvest, and residential growth. NMFS assumes these activities, and similar resultant effects (as described in the Status of the Species and Environmental Baseline sections), on listed salmonids species will continue on an annual basis over time.

Some continuing non-Federal activities are reasonably certain to contribute to climate effects within the action area. However, it is difficult if not impossible to distinguish between the action area's future environmental conditions caused by global climate change that are properly part of the environmental baseline vs. cumulative effects. Therefore, all relevant future climate-related environmental conditions in the action area are described in the environmental baseline (Section 2.4).

2.7 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 2.5) to the environmental baseline (Section 2.4) and the cumulative effects (Section 2.6), 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) appreciably diminishes the value of designated or proposed critical habitat for the conservation of the species.

The CCC coho salmon ESU has not shown improvement since its original listing in 1996 as threatened, and then as endangered in 2005. The best available updated information on the biological status of this ESU and the threats facing this ESU indicate that it continues to be in danger of extinction (Williams *et al.* 2016). The NMFS' recovery plan (NMFS 2012) for the CCC coho salmon ESU identified the major threats to population recovery. These major threats include: roads, water diversions and impoundments; residential and commercial development;

and severe weather. The impacts of these major threats are described in the critical habitat status section.

Steelhead populations throughout northern and central California have also shown a decrease in abundance, but are still widely distributed throughout most of the DPS. Although NC, CCC, 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 the CCC coho salmon ESU. 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 these steelhead DPSs. Based on the above information, recent status reviews and available information indicate NC, CCC, and S-CCC steelhead are likely to become endangered in the foreseeable future.

The most recent CC Chinook salmon status review found continued evidence of low population sizes relative to historical abundance. Although mixed abundance trends within some larger watersheds in the north may suggest some populations are persisting, the low abundance, low productivity, and potential extirpations of populations in the southern part of the CC Chinook salmon ESU are of concern. The reduced abundance contributes significantly to long-term risk of extinction, and is likely to contribute to short-term risk of extinction in the foreseeable future. Thus, NMFS concludes the CC Chinook salmon ESU falls far short of historic population numbers and distribution, and is therefore not viable in regards to the population size VSP parameter. The ESU's geographic distribution has been moderately reduced, but especially for southern populations and spring-run Chinook populations. Based on the above information, recent status reviews and available information indicate CC Chinook are likely to become endangered in the foreseeable future.

During the 5-year proposed action, up to 5,000 juveniles of each steelhead DPS (NC, CCC, and S-CCC), 5,000 juveniles of each coho salmon ESU (SONCC and CCC), and 50 CC Chinook salmon may be captured and relocated. The vast majority of these fish will avoid any harm, aside from potential behavioral impacts to feeding and rearing behavior temporarily interrupted through the capture and release process. As noted earlier, these behavioral impacts will likely be negligible, given their short duration and sub-injurious nature. Each year, up to five coho salmon of each ESU, and ten steelhead of each DPS, may perish as a result of physical injury during capture. Given the relatively poor habitat quality and fish abundance expected within the "urban" portions of the action area of this consultation, the small number of fish potentially lost through the Program will be easily replaced by production from the larger populations residing in higher quality habitat outside each project's affected area. Moreover, the improved habitat quality (see below) resulting from each project will help ensure that future generations of fish inhabiting the action area will survive and reproduce, augmenting survival and recovery of the larger ESU/DPS.

Stream and river "channelization" restricts natural processes that create and maintain aquatic habitat, and is a high threat to recovery in many California salmonid ESUs and DPSs (NMFS 2013, 2014, 2016). Bio-engineered streambank stabilization, such as those techniques described in the proposed action, will prevent lateral channel migration, which is the inherent goal of any streambank stabilization technique. However, activities under this proposed action largely occur in urban, developed watersheds where past infrastructure development has already effectively precluded habitat creation and maintenance by degrading the essential hydrologic and geomorphic processes that naturally facilitate it. Due to the heavily urbanized footprint where these projects will typically occur, restoring these natural processes will take decades, as well as significant public and monetary support. Therefore, within these urbanized stream channels, quality instream habitat must be created and maintained by human effort until larger-scale restoration actions restart natural processes to create and maintain habitat. The proposed action will incentivize applicants to implement projects that accomplish just that, while not precluding the possibility for natural channel function restoration at the site sometime in the future. Thus, by utilizing native riparian plantings and logs/rocks that mimic habitat function and complexity as seen in unimpaired waterways, the proposed bio-engineering techniques will begin to create essential components of ESA-listed salmonid critical habitat where, in all likelihood, they currently do not exist.

Also, with the vast majority of projects occurring in degraded, channelized, urban habitats, the proposed action will help discourage channelization impacts from expanding into more rural stream reaches where natural channel function exists or is recoverable. These rural projects will require individual formal ESA consultation, which allows NMFS, the applicant, and other stakeholders to investigate and consider novel approaches that maintain or recover channel function (*e.g.,* floodplain connectivity, natural channel sinuosity, natural sediment transport, *etc.*) while addressing the needs of all parties involved. The density of established infrastructure encroaching into the meander belt[16] of urban streams prevents this approach at likely project sites within the action area.

Also, because the proposed action provides a way to speed the implementation of projects with bio-engineering designs, it encourages bank stabilization approaches that help restore some habitat elements needed by listed salmonids. This conservation efficiency will also free up NMFS staff to spend more time working on other remaining bank stabilization projects during individual consultations. This time will be beneficial for NMFS, applicants, and other stakeholders to investigate and consider improved approaches that maintain or recover channel function (*e.g.,* floodplain connectivity, natural channel sinuosity, natural sediment transport, *etc.*) on a project-by-project basis.

While projects under this proposed programmatic action will likely continue some degradation of critical habitat into the future, as noted above, the programmatic action helps begin the process of restoring critical habitat in these urbanized stream reaches. Because the improvements likely achieved by the program will create habitat areas supportive of juvenile salmonid rearing in many areas where limited or no rearing habitat is currently likely to exist, the improvements are substantial at the site level. In short, unconfined stream channels naturally create and maintain instream habitat components. The proposed action will not restore those processes, but will instead artificially create and maintain many of those same instream habitat components at each project site while not precluding future establishment of natural fluvial and geomorphic function.

16 "Meander belt" refers to the spatial area of valley bottom and floodplain across which an alluvial waterway naturally migrates over time.

While there will be some loss of habitat function and carrying capacity at the anticipated few areas where natural channel function still exists and critical infrastructure needs protection, we expect these losses to be small relative to the gains in habitat condition in more urbanized areas. Most of the bank stabilization work needed to protect critical infrastructure occurs in urban and urbanizing areas where such infrastructure is common and channelization has already occurred. In addition, the gains in urbanized areas are likely to further help offset any losses to juvenile salmonids occurring when juveniles are relocated from work areas. Thus, the proposed action does not appreciably reduce the likelihood of survival or recovery of listed salmonids, nor does it appreciably degrade the value of their critical habitat.

2.8 Conclusion

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 action, any effects of interrelated and interdependent activities, and cumulative effects, it is NMFS' biological opinion that the action is unlikely to jeopardize the continued existence of CCC steelhead and NC steelhead, or destroy or adversely modify their designated critical habitat.

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 action, any effects of interrelated and interdependent activities, and cumulative effects, it is NMFS' biological opinion that the action is unlikely to jeopardize the continued existence of CCC coho salmon and SONCC coho salmon, or destroy or adversely modify their designated critical habitat.

2.9 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 ITS.

2.9.1 Amount or Extent of Take

In the biological opinion, NMFS determined that incidental take is reasonably certain to occur as follows:

NMFS anticipates that the proposed action will result in incidental take of juvenile CCC and SONCC coho salmon, and NC, CCC, S-CCC steelhead from fish relocation related to construction activities. As stated in the Effects Section, up to 1,000 each of CCC, S-CCC, and NC steelhead; 1,000 CCC coho salmon and SONCC coho salmon; and 10 CC Chinook salmon may be captured during relocation activities each year. Of these captured and relocated fish, no more than 2 percent may be injured or killed.

NMFS also anticipates incidental take of listed salmonids resulting from channelization of portions of streams. As noted in the Effects section, the amount of take resulting from channelized conditions caused by the proposed action at each future project site is difficult to estimate. Therefore, the habitat surrogate chosen to monitor the extent of this take is the length of bio-engineered streambank restored per project (streambank length must be less than 3x the active channel width), and the number of projects implemented per year (20). Furthermore, if supplemental conservation measures or bio-engineering techniques are not implemented per the proposed action, take would be considered exceeded.

2.9.2 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.

2.9.3 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 NC steelhead, CCC steelhead, S-CCC steelhead, SONCC coho salmon, CCC coho salmon, and CC Chinook salmon:

1. Measures shall be taken to minimize the amount or extent of incidental take of listed salmonids resulting from fish relocation, dewatering, or instream construction activities.

2.9.4 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.

The following Terms and Conditions implement Reasonable and Prudent Measure 1:

a. The applicant shall retain a qualified biologist with expertise in the areas of anadromous salmonid biology, including handling, collecting, and relocating salmonids; salmonid/habitat relationships; and biological monitoring of salmonids. The applicant shall ensure that all fisheries biologists working on this project be qualified to conduct fish collections in a manner which minimizes all potential risks to ESA-listed salmonids. Electrofishing, if used, shall be performed by a qualified biologist and conducted according to the NOAA Fisheries Guidelines for Electrofishing Waters Containing Salmonids Listed under the Endangered Species Act, June 2000.

b. The fisheries biologist shall monitor the construction site during placement and removal of cofferdams to ensure that any adverse effects to salmonids are minimized. The biologist shall be on site during all dewatering events in anadromous fish streams to ensure that all ESA-listed salmonids are captured, handled, and relocated safely. The fisheries biologist shall notify NMFS staff at (707) 575-6050 or rick.rogers@noaa.gov, one week prior to capture activities in order to provide an opportunity for NMFS staff to observe the activities. During fish relocation activities the fisheries biologist shall contact NMFS staff at the above number, if mortality of federally listed salmonids exceeds two percent of the total for each species collected, at which time NMFS will stipulate further measures to reduce the take of salmonids.

c. If ESA-listed fish are handled, it shall be with extreme care and they shall be kept in water to the maximum extent possible during rescue activities. All captured fish shall be kept in cool, shaded, aerated water protected from excessive noise, jostling, or overcrowding any time they are not in the stream and fish shall not be removed from this water except when released. To avoid predation the biologist shall have at least two containers and segregate young-of-year fish from larger age-classes and other potential aquatic predators. Captured salmonids will be relocated as soon as possible to a suitable instream location where suitable habitat conditions are present to allow for survival of transported fish and fish already present.

d. Non-native fish that are captured during fish relocation activities shall not be relocated to anadromous streams, or areas where they could access anadromous habitat.

e. Pumps used to dewater the work area shall be equipped with screens that meet the following NMFS fish screening criteria:

- Perforated plate: screen openings shall not exceed 3/32 inches (2.38mm), measured in diameter.
- Woven Wire: screen openings shall not exceed 3/32 inches (2.38 mm measured diagonally).
- Screen material shall provide a minimum of 27% open area. Approach velocity shall not exceed 0.33 feet per second.

2.10 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 has the following conservation recommendation for the Corps:

> The Corps should engage with NMFS on other potential Program-level efforts to achieve both improved conservation and regulatory efficiency during Section 7 consultations.

2.11 Reinitiation of Consultation

This concludes formal consultation for the U.S. Army Corps of Engineers' Programmatic Bio-Engineered Bank Stabilization Permitting Program.

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 ITS is exceeded, (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion, (3) the agency action is subsequently modified in a manner that causes an effect on 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.

3. MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT ESSENTIAL FISH HABITAT RESPONSE

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 the descriptions of EFH contained in the Pacific Coast Salmon Fishery Management Plan (PFMC 1999) developed by the Pacific Fishery Management Council and approved by the Secretary of Commerce.

3.1 Essential Fish Habitat Affected by the Project

EFH managed under the Pacific Coast Salmon Fishery Management Plan may be adversely affected by the Project.

3.2 Adverse Effects on Essential Fish Habitat

The potential adverse effects of the Project on EFH have been described in the preceding Biological Opinion. To summarize, the project may degrade instream habitat by preventing natural fluvial and geomorphic processes that create and maintain salmonid habitat. The project is proposed with design, monitoring, and Best Management Practices meant to avoid or minimize potential adverse effects to EFH from the project, and with elements to promote habitat recovery. As such, NMFS provides no EFH Conservation Recommendations at this time.

3.3 Supplemental Consultation

The Corps must reinitiate EFH consultation 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 U.S. Army Corps of Engineers, San Francisco District, and individual copies of this opinion were provided to them. 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 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 reviewed in accordance with West Coast Region ESA quality control and assurance processes.

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6. APPENDICES

Appendix A

E-mail Verification Guidelines for Projects Proposed for the Corps Bio-Engineered Bank Stabilization Program

The **Bio-Engineered Bank Stabilization Programmatic** e-mail box (corps.bankstabprogrammatic.wcr@noaa.gov) is to be used for actions submitted to the National Marine Fisheries Service (NMFS) by the U.S. Army Corps of Engineers (San Francisco District) for verification under the Bio-Engineered Bank Stabilization Program, as described in the Programmatic Biological Opinion (WCR 2020-00688).

An automatic reply will be sent upon receipt, but no other communication will be sent from the programmatic e-mail box; this box is used **only for the initial contact** regarding actions the Corps proposes to approve under the Corps Bio-Engineering Bank Stabilization Program.. Once NMFS receives the initial contact email, the NMFS staff person assigned to the project will contact the Corps at the information you provide. All other subsequent communications regarding the proposed action should be conducted **outside** the use of the corps.bankstabprogrammatic.wcr@noaa.gov, e-mail.

The Corps will send only **one** project per e-mail submittal, and will attach all related documents in digital form. These documents will include the following:

1. action implementation Form, containing Action Notification;
2. map(s) and project design drawings (if applicable);
3. any other information useful to NMFS when evaluating potential project inclusion under the Corps Bio-Engineered Bank Stabilization Programmatic Biological Opinion.

E-mail Titling Conventions

In the subject line of the email, the Corps shall indicate the Corps Permit Number and project name, as follows:

Bio-Eng Bank for [project name], [Corps file No.].

E-mail Body

In the first paragraph of the email text, the Corps will include the location of the project by County and waterbody (tributary and watershed). This will facilitate expedient distribution within NMFS. Watershed shall be the name of the watershed containing the project that drains to the Pacific Ocean or San Francisco Bay:

Example:

This email requests confirmation from NMFS that the [project name] can be included in the Corps Bio-Engineering Bank Stabilization Program. The project is located on Ross Creek in the Corte Madera Creek Watershed in Marin County, California. Project information is attached.

***Importantly, do not request consultation or concurrence in the email. Consultation has already occurred with the issuance of NMFS' Programmatic Biological Opinion for the Corps' Bio-Engineering Bank Stabilization Program.

Withdrawals

In rare occurrences, a withdrawal may be necessary and unavoidable prior to subsequent communications outside of the corps.bankstabprogrammatic.wcr@noaa.gov, email. In this situation, please specify in the e-mail subject line that the project is being withdrawn. There is no form for a withdrawal; simply state the reason for the withdrawal and submit to the e-mail box above, following the email titling conventions. If a previously withdrawn notification is resubmitted later, this resubmittal will be regarded as a new action notification. Once a specific NMFS staff person has responded to the Corps regarding a particular action, withdrawals will occur using the procedures already in place, and not the corps.bankstabprogrammatic.wcr@noaa.gov, email.

Appendix B

ACTION NOTIFICATION FORM
U.S. Corps of Engineers, San Francisco District
Bio-Engineered Bank Stabilization Programmatic Biological Opinion

NMFS Review and Approval. The Corps project manager shall submit this form with the Action Notification portion completed to NMFS at corps.bankstabprogrammatic.wcr@noaa.gov as notification for approval. Please include digital copies of any project-related information, such as design diagrams, site photos, *etc.*

1. Action Notification

Date Notification Submitted	
Corps Contact	
Applicant	
Project Name	
Latitude and Longitude at Project site	
Impacted Waterway	
Proposed Construction Period (start and end dates)	
Proposed Length of Streambank Stabilization (feet) and Active Channel Width at site	

2. Project Description: (type of bioengineering used, *etc.* If the below space is insufficient, please attach additional details to submittal email)

NMFS Species/Critical Habitat impacted by Project:

☐SONCC coho salmon
☐CCC coho salmon
☐NC steelhead
☐CCC steelhead
☐S-CCC steelhead
☐CC Chinook salmon