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

May 18, 2022 **Refer to NMFS No:** WCRO-2021-03365

James Mazza
Acting 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 NOAA Restoration Center and Army Corps of Engineers' (Corps) Reissuance of Regional General Permit 12 (RGP-12)

Dear Mr. Mazza:

Thank you for your letter of December 14, 2021, 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 the San Francisco Corps of Engineers' reissuance of RGP-12. 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)].

The enclosed biological opinion describes NMFS' analysis of likely effects of reissuance of RGP-12 on threatened Southern Oregon/Northern California Coast (SONCC) coho salmon (*Oncorhynchus kisutch*) and endangered Central California Coast (CCC) coho salmon; threatened Coastal California (CC) Chinook salmon (*O. tshawytscha*); threatened Northern California (NC) steelhead (*O. mykiss*), threatened Central California Coast (CCC) steelhead, and endangered South-Central California Coast (S-CCC) steelhead; and designated critical habitat for these species in accordance with Section 7 of the ESA. In the biological opinion, NMFS concludes reissuance of RGP-12 is not likely to jeopardize the continued existence of these ESA-listed species, nor is it likely to adversely modify salmonid critical habitat. NMFS anticipates take of these species will occur as a result of reissuance of RGP-12, and has included an incidental take statement with the enclosed biological opinion.

In addition, NMFS concurs with the Corps' determination that the proposed action is not likely to adversely affect the southern Distinct Population Segment (DPS) of North American green sturgeon *(Acipenser medirostris)*, the southern DPS Pacific eulachon (*Thaleichthys pacificus*), or designated critical habitats for these species.

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 operate within an area identified as EFH for fish species managed under the following Fishery Management Plans:

Pacific Coast Salmon (PFMC 2016), Coastal Pelagic Species (PFMC 2019a), and Pacific Coast Groundfish (PFMC 2019b). The Program includes design, staging, monitoring, and adaptive management strategies recommended by NMFS to avoid or minimize potential adverse effects to EFH, and elements that promote species recovery. Thus, no EFH conservation recommendations are provided.

Please contact Julie Weeder at NMFS' Northern California Office at 707-825-5168 or Julie.Weeder@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

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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' Reissuance of Regional General Permit 12

NMFS Consultation Number: WCRO-2021-03365
Action Agency: U.S. Army Corps of Engineers

Affected Species and NMFS' Determinations:

ESA-Listed Species	Status	Is Action Likely to Adversely Affect Species?	Is Action Likely to Jeopardize the Species?		
Southern Oregon/Northern California Coast Coho Salmon (*Oncorhynchus kisutch*)	Threatened	Yes	No		
Central California Coast Coho Salmon (*O. kisutch*)	Endangered	Yes	No		
California Coastal Chinook Salmon (*O. tshawytscha*)	Threatened	Yes	No		
Northern California Steelhead (*O. mykiss*)	Threatened	Yes	No		
Central California Coast Steelhead (*O. mykiss*)	Threatened	Yes	No		
South Central California Coast Steelhead (*O. mykiss*)	Threatened	Yes	No		
Southern Green Sturgeon (*Acipenser medirostris*)	Threatened	No	N/A		
Southern Eulachon (*Thaleichthys pacificus*)	Threatened	No	N/A		

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
Coastal Pelagic Species	Yes	No
Pacific Coast Groundfish	Yes	No

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

Issued By:

Alecia Van Atta
Assistant Regional Administrator
California Coastal Office

Date: May 18, 2022

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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 U.S.C. 1531 et seq.), as amended, and implementing regulations at 50 CFR part 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 part 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). The document will be available within 2 weeks at the NOAA Library Institutional Repository [https://repository.library.noaa.gov/welcome]. A complete record of this consultation is on file at California Coastal NMFS office.

1.2 Consultation History

In November 2019, the California Department of Fish and Wildlife (CDFW) and the San Francisco District Regulatory Division of the U.S. Army Corps of Engineers (Corps) began coordination with NMFS West Coast Region's California Coastal Office (NMFS) to revise and reissue Regional General Permit 12 (RGP-12), which is held by CDFW. RGP-12 authorizes projects funded and/or approved under CDFW's grant programs within the San Francisco Corps district, including the Fisheries Restoration Grants Program (FRGP).

The Corps sought NMFS consultation on reissuance of RGP-12 due to potential effects to ESA-threatened Southern Oregon/Northern California Coast (SONCC) coho salmon (*Oncorhynchus kisutch*) and endangered Central California Coast (CCC) coho salmon; threatened California Coastal (CC) Chinook salmon (*O. tshawytscha*); threatened Northern California (NC) steelhead (*O. mykiss*), threatened Central California Coast (CCC) steelhead, and threatened South-Central California Coast (S-CCC) steelhead, as well as designated critical habitats for these species. In addition, the Corps anticipated potential effects to Essential Fish Habitat (EFH) for three fisheries regulated under the Magnuson Stevens Fishery Conservation and Management Act (MSA): Pacific Coast Salmon, Coastal Pelagic Species, and Pacific Coast Groundfish.

The RGP-12 Biological Opinion (BO) in place when coordination started (WCR-2015-2400) was set to expire on December 1, 2020. Due to extensive anticipated revisions to the proposed action and the processing time needed to reissue RGP-12, the Corps determined it would not be possible to reissue an RGP-12 reflecting these revisions prior to the expiration date of the then-current BO (WCR 2015-2400). Therefore, the Corps sought NMFS consultation on a time extension of the unchanged RGP-12 for two additional field seasons. On November 6, 2020, NMFS provided the Corps with a BO for this extension (WCRO-2020-02938). This BO expires on December 31, 2022.

In late 2019, throughout 2020 and 2021, and during the first four months of 2022, staff from CDFW, the Corps, and NMFS met regularly to:

- Add restoration work in tidal areas, as well as additional restoration methods, to the proposed action.
- Discuss NMFS comments on draft versions of the Biological Assessment (BA).
- Discuss the Instream Bank Stabilization project type and the living shorelines portion of the Instream Habitat Improvement project type.

On December 13, 2021, NMFS received a letter from the Corps requesting initiation of Endangered Species Act (ESA) and MSA consultation on their reissuance of RGP-12 (the proposed action), along with a final BA. The same day, NMFS notified the Corps that the initiation letter and BA included Central Valley ESA-listed salmonids that are not present in the action area. On December 14, 2021, the Corps transmitted a revised initiation letter to NMFS omitting the Central Valley salmonids from the consultation request. NMFS initiated ESA and MSA consultation on this proposed action on December 14, 2021. During April and early May 2022, NMFS provided technical assistance to CDFW and the Corps on suggested revisions to the BA. On May 16, 2022, CDFW submitted a revised BA to the Corps and NMFS that included updated take estimates for Program activities, and omitted information on Central Valley salmonids and critical habitat.

1.3 Proposed Federal Action

Under the ESA, "action" means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies (see 50 CFR 402.02). Under the MSA, "Federal action" means any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken by a Federal agency (see 50 CFR 600.910).]

The Corps proposes to reissue RGP-12 to CDFW every 5 years[1] pursuant to section 404 of the Federal Clean Water Act of 1972, as amended (33 U.S.C. 1344 et seq.), for the placement of fill material into the waters of the United States to annually implement anadromous salmonid habitat restoration projects under CDFWs Fisheries Restoration Grant Program (Program). Projects will be implemented in various streams and rivers in portions of the following coastal counties, which are within the regulatory jurisdictional boundaries of the Corp's San Francisco District: Alameda, Contra Costa, Del Norte, Glenn, Humboldt, Lake, Marin, Mendocino, Monterey, Napa, San Benito, San Francisco, San Luis Obispo (northeast, non-coastal), San Mateo, Santa Clara, Santa Cruz, Siskiyou, Solano, Sonoma, and Trinity.

The activities funded by FRGP and implemented under RGP-12 are designed to restore habitat that will support recovery of the following ESA-listed salmonids: SONCC coho salmon, CCC

[1] The timeframe considered for this ESA analysis is ongoing and long-term.

coho salmon, CC Chinook salmon, NC steelhead trout, CCC steelhead trout, and S-CCC steelhead trout.

Projects funded through CDFW's FRGP and implemented under RGP-12 are required to complete all construction related activities within four field seasons from grant execution date. Projects must be completely closed out by their fifth year from their Proposal Solicitation Notice year. Instream restoration activities are required to be implemented annually during the summer low-flow period, typically between June 15 and November 1. Actual projects start and end dates, within this timeframe, are at the discretion of the CDFW (i.e., on the Shasta River projects must be completed between July 1 and September 15 to avoid impacts to immigrating and emigrating salmonids). Whenever possible, the work period at individual sites shall be further limited to entirely avoid periods when salmonids are present (for example, in a seasonal creek, work will be confined to the period when the stream is dry). Extensions to the work season can be granted if: 1) there is less than a 50% chance of 1.5 inches of rain predicted over any 24-hour period during the granted time extension; and 2) if CDFW determines and NMFS confirm that an extension will not result in effects that go beyond those analyzed during the ESA consultation on the proposed action, either in type or magnitude.

The proposed habitat restoration actions would provide predator escape and resting cover, increase spawning habitat, improve upstream and downstream migration corridors, improve pool to riffle ratios, and add habitat complexity and diversity. Instream structures constructed as part of the proposed action would be designed to reduce sedimentation, protect unstable banks, stabilize existing slides, provide shade, and create scour pools.

1.1.1. Oversight and Project Administration

1.1.1.1 Submittal of Project Applications for Funding and Authorization Under FRGP

Potential grantees seeking funding or authorization under FRGP will submit proposals during the annual Proposal Solicitation Notice (PSN). Grantees will have from March to April of each year to apply for that fiscal year's grant solicitation for potential inclusion into the FRGP. After closure of the PSN, projects go through two sets of review: Administrative Review, and the Technical Review Team. Administrative Review checks to ensure that all required documents for each project type have been submitted correctly and within the allotted timeframe. Once proposals have passed Administrative Review, potential projects are then assigned three reviewers from a joint effort of CDFW and National Oceanic and Atmospheric Administration (NOAA) environmental scientists/engineers to deem the proposals' ability to restore and enhance salmonid habitat as stated. Projects that pass this review are assembled into a potential funding list. Once the potential funding list has been determined, the FRGP Regulatory Coordinator works to create a California Environmental Quality Act (CEQA) Mitigated Negative Declaration (MND) to show that all projects will not have significant environmental and cultural impacts in their proposed area. Once projects have cleared CEQA Review and are deemed appropriate the funding list is brought to the CDFW Director for final approval before awards are made to potential grantees.

1.1.1.2 Project Eligibility

1.1.1.2.1 Ineligible for Funding

Projects with the following characteristics are ineligible to receive funding from the FRGP program, and are not part of the proposed action, therefore this ESA consultation document does not contemplate them further.

- Projects that are required mitigation or used for mitigation (CDFW requirement for program and CEQA/California Endangered Species Act requirement (CESA) for permitting).
- Projects that are under an enforcement action by a regulatory agency (CDFW requirement for program and CEQA/CESA requirement for permitting).
- Installation of new fish ladders or maintenance of existing ladders.
- Projects that would require the installation of a flashboard dam or head gate to guarantee project performance.
- Contain the construction of concrete-lined channels of any sort.
- Implementation projects that do not restore, recover, or enhance either salmonid populations and/or habitat.
- Projects working within vernal pool habitat.
- Projects that use gabion baskets.
- Projects where the constructed habitat would be used as a new point of water diversion.
- Projects that are likely to cause, for any Covered Species, a permanent net loss of habitat, permanent net loss of habitat function, or permanent net loss of functional value of designated or proposed critical habitat (e.g., the physical and biological features essential for the species' recovery and conservation).
- Projects that would result in any net loss of eelgrass resources.
- Placement of new tide gates where they did not previously exist.
- Use of riprap, rock slope protection, or any other form of bank protection beyond the minimum amount needed to achieve restoration project goals, as determined by CDFW.
- Use of chemically treated timbers used for grade or channel stabilization structures, bulkheads, overwater structures, or other instream structures.
- Removal of any dam under Federal Energy Regulatory Commission (FERC) jurisdiction.
- Fish hatchery/fish stocking projects.
- Watershed stewardship training.
- Salmon in the classroom projects.
- Projects involving obstruction blasting (with explosives).

1.1.1.2.2 Ineligible for Programmatic Permitting

Projects with the following characteristics are eligible for FRGP funding but would be ineligible for coverage under this consultation, unless the variance process (section 2.2.4) results in their eligibility, such projects must seek separate ESA consultation.

- Projects requiring dewatering of more than 1,000 contiguous feet of stream at any given time.

- Projects that will result in handling the same fish multiple times during sequenced dewatering events during the same year.
- Projects that include in-water impact pile driving that is expected to exceed the Interim Pile Driving Criteria (FHWG 2008) (or current Pile Driving Criteria when the 2008 criteria are updated).

1.1.1.3 Project Tracking and Annual Reporting

Projects funded through the Program will be tracked through CDFW's WebGrants database from project proposal submission through the final project closeout. All projects are assigned a CDFW Grant Managers that oversees project deliverables to meet the proposed metrics. In order for grantees to begin implementation each year, projects must acquire a Notice to Proceed showing that all appropriate biological and cultural surveys along with project objectives have been met.

In addition, each year on March 15, CDFW will send the Corps, United States Fish and Wildlife Service (USFWS), and NMFS a notification list detailing new and ongoing projects that are currently working under RGP-12. The notification list will include the following information: Project application identification number, FRGP grant number, project type, grant status, project title, project description, project applicant, county, CDFW region, USFWS/NOAA office jurisdiction, HUC-8 & HUC-10, stream(s), CDFW grant manager, latitude & longitude, proposed work start and end dates for that year, overall stream length treated (miles), waterbody impacted (riparian, instream, or upslope), any additional notes needed for the individual project.

Each year after the project implementation season ends on November 1, CDFW will begin analysis of data documenting effects of Program activities on juvenile listed salmonids and their critical habitat, including effects from project implementers (including monitoring activities) and effects of CDFW's monitoring activities for that calendar year. After data is validated, CDFW and Pacific States Marine Fisheries Commission staff compile the metrics into the annual reports to submit to the Corps, USFWS, and NMFS on March 1 of each year.

The annual report to NMFS will include information about each restoration project or monitoring effort carried out during the reporting period as described below.

1. Raw data provided in spreadsheet form documenting the number, HUC-10 location, and ESU or DPS of each fish relocated and killed (1 row for each project). A map indicating the location of each project.
2. Summaries of the following information across all projects in that reporting period: The number of fish of each ESU/DPS exposed to adverse effects of project activities authorized under RGP-12, and of these the number of fish killed.
    a. A comparison of the actual exposure and death data to the maximum exposure and death anticipated for each species, as described in Tables 3 and 4.
    b. The number and type of instream structures implemented within the stream channel.
    c. The length of streambank (feet) stabilized or planted with riparian species.
    d. The number of culverts replaced or repaired, including the number of miles of restored access to unoccupied salmonid habitat.
    e. The distance (miles) of road decommissioned.

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

3. If more than 3% of the fish captured in any given location and day perish, the report will include a description of the factors that contributed to fish death at each such capture event.
4. A narrative description of any requested variances from the limitations described in the Proposed Action and their resolution.
5. A narrative description of how any project-specific information collected during the previous year (such as effectiveness monitoring) was or should be used to assess the effects and benefits of salmonid restoration projects authorized through the Program.
6. For each project that includes application of s bio-engineering methods, the length of bio-engineered streambank restored per project compared to the active channel width of that project (the former must be less than 3x the latter).
7. If the number of juveniles of any species that are harmed or killed by Program activities exceeds the annual estimate for that species by 10% or more in a single year, or by any amount in three consecutive years, the Corps and/or CDFW will coordinate with NMFS to develop an adaptive management plan to incorporate additional minimization measures in project plans as needed.
8. Through the Salmon Habitat Assessment for Restoration Effectiveness (SHARE) team, or other approaches mutually agreed upon by the Corps, CDFW, and NMFS, the Corps and/or CDFW will engage with NMFS on an ongoing basis to review the results of implementation, effectiveness, and validation monitoring, modify how such monitoring is carried out by applicants and CDFW, and assess if these results suggest opportunities to reduce impacts on listed salmonids and their habitat, to advance restoration success, or both.

1.1.1.4 Variance Process

Requests for variance from those limitations previously described in the proposed action will be considered. One potential example of a variance request would be allowing more than 1000 contiguous feet of stream to be dewatered if the water quality conditions were demonstrated to be poor (temperatures above 25° C) throughout the reach and no cold water refugia areas were identified in the area to be dewatered. Another example is a request to forego relocating fish prior to dewatering a stream reach with water temperatures greater than 25° C. The following process will be used to determine whether the proposed variance would result in effects of a nature or magnitude that were not anticipated by the Program as described in the BA (CDFW 2022). If so, the variance will not be granted.

Variance requests may be submitted by project applicants at any time. Variance requests will be evaluated by CDFW in coordination with applicable agencies. CDFW will contact applicable agencies about any variance requests, and those agencies may assist CDFW in determining whether or not the variance will be granted. CDFW will then notify the project applicants of whether or not the variance has been approved under the Program and document the resolution of each variance request in their annual report for the Program. This documentation will include the following information:

- A description of the project and the design feature within the project that needs a variance.

- The reason why the design feature requires a variance.
- The specific design variance requested.
- The rationale for why the requested variance will not result in effects that go beyond those analyzed in the BA (CDFW 2022), either in type or magnitude. In the temperature example, this rationale may include describing known temperature tolerances for species that may be present and any evidence that no salmonids have been detected in areas like this (e.g., the mainstem Eel River) above 25° C, to argue that no fish would be harmed by the requested variance.
- Whether the design variance was granted or denied, and the rationale for any denials.

1.1.2. Project Types

NMFS has evaluated the initiation package, including the final BA (CDFW 2022), and determined that it provides a comprehensive description of the proposed action. The project description (section 2.0 of the BA) is adopted here and briefly summarized below (50 CFR 402.14(h)(3)).

The Program has 20 individual project types. The project types consist of implementation projects (those with a field component) and non-implementation projects (those with no field component, such as planning). All of these project types are part of the proposed action, but because non-implementation projects have no field component, they will have no effect on listed species or their critical habitats and are not discussed further. Implementation projects may require the use of heavy equipment (i.e., self-propelled logging yarders, mechanical excavators, backhoes, etc.); however, hand labor will be used when possible. The implementation project types are:

HI – Instream Habitat Improvements: Instream habitat restoration includes the installation of boulder structures (boulder weirs; vortex boulder weirs; boulder clusters; and single and opposing boulder wing-deflectors), log and root wad structures (divide logs; digger logs; spider logs; engineered log jams; log weirs; upsurge weirs; single and opposing log wing-deflectors; and log, root wad and boulder combinations), off-channel and/or side channel habitat construction and floodplain connectivity, and projects that involve grading, such as those designed to reset the channel in freshwater or estuarine areas. The project type also includes the creation of living shorelines, salt marsh remediation, the removal of structures to improve water quality (i.e., chemically treated wood pilings), and the restoration and re-establishment of submerged aquatic vegetation (e.g., eelgrass beds). See pages 14-24 in the BA (CDFW 2022) for a more detailed description.

HB – Instream Barrier Modification for Fish Passage: Instream barriers are grade control structures (weirs), flashboard dams, small dams' debris basins, water diversion structures, log jams, beaver dams (removal or modification of beaver dams would only be in service of a larger restoration effort), waterfalls, chutes, landslides, tide gates, and log debris accumulations that prevent or impede the passage of adult and juvenile salmonids to preferred areas. Removing low-flow barriers, tide/flood gates, low-risk small dams and failing Denil and Alaska steep-pass fishways; installing rock weirs to deepen low-flow impediments; notching grade control structures; placing baffles within concrete-lined sections of channel and installing engineered stream bed ramps on small dams and on flood-control structures such as debris basins are ways to greatly improve the migration efforts of salmonids returning to natal streams. This project type includes the creation of beaver habitat and installation of beaver dam analogue structures. See pages 24-28 in the BA (CDFW 2022) for a more detailed description.

FP – Fish Passage at Stream Crossings: Stream crossing barriers such as paved roads, unpaved roads, railroads, trails and paths, fair-weather Arizona crossings, bridges, and box, pipe, or concrete culverts and baffles limit or impede salmonid migration. By providing fish friendly crossings where the crossing width is at least as wide as the active channel, a culvert pass is designed to withstand a 100-year storm flow, or a crossing bottom is buried below the streambed creates access to migratory and spawning habitat. Examples include but are not limited to replacement of barrier stream crossing with bridges, bottomless arch culverts, embedded culverts, or fords. See pages 28-30 in the BA (CDFW 2022) for a more detailed description.

HU – Watershed Restoration (Upslope): Upslope watershed restoration projects are designed to reduce sediment delivery to anadromous streams through road decommissioning, road upgrading, and storm proofing roads (replacing high risk culverts with bridges, installing culverts to withstand the 100-year flood flow, installing critical dips, installing armored crossings, and removing unstable sidecast and fill materials from steep slopes). See pages 30-31 in the BA (CDFW 2022) for a more detailed description.

HR – Riparian Habitat Restoration: Riparian restoration projects are designed to improve instream salmonid habitat through increased stream shading which lower stream temperatures, as well as increase future recruitment of woody debris to streams, and increase invertebrate forage productions. This project type typically includes the following: natural regeneration, livestock exclusionary fencing, bioengineering, revegetation projects, tree and natural material revetment, mulching, willow wall revetment, willow siltation baffles, brush mattresses, check-dams, brush check-dams, exclusionary fencing, waterbars and eradication of non-native, invasive vegetation species and revegetation with native endemic riparian species. See pages 31-34 in the BA (CDFW 2022) for a more detailed description.

WC – Water Conservation Measures: Eligible water conservation projects are those that provide more efficient use of water extracted from stream systems and result in an increase in flows that benefit aquatic species. Off-channel water storage, changes in the timing or source of water supply, moving points of diversion, irrigation ditch lining, piping, stock-water systems, installation of efficiency irrigation systems, graywater, and rainfall collection systems, and agricultural tailwater recovery/management systems are included in this category when the water savings are quantified and dedicated for instream beneficial flows. The water savings for these projects must include an instream dedication of 100% of the water saved due to project implementation and in a manner to support fish during water limited seasons, and shall dedicate to the stream for anadromous salmonid benefits through a mechanism such as a Forbearance Agreement, an Instream Flow Lease, or a formal dedication or transfer of water rights through Chapter 10, Section 1707 of the California Water Code (1707 petition). See pages 34-36 in the BA (CDFW 2022) for a more detailed description.

WD – Water Measuring Devices (Instream and Water Diversion): Eligible water measuring device projects are those that will install, test, and maintain instream water diversion measuring devices. The instream gauges must be installed so they do not impede fish passage in anadromous streams. See pages 36-37 in the BA (CDFW 2022) for a more detailed description.

PD – Project Design: Eligible proposals for developing project designs or a feasibility study for restoration activities are those that would protect or improve habitat for salmonids (e.g., the above list of project types). While these project types generally have no on-the-ground work, there is the potential need for small levels of ground disturbance for geotechnical surveys (i.e., ground water wells) in order to produce the most scientifically sound designs for future implementation projects. See page 37-38 in the BA (CDFW 2022) for a more detailed description.

MO – Monitoring Watershed Restoration (Large-scale and Project-scale): Eligible restoration monitoring projects are those which will address at least one of the following tasks: (1) implementation monitoring, (2) effectiveness monitoring and (3) validation monitoring. Such monitoring may include capture and handling of fish, and may result in minor increases in turbidity when monitors wade in the stream to measure habitat features. See page 38 in the BA (CDFW 2022) for a more detailed description.

SC – Fish Screens: This category includes the installation of fish screens on existing water intakes. Constructing/installing a fish screen usually includes site excavation, forming and pouring a concrete foundation and walls, and installation of the fish screen structure. Pile driving may be needed for certain types of screens. Typically, if the fish screen is placed within or near flood-prone areas, rock or other armoring is installed to protect the screen. Fish screen types include self-cleaning screens (including flat plate and other designs, including rotary drum screens and cone screens with a variety of cleaning mechanisms), and non-self-cleaning screens (including tubular, box, and other designs). All screens must be consistent with NMFS fish screening guidelines. See pages 38-39 in the BA (CDFW 2022) for a more detailed description.

1.1.3. Construction Techniques

The CDFW Manual[2] provides information, guidance, and techniques for proper implementation of various types of salmonid restoration projects. Additional acceptable manuals allowed through the FRGP and the sections of those eligible for usage (in addition to the CDFW Manual) are described in Attachment C of the BA (CDFW 2022). Further, FRGP will conduct an annual meeting during the month of October each year to address potential changes/updates to these approved restoration manuals. This will allow all agencies to bring forth the most up-to-date scientific manuals for use in restoration methods for the benefit of listed species and habitats; as well as allowing for discussion on the possible change in effects that may follow from the inclusion of proposed additional manuals. CDFW will involve NMFS in this process.

1.1.4. Program-wide Best Management Practices (BMPs), Conservation Measures, and Mitigation & Avoidance Measures

Below is a partial list of BMPs and measures for projects implemented under RGP-12. These BMPs and measures are those most relevant to avoiding or minimizing adverse effects on

[2] http://www.dfg.ca.gov/fish/Resources/HabitatManual.asp

salmonids and their habitat. See pages 41-52 in the BA (CDFW 2022) for a complete list of the BMPs and measures that will be implemented with this Program.

- Project work within the wetted stream shall be limited to the period between June 15 and November 1, or the first significant rainfall, or whichever comes first. Actual projects start and end dates, within this timeframe, are at the discretion of the CDFW (i.e., on the Shasta River projects must be completed between July 1 and September 15 to avoid impacts to immigrating and emigrating salmonids).
- To account for the increased sediment production from projects and to limit impacts from large scale projects, CDFW will limit the amount of large-scale HI projects that are greater than or equal to 50 acres in size. Projects of these sizes will be limited to 1-2 per year per HUC-10 size (see section 4.1.4 of the BA (CDFW 2022) for HUC-10 size limits). As such no more than one small dam or project 50 acres or greater would be allowed per year at a HUC-10 watershed scale of 100 square miles or less. Conversely, no more than two small dam projects or projects that are 50 acres or greater would be allowed per year in HUC-10s that are 101 square miles or more. These limits only apply to the instream construction phase of the projects where the mobilization of sediment is most likely to occur and does not pertain to riparian activities or the life of the active grant project. In addition, all projects during their construction phase under this permit will be spaced at least 1,500 lineal feet apart in fish bearing streams and 500 lineal feet apart in non-fishing bearing streams to avoid compounding mobilization of sediment during construction activities.
- Fish relocation and dewatering activities shall only occur between June 15 and November 1 of each year and shall be performed by a qualified fisheries biologist.
- A maximum of 1,000 contiguous feet of that stream reach may be dewatered at any given time. Other sections of stream within the same project area may be dewatered in up to 1,000 contiguous foot increments, as long as listed fish that were handled during the initial dewatering event are not handled during subsequent dewatering events during the same year. To avoid handling the same fish multiple times during sequenced dewatering events, fish must be relocated to suitable habitat conditions outside of the zone that could be dewatered during that season. In addition, for each dewatering and relocation event, sufficient field staff must be available to efficiently move and care for relocated fish. The fish relocation plan submitted prior to the event must describe this sufficiency.
- Staging/storage areas for equipment, materials, fuels, lubricants, and solvents, will be located outside of the stream's high-water channel and associated riparian area where it cannot enter the stream channel. Stationary equipment such as motors, pumps, generators, compressors, and welders located within the dry portion of the stream channel or adjacent to the stream, will be positioned over drip-pans. Vehicles will be moved out of the normal high-water area of the stream prior to refueling and lubricating. Prior to the onset of work, CDFW shall ensure that the grantee has prepared a plan to allow a prompt and effective response to any accidental spills.
- The number of access routes and footpaths, number and size of staging areas, and the total area of the work site activity shall be limited to the minimum necessary. All access routes, footpaths, and staging areas created during the project shall be replanted with native vegetation.

- Any construction debris shall be prevented from falling into the stream channel. Any material that does fall into a stream during construction shall be immediately removed in a manner that has minimal impact to the streambed and water quality.
- Where feasible, the construction shall occur from the bank, or on a temporary pad underlain with filter fabric.
- Temporary fill shall be removed in its entirety prior to close of work-windows.
- Suitable large woody debris removed from fish passage barriers that is not used for habitat enhancement, shall be left within the riparian zone so as to provide a source for future recruitment of wood into the stream, reduce surface erosion, contribute to amounts of organic debris in the soil, encourage fungi, provide immediate cover for small terrestrial species and to speed recovery of native vegetation.

Dewatering and Fish Relocation

- CDFW shall minimize the amount of wetted stream channel that is dewatered at each individual project site to the fullest extent possible.
- Any work within the stream channel shall be performed in isolation from the flowing stream and erosion protection measures shall be in place before work begins.
- If there is any flow when work will be done, the grantee shall construct coffer dams upstream and downstream of the excavation site and divert all flow from upstream of the upstream dam to downstream of the downstream dam.
- No heavy equipment shall operate in the live stream, except as may be necessary to construct coffer dams to divert stream flow and isolate the work site.
- Coffer dams may be constructed with clean river run gravel or sandbags and may be sealed with sheet plastic. Upon project completion, sandbags and any sheet plastic shall be removed from the stream. Clean river run gravel may be left in the stream channel, provided it does not impede stream flow or fish passage and conforms to natural channel morphology without significant disturbance to natural substrate.
- Dewatering shall be coordinated with a qualified biologist to perform fish and wildlife relocation activities.
- The length of the dewatered stream channel shall be kept to a minimum and shall be less than 1,000 contiguous feet at any given site on any given day.
- Pump intakes shall be covered with 0.125-inch mesh to prevent entrainment of fish or amphibians that failed to be removed. Pump intakes shall be periodically checked for impingement of fish or amphibians and shall be relocated according to the approved measured outline for each species below.
- Prior to placement of block nets above and below the work area, qualified biologists will visually scan the area, watching closely for large salmonids or evidence of their presence (e.g., disturbance of water surface due to top of dorsal fin). During net placement, biologists will watch closely to ensure that no adults are inadvertently captured. If any adults are captured, work will cease and NMFS will be contacted. Sampling will not proceed without NMFS' express approval.
- Species shall be excluded from the work area by blocking the stream channel above and below the work area with fine-meshed net or screen. Mesh shall be no greater than 1/8-inch diameter. The bottom edge of the net or screen shall be completely secured to the channel bed to prevent fish from reentering the work area. Exclusion screening shall be placed in areas of low water velocity to minimize fish impingement. Screens shall be

regularly checked and cleaned of debris to permit free flow of water. While placing block nets, implementers will watch closely to ensure that no adults are inadvertently trapped between the nets. If any adults are captured, work will cease and NMFS will be contacted. In-water work will not proceed without NMFS' express approval.

- Any equipment entering the active stream (for example, in the process of installing a cofferdam) shall be preceded by an individual on foot to displace wildlife and prevent them from being crushed.
- Handling and electrofishing of NMFS jurisdictional aquatic species under this Program may only be done by biologists that CDFW has approved as qualified. Qualified biologists must be experienced in identifying NMFS jurisdictional aquatic species, have experience with removal and relocation of these species, and have an understanding of the habitat and/or water quality needs of these species.
- Any project looking to conduct electrofishing within brackish waters will need to submit a plan to FRGP for approval by NMFS before work may commence. This plan must also show that the individual project will be using the correct specialized rods and attachments for work in high conductivity waters.
- In regions of California with high summer air temperatures, perform relocation activities either during morning periods or earlier in the season when temperatures are low.
- Prior to capturing fish, the most appropriate release location(s) shall be determined. The following shall be determined:
    - Temperature: Water temperature shall be similar as the capture location.
    - Habitat: There shall be ample habitat for the captured fish (i.e., the release location(s) are not already overcrowded with fish either naturally or from relocation efforts).
    - Exclusion from work site: There shall be a low likelihood for the fish to reenter the work site or become impinged on exclusion net or screen.
- Handling of salmonids shall be minimized. However, when handling is necessary, always wet hands or nets prior to touching fish.
- Temporarily hold fish in cool, shaded, aerated water in a container with a lid. Provide aeration with a battery-powered external bubbler. Protect fish from jostling and noise and do not remove fish from this container until time of release.
- Air and water temperatures shall be measured periodically. A thermometer shall be placed in holding containers and, if necessary, periodically conduct partial water changes to maintain a stable water temperature. If water temperature reaches or exceeds 18°C, fish shall be released, and rescue operations ceased.
- Overcrowding in containers shall be avoided by having at least two containers and segregating young-of-year (YOY) fish from larger age-classes to avoid predation. Larger amphibians, such as Pacific giant salamanders, shall be placed in the container with larger fish. If fish are abundant, the capturing of fish and amphibians shall cease periodically and captured fish and amphibians shall be released at the predetermined locations.
- If mortality during relocation exceeds 3%, capturing efforts shall be stopped and the appropriate agencies shall be contacted immediately.

In-water Pile Driving

Most pile driving will be conducted in, or adjacent to, dry channels. If pile driving cannot occur in a dry channel, species will be removed using the techniques described within this section and project applicants shall implement the following measures to avoid and minimize potential adverse effects that could otherwise result from in-water pile driving activities:

- Project applicants shall conduct an hydroacoustic assessment and develop a pile driving plan to confirm that underwater sound pressure levels are expected to below the accumulative sound exposure level (cSEL) injury threshold criteria for peak pressure and accumulated sound exposure levels. The pile driving plan will identify the appropriate, site-specific attenuation, sound monitoring, dewatering, or fish relocation measures necessary to avoid injury and mortality. If water depths allow for hydrophones that will enable real-time monitoring of underwater sound pressure levels, pile driving will cease before injury levels are exceeded regardless of what kind of attenuation, dewatering, or fish relocation measures are implemented. Impact pile driving that exceeds the Interim Pile Driving Criteria (FHWG 2008) listed below (or current Pile Driving Criteria when 2008 criteria are updated) will not be eligible for programmatic permitting.

    - Peak pressure = 206 decibel (dB) peak
    - Accumulated sound exposure levels = 183 dB cSEL
    - Accumulated sound exposure levels for fish over 2 grams = 187 dB cSEL

- The 183 dB cSEL level will be used unless, through the variance process defined below, salmonids under 2 grams are determined to be absent. The number of piles, type/size of the piles, estimated sound levels caused by the driving, how many piles will be driven each day, and any other relevant details on the nature of the pile driving activity must be included in the project application. See the Technical Guidance for the Assessment of Hydroacoustic Effects of Pile Driving on Fish (Caltrans 2020) for more information. Proposed projects that include impact pile driving that would exceed the183 dB cSEL level identified in the June 2008 Interim Pile Driving Criteria (FHWG 2008) (or exceeds the current Pile Driving Criteria when 2008 criteria are updated) would not be eligible for programmatic permitting and would require separate authorization and section 7 consultation.
- Pile driving shall occur during the established/approved in-water and general work windows described above.
- Sheet piling shall be driven by vibratory or nonimpact methods (i.e., hydraulic) that result in sound pressures below threshold levels to the extent feasible.
- Pile driving activities shall occur during periods of reduced currents. Pile-driving activities shall be monitored to ensure that the effects of pile driving on protected species are minimized. If any stranding, injury, or mortality to listed species is observed, NMFS/USFWS shall be immediately notified, and in-water pile driving shall cease. Vibratory hammers, rather than impact hammers, shall be used whenever possible.
- If pile driving is implemented in, or adjacent to, a wetted stream, monitoring of listed species shall occur during pile-driving activity to ensure no species stranding or mortality occurs.

- Sound monitoring will be done, if monitoring is possible due to water depth, to ensure to cSEL injury levels are not exceeded. If levels are met, then pile driving shall cease for a minimum of 12 hours. Potential attenuation measures include the following:

    - Use of a cushioning block between the hammer and pile.
    - Use of a confined or unconfined air bubble curtain.

Herbicide use protection measures
The following protection measures may be relevant to projects where herbicide application is anticipated as a project activity. Herbicides with the following active ingredients are approved by this Program for use in the riparian zone: 2,4-D (amine), Aminopyralid, Chlorsulfuron, Dicamba, Glyphosphate 1 (aquatic), Glyphosphate 2, Picloram and Tricliopyr.

- Whenever feasible, reduce vegetation biomass by mowing, cutting, or grubbing it before applying herbicide to reduce the amount of herbicide needed.
- Chemical control of invasive plants and animals will only be used when other methods are determined to be ineffective or infeasible. Herbicide use will be evaluated on a project-by-project basis with consideration of (and preference given toward) integrated pest management (IPM) strategies wherever possible. See University of California statewide IPM Program for guidance documents.
- Chemical use is restricted in accordance with approved application methods and BMPs designed to prevent exposure to non-target areas and organisms.
- Any chemical considered for control of invasive species must adhere to all regulations, be approved for use in California, its application must adhere to all regulations per the California Environmental Protection Agency, and it must be applied by a licensed applicator under all necessary state and local permits.
- Use herbicides only in a context where all treatments are considered, and various methods are used individually or in concert to maximize the benefits while reducing undesirable effects and applying the lowest legal effective application rate, unless site-specific analysis determines a lower rate is needed to reduce non-target impacts.
- Treat only the minimum area necessary for effective control. Soil-activated herbicides can be applied as long as directions on the label are followed. FRGP staff will recommend project proponents seek the advice of an Agricultural Pest Control Advisor if they are unfamiliar with the best chemical choices and combinations for their project, even if they are only planning to use the choices put forward in this biological assessment. If the project proponent is experienced with the use of certain chemicals and chemical mixtures, this extra step may not be necessary.
- To limit the opportunity for surface water contamination with herbicide use, all projects will have a minimum buffer for ground-based broadcast application of 100 feet, and the minimum buffer with a backpack sprayer is 15 feet (aerial application is not included in the proposed action).
- The licensed Applicator will follow recommendations for all California restrictions, including wind speed, rainfall, temperature inversion, and ground moisture for each herbicide used. In addition, herbicides will not be applied when rain is forecast to occur within 24 hours, or during a rain event or other adverse weather conditions (e.g., snow, fog).

- Herbicide adjuvants are limited to water or nontoxic or practically nontoxic vegetable oils and agriculturally registered, food grade colorants (e.g., Dynamark U.V. (red or blue), Aquamark blue or Hi-Light blue) to be used to detect drift or other unintended exposure to waterways.
- Any herbicides will be transported to and from the worksite in tightly sealed waterproof carrying containers. The licensed Applicator will carry a spill cleanup kit. Should a spill occur, people will be kept away from affected areas until clean-up is complete. Herbicides will be mixed more than 150 feet, as practicable, from any water of the state to minimize the risk of an accidental discharge. Impervious material will be placed beneath mixing areas in such a manner as to contain any spills associated with mixing/refilling.
- The licensed pesticide applicator will keep a record of all plants/areas treated, amounts and types of herbicides used, and dates of application, and pesticide application reports must be completed within 24 hours of application and submitted to applicable agencies for review. Wind and other weather data will be monitored and reported for all pesticide application reports.

1.1.5. Project Monitoring

The Program requires implementers of some project types to monitor their projects, and this monitoring may involve fish capture. Implementers of the project type "Monitoring Watershed Restoration (MO)" may also encounter and capture fish. In addition, a portion of the projects funded through FRGP are monitored by CDFW's Monitoring and Evaluation of Salmonid Habitat Restoration (MESHR) team, which includes staff from CDFW and the Pacific States Marine Fisheries Commission. Each year, the MESHR Team assesses the effectiveness of at least 10% of the FRGP projects funded that year and selects these projects by conducting a random draw from all of the year's funded restoration projects. The MESHR Team also monitors the implementation of 100% of the on-the-ground projects funded annually.

1.1.5.1 MESHR

1.1.5.1.1 Pre-Project and Post-Construction Monitoring

Before on-the-ground implementation of a project begins, the MESHR team conducts pre-treatment assessments on project work sites using checklists specific to each project type to create a baseline of the habitat prior to construction of project features. One to three years after a project's completion, the MESHR team will return to a project site(s) to then perform a post-treatment assessment, again using project type specific checklists which are designed to evaluate changes occurring from pre-treatment and project completion. These objectives are aimed at determining both 1) soundness and performance of project features after one to three winters, and 2) effectiveness based on any observed changes to habitat qualities. Additionally, projects that are for remediation of complete fish passage barriers and instream habitat improvement are monitored for use by salmonids via winter spawner surveys and/or summer snorkel surveys.

1.1.5.1.2 Pre-Assessment Monitoring and Post Project Effectiveness Monitoring

When planning restoration projects, a lack of information regarding species occurrence, distribution, and density during different parts of the year often confound project design objectives. Knowing site-specific fish and other listed species presence/absence information during the summer and winter can help inform design elements and help determine if the proposed feature(s) will be used only for winter rearing, summer rearing, or both.

In order to determine the effectiveness of a project, CDFW will species utilization, timing, and duration of use, and in certain cases, growth rates of target species utilizing the project area. Passive Integrated Transponder (PIT) tags may be used to determine growth rates, residency times, and apparent survival. Tissue samples may be provided to the various CDFW laboratories and research centers and NOAA's Southwest Fisheries Science Center for genetic analysis when requested by either.

Some of the projects that may be monitored for effectiveness include estuary restoration, Beaver Dam Analogs (BDAs) off-channel habitat creation, and floodplain reconnection. Many projects will be monitored for both summer and winter habitat utilization. Monitoring efforts may be conducted from the first significant rainfall (October – November) through spring (April – June) for winter rearing projects and also during summer base flow season (June – October) to determine summer rearing. In addition to the biological monitoring, habitat conditions (temp/salinity/dissolved oxygen (DO)) may be spot checked during sampling events as well.

The types of salmonid sampling that may be used in effectiveness monitoring are: snorkel surveys, seining, minnow traps, fyke nets, electrofishing, and rotary screw traps. Salmonids may be handled, trapped, captured, anesthetized, weighed/measured, PIT tagged, and sampled for tissue before released. See pages 73-77 of section 2.9 in the BA (CDFW 2022) for further information.

This document analyzes the effects of capturing juvenile salmonids during monitoring activities. Measures will be taken to prevent inadvertent capture of adult salmonids. Prior to deployment of gear to capture juvenile salmonids, monitors will visually scan the area to detect the presence of any adult salmonids. Monitors will also look for indirect evidence of adult fish (e.g., disturbance of water surface by dorsal fin). While sampling, monitors will continue to watch closely to ensure that no previously undetected adults are inadvertently captured. If any adults are captured, work will cease and NMFS will be contacted. Sampling will not proceed without NMFS' express approval.

1.1.5.2 Capture Methods

Many project types including, but not limited to estuary restoration, BDAs, off-channel habitat creation and floodplain reconnection projects may be monitored by CDFW or project implementers to estimate the effectiveness of these efforts. Many of these projects will be monitored for both summer and winter habitat utilization. Monitoring efforts may be conducted from the first significant rainfall (October – November) through spring (April – June) for winter rearing projects and also during summer base flow season (June – October) to determine summer rearing. In addition to the biological monitoring, habitat conditions (temp/salinity/DO) may be spot checked during sampling events as well.

Snorkel Surveys

Snorkel surveys are conducted to determine if a species is present in a given area. Surveys may be conducted pre- and post-project when conditions allow. Survey crews would consist of 1-2 divers counting salmonids swimming upstream using a 4-pass bounded count methodology for population estimates or single pass surveys for presence/absence surveys in water that has at least 3 feet of visibility. Procedure used: Observation only.

Seining

Seining is conducted to capture species in deeper water that does not have significant complexity (e.g., where there is no large wood). Two consecutive seine hauls are conducted at a given location using a 30ft x 4ft knotless mesh nylon seine. Nets consist of 6mm mesh wing sections 9m in length and a 3mm mesh 2m x 2m bag section. The seine is set by 2-3 crew members in a round haul fashion by fixing one end on the bank while the other end is deployed, wading upstream and returning to shore in a half circle. Once the lead line approaches the shore it is withdrawn more than the cork line until species are corralled in the bag and the lead line is on the bank. Each haul is expected to take approximately 1 – 5 minutes. Species captured in the bag are kept submerged in water until they are transferred by dip net, separated, and placed in aerated 5-gallon buckets following each haul prior to processing. Sampling will cease if water quality conditions are unfavorable to the health of the species or if temperatures exceed 21°C. Procedures used: seine, measure, weigh, anesthetize, PIT tag, capture, handle, release.

Minnow Traps

Minnow trapping is typically used in very complex habitats where seining would be likely not to be successful due to small/large wood and significant aquatic vegetation. Galvanized 5mm square wire mesh minnow traps will be baited with iodine-soaked roe and set. The minnow traps are 430mm in length with a middle circumference of 760 mm and fyke openings of 25mm at both ends. Traps are fished at each site on the bottom of the channel next to habitat structures if possible. Soak time of individual traps ranges from 30 to 180 minutes. Sampling will cease if water quality conditions are unfavorable to the health of the fishes or if temperatures exceed 21°C. Procedures used: trap, measure, weigh, anesthetize, PIT tag, capture, handle, release.

Fyke Nets

Fyke nets will be used in off-channel and slow-water habitats when minnow traps and seining are ineffective. Fyke nets (size ¼ in. mesh) may be set in the afternoon in a pond with the entrance/exit blocked so that no species may enter or leave. Fyke nets are set overnight and checked the following morning. The same methods will be repeated approximately one or two days following the first trapping event. Fyke nets have an opening at the mouth up to 15-feet wide and narrow down to a small opening approximately 6-inches wide and up to 20-feet in length. Fyke nets are set in the deepest part of the pond and would not be used in flood flows or when temperatures exceed 21°C. Procedures used: trap, measure, weigh, anesthetize, PIT tag, capture, handle, release.

Electrofishing
Electrofishing may be used in low water conditions when stream habitat is too complex for seining or minnow traps, or if other methods are not effective to inform the monitoring question. All electrofishing will be conducting according to NMFS Guidelines for Electrofishing Waters Containing Salmonids listed under the Endangered Species Act (2000) and the documents provided by the Pacific Lamprey Conservation Initiative found in the biological assessment's section 2.8.3. Electrofishing activities will be conducted during periods of the day and ideally when water is coolest. All electrofishing and handling procedures will be consistent with electrofishing methods and guidelines described above which describes species relocation activities, except species would not be relocated from the habitat where they were found during effectiveness monitoring. After handling, species will be released in the same general location they were captured. Electrofishing will not be used in high flows or when temperatures exceed 18°C. Additionally, any project looking to conduct electrofishing within brackish waters will need to submit a plan to FRGP for approval by NMFS and USFWS before work may commence. This plan must also show that the individual project will be using the correct specialized rods and attachments for work in high conductivity waters. Procedures used: electrofishing, measure, weigh, anesthetize, PIT tag, capture, handle, release.

Rotary Screw Traps
Rotary screw traps can be used to estimate juvenile production and with other methods like PIT tagging to describe individual fish growth, movement, survival, and residence timing which can used to evaluate restoration effectiveness. Rotary screw traps consist of large cones suspended between two floating pontoons. River flow rotates the cone and funnels a portion of the migrating fish into an underwater holding tank at the back of the trap. Rotary screw traps will only be operated when flows are safe for personnel to access and operate traps and avoid equipment damage. Traps will be checked daily, and all species will be removed from the live well. Salmonids can be anesthetized, measured, weighed, scanned for PIT tags, and examined for any fin-clips. Rotary screw trap efficiency can be estimated by releasing salmonids upstream of the trap after tagging and recovery. Efficiencies for juvenile salmonids will be estimated from this mark-recapture data using standard techniques where marked fish are released upstream of the trap, and the portion of these fish subsequently recaptured at the traps and will serve as the basis for calculating trap efficiencies. Procedures used: rotary screw traps, measure, weigh, anesthetize, PIT tag, capture, handle, and release.

1.1.5.3 Handling Methods

Anesthetic
Fish will be closely observed in an anesthetic bath of Alka-Seltzer Gold (aspirin free) brand sodium bicarbonate (NaHCO3) until loss of equilibrium is achieved but operculum movement is still present. Concentrations will range from one to two tablets per gallon of fresh river water depending on fish size and water temperature. The bicarbonate material will be allowed to completely dissolve before fish are added to the anesthetic bath.

Fry and juveniles will be anesthetized in groups < 10 fish per batch and larger parr and smolts will be anesthetized in groups of two fish. Fish should be able to be handled after 1-2 minutes in the anesthetic bath and will be processed immediately following loss of equilibrium. Fish will be allowed to recover in 5-gallon buckets of aerated fresh river water until normal behavior is observed. Water temperature in the recovery bucket will be monitored and maintained to be within two degrees of the ambient river temperature. Fish will be released to slow water habitat in the location in which they were originally found.

Measure/Weigh
While anesthetized, individuals will be placed onto a wetted Plexiglas measuring board and measured to the nearest mm fork length (FL), then transferred to a wetted container on an electronic scale and weighed to the nearest 0.01g.

PIT Tagging
Anesthetized fish greater than or equal to 70 mm FL may be implanted with tags up to 12 mm long, fish 60 mm FL to 69 mm FL may be implanted with up to 9 mm tags, and fish <60 mm would not be tagged. A full duplex PIT tag that is surgically implanted into the body cavity of the fish will be used as described by Prentice et al. (1990). A small incision will be made with a sterile scalpel anterior to the pectoral fin and the tag would be inserted by hand into the body cavity of the fish. Recovery protocols would follow as above to allow for full recovery before release.

Tissue Sampling
Tissue sampling techniques such as fin-clipping are common to many scientific research efforts using listed species. Fin-clipping is the process of removing part of a fish's fin to either mark the fish or to collect genetic material for analysis. Although researchers have used all fins for marking at one time or another, the current preference is to clip the adipose, pelvic, or pectoral fins. Marks can also be made by punching holes or cutting notches in fins, severing individual fin rays (Welch and Mills 1981). Many studies have examined the effects of fin-clips on fish growth, survival, and behavior. The results of these studies are somewhat varied; however, it can be said that fin-clips do not generally alter fish growth.

1.1.5.4 Measures to Minimize Effects of Project Monitoring Activities

Snorkel surveys would be the predominant method of assessing species presence, wherever feasible. Where there is an interest in collecting growth data or to implant PIT tags to track movement and survival of species, fyke, seining, and minnow trapping efforts would be considered. If species handling is desired, data collection crews will be large enough to reduce the impact of handling on captured species to the greatest extent possible. Captured species will be placed in buckets of fresh river water with thermometers to verify temperature is consistent with environmental temperatures and a portable aerator to keep DO levels up to acceptable levels. During high flows, minnow traps will be set in areas of slow water refugia. All PIT tagged fish will be anesthetized before PIT tag implementation. All individuals will be returned to the habitat where they were collected. Further, FRGP is proposing a yearly meeting during the month of October each year (only if needed) to address potential changes/updates to these monitoring activities. This will allow all agencies to bring forth the most up-to-date scientific techniques for use in our restoration projects for the benefit of our listed species and habitats; as well as allowing for the discussion on the possible change in effects that may follow from the inclusion of new proposed monitoring techniques.

1.1.5.5 Annual Estimates of Fish Captured, Handled, and Tagged During Monitoring, and Related Fish Losses

Table 1: Annual exposure estimates of juvenile salmonids captured, handled, and tagged during project monitoring, and anticipated injury mortality response.

ESU/DPS	Maximum Number of Juveniles Captured and Handled	Maximum Number of Juveniles PIT tagged	Anticipated injury and mortality (3%)
SONCC coho salmon	2500	25	75
CCC coho salmon	500	50	15
CC Chinook salmon	30	10	1
NC steelhead	9000	900	270
CCC steelhead	1000	100	30
S-CCC steelhead	1000	100	30

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

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 to 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 provide 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 reasonable and prudent measures (RPMs) and terms and conditions to minimize such impacts.

The Corps determined the proposed action is not likely to adversely affect Southern DPS Green Sturgeon (*Acipenser medirostris*), Southern Eulachon (*Thaleichthys pacificus*), or designated critical habitat for either species. Our concurrence is documented in the "Not Likely to Adversely Affect" Determinations section (2.10).

2.1 Analytical Approach

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

This biological opinion also relies on the regulatory 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 of critical habitat for SONCC coho salmon, CCC coho salmon, CC Chinook salmon, NC steelhead, CCC steelhead, and S-CCC steelhead use the term primary constituent element (PCE) or essential features. The 2016 final rule (81 FR 7414; February 11, 2016) that revised the critical habitat regulations (50 CFR 424.12) replaced 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 ESA Section 7 implementing regulations define effects of the action using the term "consequences" (50 CFR 402.02). As explained in the preamble to the final rule revising the definition and adding this term (84 FR 44976, 44977; August 27, 2019), that revision 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 rangewide 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 critical 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 Rangewide Status of the Species and Critical Habitat

This opinion examines the status of each species that is likely to 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' "reproduction, numbers, or distribution" for the jeopardy analysis. 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 function of the PBFs that are essential for the conservation of the species. This biological opinion analyzes the effects of the proposed action on the following listed species and their designated critical habitats:

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

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

Threatened CC Chinook salmon
- Listing determination (70 FR 37160; June 28, 2005)
- Critical habitat designation (70 FR 52488; September 2, 2005)

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

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

Threatened 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

2.2.1.1 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 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.

2.2.1.2 Chinook salmon

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 centimeters (cm), with no more than 5% 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 out-migrate during April through July (Myers et al. 1998).

2.2.1.3 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 in the action area (CDFW 2014, 2015, 2016, 2017, 2018, 2019) 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 (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 2016f).

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 edge-water 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

2.2.2.1 SONCC coho salmon

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. The most recent status review reaffirmed the ESU's threatened status (NMFS 2016a).

2.2.2.2 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, NMFS 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 (NMFS 2016b).

2.2.2.3 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 (Sonoma Water 2020).

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[3], 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). The most recent status review describes the discovery of spawning adults in several smaller, coastal Mendocino County tributaries where they had not been previously documented, which suggests ESU spatial diversity is likely better than previously thought (NMFS 2016c). The same status review reaffirmed the ESU's threatened status (NMFS 2016c).

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

2.2.2.4 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 (NMFS 2016c) 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 (NMFS 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 (NMFS 2016c) concludes NC steelhead, despite recent conservation efforts, remain impacted by many of the factors that led to the species being listed as threatened. Low streamflow volume, illegal cannabis cultivation, and periods of poor ocean productivity continue to depress NC steelhead population viability. The most recent status review reaffirmed the DPS's threatened status (NMFS 2016c).

2.2.2.5 CCC Steelhead

Historically, approximately 70 populations of steelhead existed in the CCC steelhead DPS (Spence et al. 2008, NMFS 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 review reaffirmed the DPS's threatened status (NMFS 2016d).

2.2.2.6 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[4] 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 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[5], 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

[4] 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.

[5] http://www.mpwmd.dst.ca.us/fishcounter/fishcounter.htm

(Goode et al. 2005) and, therefore, S-CCC steelhead remain listed as threatened (Williams et al. 2011). The most recent status review reaffirmed the DPS's threatened status (NMFS 2016e).

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 7214) 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.

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For SONCC and CCC coho salmon critical habitat, the following PBFs 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).

PBFs for CC Chinook salmon and NC, CCC and S-CCC steelhead 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;
- 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; and
- 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.

The condition of critical habitat for SONCC and CCC coho salmon, CC Chinook salmon, and NC, CCC, and S-CCC steelhead, specifically its ability to provide for their conservation, has been degraded from conditions known to support viable salmonid populations. NMFS's recovery plans for these species describe how the currently depressed population conditions are, in part, the result of the following human-induced factors affecting critical habitat[6]: logging, agriculture, mining, urbanization, stream channelization, dams, wetland loss, and water withdrawals (including unscreened diversions for irrigation) (NMFS 2012, NMFS 2013, NMFS 2014, NMFS 2016f). 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; (NMFS 2012, NMFS 2013, NMFS 2014, NMFS 2016f, 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/DPSs (NMFS 2012, NMFS 2013, NMFS 2014, NMFS 2016f). As identified in the NMFS recovery plans for these species, altered flow regimes can delay or preclude migration, dewater aquatic habitat, and strand fish in disconnected pools, while unscreened diversions can entrain juvenile fish (NMFS 2012, NMFS 2013, NMFS 2014, NMFS 2016f).

2.2.4 Climate Change Impacts on Coho Salmon, Chinook salmon, Coho Salmon, Steelhead, and their Critical Habitat

One factor affecting the rangewide 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

[6] Other factors, such as overfishing 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.

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 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).

Changing ocean conditions in the Pacific Northwest, caused by global climate change, present a potentially severe threat to eulachon survival and recovery. Increases in ocean temperatures have already occurred and will likely continue to impact listed fish and their habitats. In coastal and estuarine ecosystems, the threats from climate change largely come in the form of sea level rise and the loss of coastal wetlands. Sea levels will likely rise exponentially over the next 100 years, with possibly a 43-84 cm rise by the end of the 21st century (IPCC 2019). In addition, changes in climate along the entire Pacific Coast and along northern California and southern Oregon coasts will further change hydrologic patterns and ultimately pose challenges to eulachon spawning because of decreased snowpack, increased peak flows, and decreased base flow.

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 is all stream channels, estuarine habitat, riparian areas, wetlands and hydrologically linked upslope areas affected by the implementation of restoration projects authorized and permitted under the program and within the jurisdiction of the Corps' San Francisco District (Figure 1), including tidally influenced areas that are jointly under the jurisdiction of the California Coastal Commission. Areas under the jurisdiction of the San Francisco Bay Conservation and Development Commission (Commission) are not included within the proposed action[7]. The action area includes all coastal anadromous California streams from Del Norte County at the Oregon/California border south to San Luis Obispo County, and all streams draining into San Francisco and San Pablo bays eastward to the Napa River (inclusive). The action area does not include the Sacramento-San Joaquin River Basin, or the tidally influenced portions of tributaries draining into San Francisco and San Pablo bays.

Figure 1: California U.S. Army Corps of Engineers District Regulatory Boundaries, with the San Francisco District (the action area) shown in light blue.

[7]This is due to the Commission's additional permitting requirements. Program projects will not occur in these areas.

The action area for RGP-12 encompasses a range of environmental conditions and numerous listed salmonid ESUs/DPSs, and has been broken into the four geographic areas- North Coast, North Central Coast, San Francisco Bay, and Central Coast (Figure 2). Effects resulting from most restoration activities will be restricted to the immediate restoration project site, while some activities may result in turbidity for a short distance (1,500 feet) downstream. The specific location for each individual habitat restoration project cannot be described, as these locations have not yet been identified. These locations will vary depending on project type, specific project methods, site conditions, and habitat restoration opportunities.

Figure 2: Geographic areas within the action area.

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).

Restoration projects that have been accepted into the Program up to this point, including both those with some implementation completed and those for which implementation has not yet begun, have been analyzed under the existing RGP-12 programmatic biological opinion (WCRO-2020-02938) and are part of the environmental baseline for the current proposed action.

The action area encompasses approximately 26,693 square miles of the central and northern California Coast Range. Native vegetation in the action area 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 along ridge tops and south-facing slopes of some watersheds.

For the most part, the action area 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. Average air temperatures range from 46° to 56° F along the coast. 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. The action area will change in the future due to climate change. See the status of the species and critical habitat section (2.3) for more information. Changes in the action area are, overall, likely to be similar to those discussed above in section 2.3, and are described in more detail below in section 2.4.3.

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

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

This section provides a synopsis of the geographic area of consideration, the ESUs and watersheds present, specific recent information on the status of salmon and steelhead in the action area, and a summary of the factors affecting the listed species residing 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, 2016f). The following summarizes the factors affecting the environment of the species or critical habitat in the action area. The geographic area boundaries are shown in Figure 2.

2.4.1.1 North Coast Area

This area includes all coastal streams entering the Pacific Ocean from Oregon/California Border south to Bear Harbor in Mendocino County. It 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.

Although forestry is the dominant land use throughout the area, limited agriculture exists. The area includes the California portion of the SONCC coho salmon ESU, the northern part 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 current 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 stored water (via eutrophication) before 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. In contrast, the 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 (NMFS 2016a). 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 (NMFS 2016c). Both species are facing another severe drought that is affecting the majority of the populations within CC Chinook salmon and NC steelhead's range.

2.4.1.2 North Central Coast Area

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

Excessive sedimentation, low large wood 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, except for Walker Creek and Lagunitas Creek. 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 on Lagunitas Creek blocked access to half of the historical salmonid habitat. Similarly, Soulejoule Reservoir precludes access to a significant amount of headwater stream habitat within the remainder of the watershed (NMFS 2012, NMFS 2016f). Overwinter habitat is limiting within Lagunitas Creek primarily due to poor large woody recruitment and limited floodplain engagement (NMFS 2016f). 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, primarily supported 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 Don Clausen Fish Hatchery (Russian River), stocking captively-bred juvenile coho salmon into tributaries of the lower Russian River. Occasionally excess juvenile coho will be stocked into 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, NMFS 2016f).

2.4.1.3 San Francisco Bay Area

The San Francisco Bay Area encompasses all streams draining into San Francisco and San Pablo bays eastward to the Napa River (inclusive). The action area excludes San Francisco Bay, the Sacramento-San Joaquin River Basin, and the tidally influenced portions of tributaries draining into San Francisco and San Pablo bays. 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 piers, 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 limit water quality throughout the area (CSWRCB 2014). These human-induced changes have substantially degraded natural productivity, biodiversity, and ecological integrity in streams throughout the region.

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 2016d). 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 2016f). 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.

2.4.1.4 Central Coast Area

The Central Coast Area encompasses the coastal area from San Francisco County south along the California coast to the southern extent of San Luis Obispo County. It includes coastal watersheds supporting CCC coho salmon, CCC steelhead, and S-CCC steelhead.

In general, summer streamflow 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 have low density rural residential development. The majority of the Central Coast Area is privately owned. However, portions under public ownership include 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 the central coast area include water impoundments, urbanization, surface water diversion, 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 compared to historical numbers, recent surveys suggest a wider distribution and greater abundance of coho salmon than thought during past status reviews (NMFS 2016b).

Steelhead are widely distributed throughout the Central Coast area, although similarly significantly reduced from levels seen several decades ago (NMFS 2016f). 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 streamflow (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 Ongoing Drought

Salmonid populations are struggling throughout the west coast due to persistent drought. The following language is taken from Williams et al. (2016), which provides a description of the effects of recent drought conditions on listed salmonids in California, but has been updated to include those similar conditions that have occurred since 2016.

California has experienced well below average precipitation over the last decade (2010-2022). Some paleoclimate reconstructions suggest that the current drought is the most extreme in the past 500 or perhaps more than 1,000 years. Anomalously high surface temperatures have amplified the effects of drought on water availability This period 2010-2022 of drought and high air, stream, and upper-ocean temperatures have together likely had negative impacts on the freshwater, estuary, and marine phases for many populations of coho salmon, Chinook salmon, and steelhead.

2.4.3 Climate Change

The threat of climate change to listed coho salmon, Chinook salmon, and steelhead will likely be lower in the northern coastal sections of the action area due to the fog zone and benefits of old growth redwood forests, including shady, complex stream and riparian areas, and cool stream temperatures (NMFS 2014, NMFS 2016f). In particular, the Redwood Creek (Humboldt County) watershed should continue to act as a refuge for salmonids due to the preponderance of protected parklands, old growth forest, the cool, coastal climate, and continuing restoration efforts. Climate change will impact forests of the western U.S., which dominate the landscape of many watersheds in the region. Forests are already showing evidence of increased drought severity, forest fire, and insect outbreak (Halofsky et al. 2020). Additionally, climate change will affect tree reproduction, growth, and phenology, which will lead to spatial shifts in vegetation. Halofsky et al. (2018) projected that the largest changes will occur at low- and high-elevation forests, with expansion of low-elevation dry forests and diminishing high-elevation cold forests and subalpine habitats.

The effects of climate change will be more pronounced further inland and in the more central and southern sections of the action area. CCC coho salmon, CCC steelhead and S-CCC will be more adversely affected by the changing climate. Recent evidence suggests that climate and weather is expected to become more extreme, with an increased frequency of drought and flooding (IPCC 2019). Water temperatures will reach extremes during the summer months with the combined effect of reduced flow and warmer air temperatures. These long-term effects may include, but are not limited to, depletion of cold-water habitat, variation in quality and quantity of tributary rearing habitat, alterations to migration patterns, accelerated embryo development, premature emergence of fry, increased bio-energetic and disease stresses on fish, and increased competition among species.

In coastal and estuarine ecosystems, the threats from climate change largely come in the form of sea level rise and the loss of coastal wetlands. Sea levels will likely rise exponentially over the next 100 years, with possibly a 43-84 cm rise by the end of the 21st century (IPCC 2019). This rise in sea level will alter the habitat in estuaries and either provide an increased opportunity for feeding and growth or in some cases will lead to the loss of estuarine habitat and a decreased potential for estuarine rearing.

Marine ecosystems face an entirely unique set of stressors related to global climate change, all of which may have deleterious impacts on growth and survival while at sea. In general, the effects of changing climate on marine ecosystems are not well understood given the high degree of complexity and the overlapping climatic shifts that are already in place (e.g., El Niño, La Niña, and Pacific Decadal Oscillation) and will interact with global climate changes in unknown and unpredictable ways. Overall, climate change is believed to represent a growing threat, and will challenge the resilience of salmonids and other species in coastal Central and Northern California.

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

Given the large spatial area where individual restoration projects may occur, many past Section 7 consultations and Section 10 permits have occurred within the action area, including the consultation for the previous Corps RGP-12 permit noted above. 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 in the action area for this consultation that authorize take and have terms and conditions that minimize take of listed anadromous fish. Jeopardy opinions have been issued for proposed actions within a few watersheds in the action area (i.e., Klamath River and Eel River). For each, modifications were made to dam operations to avoid jeopardizing listed species and adversely modifying critical habitat.

In December 2021, NMFS completed a section 7 consultation (WCRO-2021-01946) with the Federal Energy Regulatory Commission on the proposed removal of four dams on the Klamath River, which is expected to overlap with the proposed action. The current environmental baseline in the mainstem Klamath River is expected to change as a result of dam removal. For example, sediment stored behind the dams will move downstream and potentially affect the riverbed in the action area. Adverse effects to SONCC coho salmon will be short-term and affect different year classes and the project will likely kill a relatively small percentage of the total number of juvenile coho salmon in the Upper Klamath River population in the year of drawdown and is not expected to eliminate any one-year class. We believe these changes to the environmental baseline will not affect our analyses of impacts of the proposed action.

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).

The Rangewide Status of Species and Critical Habitat (section 2.2), describes the life histories and status of listed salmonids affected by the Proposed Action (SONCC coho salmon, CCC coho salmon, CC Chinook salmon, NC steelhead, CCC steelhead, and S-CCC steelhead), as well as the status of designated critical habitat for these species. Juvenile salmonids are the life stages most likely to be exposed to any effects resulting from construction activities. The Program's construction season (June 15 to November 1) is designed to avoid the migratory adult life stage of salmonids, so few, if any, adults are expected to be present. Because some of the Program's monitoring activities may occur throughout the year, both juveniles and holding or migratory salmonids may be present. CDFW will seek Corps renewal of RGP-12 every five years, but this ESA analysis assumes the program will continue into the future and so is not limited to a five-year time horizon.

2.5.1 Effects to Species

NMFS expects Program implementation to cause adverse effects to limited numbers of individual juvenile SONCC coho salmon, CCC coho salmon, CC Chinook salmon, NC steelhead, CCC steelhead, and S-CCC steelhead. The construction season (June 15 – November 1) is designed to avoid the migratory periods of adult salmon and steelhead, but small numbers of adult salmonids may linger in the action area during this period. Juveniles and a low number of adults may therefore be present during the construction season, and both juveniles and adults may be present during monitoring activities carried out by CDFW year-round). Due to the protective measures described on pages 41-52 of section 2.9 of the BA (CDFW 2022), NMFS expects that any adults present in the area of interest will be detected by monitors and avoided prior to capture. In addition, adult salmonids are expected to avoid areas of disturbance and evade capture methods designed to capture juvenile fish. Therefore, no adverse effects to adult salmonids are anticipated.

2.5.1.1 Noise, Motion, and Vibration Disturbance

Noise, motion, and vibration disturbance resulting from activity in the channel may cause minor and temporary behavioral effects to listed species. NMFS expects any juvenile or adult salmonids present in the Action Area during the construction season to temporarily move to other available areas to avoid episodic areas of disturbance, resulting in minor, temporary changes in fish behavior (an hour or less). Any fish present during construction activities are expected to detect areas of disturbance, actively avoid those portions of a project footprint where heavy equipment is operated, and move into undisturbed habitat nearby. Juvenile or adult salmonids may be attracted to activity that stirs up sediment as it can disrupt benthic prey, but are expected to move quickly away whenever they detect an immediate threat. Because these avoidance behaviors will likely be limited to short time periods, we don't anticipate any reductions in the fitness of individual salmonids.

2.5.1.2 Disturbance of riparian and aquatic habitat

NMFS expects any disturbance of riparian and aquatic habitat resulting from Program activities to cause only minor, temporary effects to individual fish, with one exception. The effects to species resulting from mobilization of sediment are discussed in section 2.5.1.6.6 and are not included in the following discussion.

Some degree of disturbance to riparian and aquatic habitat is possible during implementation of every project included in the Program [i.e., when access to the habitat where fish are located is established, and during the implementation of restoration actions (e.g., during actual placement of large wood in a stream)]. The BA (CDFW 2022) and the proposed action section (1.3) include a comprehensive list of protection measures that every project must follow. For example, restoration projects implemented under the Program will avoid disturbing riparian vegetation to the extent possible, as described in the Vegetation and Habitat Disturbance Protection Measures detailed in the proposed action (section 1.3). NMFS expects use of these protection measures will minimize the extent and severity of habitat disturbance to the extent that the effects of this disturbance on fish will be minor and temporary. NMFS expects fish will respond as described in section 2.5.1.1, above.

When reaches are dewatered, or when channels are temporarily filled during grading activities, the benthic aquatic macroinvertebrate populations present in the affected areas will die. As these benthic organisms are part of the food web that provides prey to juvenile salmonids, dewatering will reduce the amount of prey available and temporarily adversely affect the PBF associated with prey resources. The extent of macroinvertebrate loss from any given project is expected to be small because the size of the dewatered area is a small fraction of the total size of the stream systems they occur in, although the dewatered area may represent a larger portion of available summer rearing habitat in any given small stream or reach. Overall, juvenile salmonids are expected to have access to sufficient amounts of macroinvertebrate prey nearby. These effects will end once in-water work is over each year. Once flow is restored to a dewatered zone by the end of the construction season, or winter flows carve a new channel, macroinvertebrates from nearby populations are expected to recolonize affected areas within one to two months (Cushman 1985, Attrill and Thomas 1996, Harvey 1986).

2.5.1.3 Exposure to Toxic Chemicals

The following aspects of the Program have the potential to detrimentally affect water quality: equipment refueling, fluid leakage, and maintenance activities within and near the stream channel; water in contact with wet cement; and herbicide application and drift.

Effects of these activities on species are expected to be minor and temporary, given the extensive protection measures described in the BA (CDFW 2022) and summarized in the proposed action (section 1.3), which should effectively limit or eliminate entry of these chemicals into stream courses. Specifically, the program-wide best management practices, conservation measures, and mitigation and avoidance measures described in section 2.8 of the BA (CDFW 2022) will minimize effects of pollution from equipment refueling, leakage, and maintenance as well as from newly poured concrete. In addition, the Herbicide Use Protection Measures described in section 2.8.2 of the BA (CDFW 2022) will limit or eliminate any herbicide transfer to stream courses. Any fish that do detect toxic chemicals in their environment during the construction season are expected to avoid them by temporarily relocating either upstream or downstream into suitable habitat adjacent to the worksite. Salmonids are particularly vulnerable to herbicide impacts during the incubation stage. However, because no salmonid eggs or embryos would be present during the defined construction or herbicide use period, NMFS expects these life stages will not be exposed to toxic chemicals; any such chemicals that enter streams later (from residual amounts remaining after work is done) will be diluted and flushed from salmonid habitat by fall rains prior to when eggs are laid and embryos emerge.

2.5.1.4 Stress, injury, or death from fish capture, handling, tagging, and/or relocation

All project sites that require dewatering will require relocation of any fish occurring there beforehand. A qualified biologist will capture and relocate fish outside of the restoration project work site prior to draining a reach to enable in-water work, to prevent crushing and desiccation. Fish in the area to be dewatered will be captured using the method most appropriate for particular field conditions, then quickly transferred to buckets of oxygenated water and promptly released in a suitable instream location nearby. The Program requires submission of a dewatering and fish capture and relocation plan for agency review and approval prior to any planned relocation event. This plan will describe the qualifications of staff that will relocate fish, the sufficiency of the field staff that will be available to efficiently move and care for relocated fish, and the suitability of the release location.

Juvenile salmonids are the life stage most likely to be exposed to fish relocation preceding dewatering, because dewatering will occur exclusively during the Program’s construction season which avoids the adult migratory periods of salmon and steelhead. Because of their relative mobility, any adults present near construction zones are expected to avoid these zones prior to dewatering. Any adults that made their way into construction areas set for dewatering would be clearly visible to field personnel due to their large size and strong movements. These personnel would establish a means for adult fish to leave the construction area before dewatering efforts began.

Both life stages may be present during project monitoring activities that may occur at any time of year. Due to size and mobility, adults are expected to effectively avoid areas where project monitoring activities are occurring. In addition, before attempting to capture juveniles, monitors will visually scan the area to be sampled with monitoring equipment, watching closely for large salmonids or evidence of their presence (e.g., disturbance of water surface due to top of dorsal fin). While sampling, monitors will watch closely to ensure that no adults are inadvertently captured.

2.5.1.5 Fish observation

Snorkel surveys may be used to observe listed fish without capturing or handling them. NMFS expects such surveys to have minor, temporary effects on observed salmonids. Observation without handling is the least disruptive method for determining a species’ presence/absence and estimating their relative numbers. Its effects are also generally the shortest-lived and least harmful of the research activities discussed in this section because a cautious observer can effectively obtain data while only causing only minor, temporary disruption of fish behavior.

Young fish frightened by the turbulence and sound created by observers are likely to seek temporary refuge in deeper water or behind or under rocks or vegetation. In extreme cases, some individuals may leave a particular pool or habitat type and then return when observers leave the area. No injuries or deaths are expected to occur as a result of snorkel surveys.

2.5.1.6 Fish capture methods

The following methods may be used to capture juvenile fish prior to dewatering, or during monitoring activities.

2.5.1.6.1 Electrofishing

Electrofishing may be used to remove fish from areas prior to dewatering activities during the construction season, to monitor salmonids in low water conditions where stream habitat is too complex for seining or minnow traps, or in places where those methods are not effective to inform the monitoring question. During electrofishing, an electrical current is passed through water containing fish (and the fish themselves) in order to stun them, which makes them easy to capture. This method can cause effects of varying severity - from disturbance of fish to immediate mortality. Salmonids can be injured or killed by spinal injuries that sometimes occur due to forced muscle contractions when the current passes through the body. Smaller fish are subjected to a lower voltage gradient than larger fish (Sharber and Carothers 1988), resulting in lower injury rates (e.g., Hollender and Carline 1994, Dalbey et al. 1996, Thompson et al. 1997). The percentage of fish that are injured or killed by electrofishing varies widely depending on the equipment used, the settings on the equipment, the expertise of the technician, and water temperature (Sharber and Carothers 1988, McMichael 1993, Dalbey et al. 1996, Dwyer and White 1997). Studies on the long-term effects of electrofishing indicate that even with spinal injuries, salmonids can survive long-term, although severely injured fish may have stunted growth (Dalbey et al. 1996, Ainslie et al. 1998).

All Program projects will follow the Guidelines for electrofishing waters containing salmonids listed under the Endangered Species Act (NMFS 2000), which describes the appropriate settings for electrofishing gear and a temperature limit above which no electrofishing should occur. When operated by experienced personnel following these guidelines, as expected under this Program, shocked fish normally revive quickly.

2.5.1.6.2 Nets and Traps

Seining methods may be used to capture salmonids in deeper water without significant habitat complexity (e.g., LWD). Minnow traps are typically used in very complex habitats where seining would likely not be successful due to small/large wood and significant aquatic vegetation. Fyke nets may be used in off-channel and slow water habitats when minnow traps and seining are found to not be effective. Dip nets are used to collect fish that are stunned by electrofishing. Rotary screw traps are used to intercept outmigrating juvenile fish in order to document natural population abundance and productivity. The capture of listed salmonids using these methods is likely to cause temporary stress to these fish during transfer from the seine, trap, or net to oxygenated water containing anesthetic. Injury may occur during transfer, but due to the experience level of field staff NMFS expects such injury to be a rare occurrence.

The capture of juvenile fish using these nets and traps, and the removal of fish from nets and traps for further data collection, may cause some stress. Individual study protocols and permit conditions described in the BA (CDFW 2022) reduce the potential for injury or death from fish trapping (e.g., rotary screw traps checked at least daily, limit on water temperature allowed for handling. etc.) Based on data from years of sampling at hundreds of locations under NMFS' 4(d) scientific research and monitoring program, NMFS expects the mortality rate resulting from fish capture and removal from traps and nets, and subsequent handling, to be 3% or less (WCRO-2020-03293).

2.5.1.6.3 Handling and Tagging in Support of Monitoring Activities

After fish are captured, some or all of them (depending on number captured and project monitoring objectives) will be anesthetized, then weighed and measured in support of monitoring objectives. The BA (CDFW 2022) and proposed action section (1.3 describe precautions that will be taken to reduce the degree of fish stress from these procedures (e.g., temperature limits for sampling, close observation of fish while they recover from anesthesia and from any procedures, and monitoring of temperature and dissolved oxygen in the recovery bucket). NMFS expects these precautions to effectively reduce the likelihood of injury or death from handling activities, including tagging fish and clipping their fins.

PIT tags may be inserted into the body cavity of some captured fish after anesthesia. A PIT tag is an electronic device that relays signals to a radio receiver; it allows salmonids to be identified whenever they pass a location containing such a receiver (e.g., any of several dams) without the need for researchers to handle the fish again. PIT tags have very little effect on growth, mortality, or behavior. The few reported studies of PIT tags have shown no effect on growth or survival (Prentice et al., 1987; Jenkins and Smith, 1990; Prentice et al., 1990). For example, in a study between the tailraces of Lower Granite and McNary Dams (225 km), Hockersmith et al. (2000) concluded that the performance of yearling Chinook salmon was not adversely affected by PIT-tags. Additional studies have shown that growth rates among PIT-tagged Snake River juvenile fall Chinook salmon in 1992 (Rondorf and Miller, 1994) were similar to growth rates for salmon that were not tagged (Conner et al., 2001). Prentice and Park (1984) also found that PIT-tagging did not substantially affect survival in juvenile salmonids.

After anesthetic is administered, a single fin may be altered or removed on each fish in order to obtain a non-lethal tissue sample or to allow for later identification of a fish. Many studies have examined the effects of fin-clips on fish growth, survival, and behavior. The results of these studies are somewhat varied; however, it can be said that fin-clips do not generally alter fish growth. Studies comparing the growth of clipped and unclipped fish generally have shown no differences between them (e.g., Brynildson and Brynildson 1967). Moreover, wounds caused by fin-clipping usually heal quickly - especially those caused by partial clips. Mortality among fin-clipped fish is also variable. Some immediate mortality may occur during the marking process, especially if fish have been handled extensively for other purposes. Delayed mortality depends, at least in part, on fish size; small fishes have often been found to be susceptible to it, and Coble (1967) suggested that fish shorter than 90 mm are at particular risk. The degree of mortality among individual fishes also depends on which fin is clipped. Recovery rates are generally recognized as being higher for adipose- and pelvic-fin-clipped fish in comparison to those that are clipped on the pectoral, dorsal, and anal fins (Nicola and Cordone 1973), likely because the adipose and pelvic fins are not as important as the other fins for movement or balance (McNeil and Crossman 1979).

Based on analyses of fish relocation data collected across the north coast, and Program coordination requirements, NMFS expects any injury or death of listed species due to fish capture and relocation will be minimal. A CDFW analysis of data from two years of fish relocation activities in Humboldt County showed that mortality rates associated with individual fish relocation sites were less than 3% and the mean mortality rates for all sites was less than 1% (Collins 2004). Further, a NMFS (2012) review of all Fisheries Restoration Grant Program (FRGP) annual monitoring reports of dewatering and relocation activities for 99 projects across 8 years showed less than 1% of relocated steelhead perished. As described in the BA (CDFW 2022), if fish mortality exceeds 3% of the catch of any listed species during any particular fish relocation event, NMFS will be contacted. Sampling or fish relocation for that project may only resume with the approval of NMFS, after the cause of the mortality event is known and activities are modified as needed to reduce or eliminate its future occurrence.

Due to Program elements, including those in section 2.8 of the BA (CDFW 2022), NMFS expects fish relocated during project implementation will not suffer from lower habitat quality or reduced growth potential after they are moved. Specifically, each fish capture and relocation plan shall describe the extent to which the release site has similar water temperatures as the capture location, contains ample habitat for captured fish, and holds a low likelihood of fish reentering the work site or becoming impinged on any exclusion nets or screens.

Based on data from years of sampling at hundreds of locations under NMFS' 4(d) scientific research and monitoring program, NMFS expects the injury and mortality rate resulting from fish capture (for all methods) and handling to be 3% or less (WCRO-2020-03293).

The number of fish NMFS anticipates will be exposed each year to monitoring activities, the number that will be tagged, and the number expected to die are shown in Table 1. Fish observed during snorkel surveys will not be adversely affected and are therefore not included in Table 1.

Table 2 describes the maximum annual number of fish NMFS anticipates project implementers will be exposed to capture and relocation, and the number of fish expected to die from capture, relocation, crushing, and desiccation.

The Program requires anyone except CDFW collecting fish, including project implementers executing their required monitoring plans, to possess a current CDFW Scientific Collecting Permit (SCP). Further, if the project may result in harm or death of fish under CESA, a Memorandum of Understanding (MOU) must be enacted between CDFW and the project implementers prior to any collection of fish. These Program elements give NMFS confidence that any collectors will be fully qualified, and that the expected annual number of fish captured/collected, and injured or killed during these activities will not exceed that described in Tables 1 and 2.

2.5.1.6.4 Crushing

If in-water work occurs without dewatering a work area, any salmonids present are at risk of being killed by crushing injury from boots or heavy equipment. NMFS expects these salmonids to avoid sources of potential injury or death, but their ability to do so decreases if the amount of water in the work area is small, e.g., at low tide, or if there are a large volume of equipment and people in a small watered area that is not sufficiently connected to other aquatic zones to allow fish to escape. The likelihood of injury or death from crushing may be greater in tidal areas, because for some activities in these areas, such as excavating a channel in a slough, it may not be feasible to dewater the work area. In addition, in-water work in tidal areas typically occurs during a low or receding tide, which would tend to concentrate fish into a smaller area of water at the same time that the in-water work is happening, increasing the chance that fish will be under boots or heavy equipment. The number of fish expected to be crushed is included in Table 2.

2.5.1.6.5 Desiccation

Any individual fish that elude capture prior to dewatering will become stranded in dewatered work areas, where they are expected to die from desiccation. For dewatering projects occurring in tidal or estuarine areas, there is often a large volume of water, and due to poor existing habitat conditions at restoration sites a low number of listed fish are expected to present, reducing the effectiveness of fish detection for relocation and increasing the risk of desiccation. The number of fish expected to die from desiccation is included in Table 2.

2.5.1.6.6 Turbidity/sediment mobilization

All project types involving ground disturbance in or adjacent to streams have the potential to increase turbidity and suspended sediment levels within the project work site and for a short distance downstream. Activity in the channel, such as wading in the river to catch fish for monitoring, installing large wood structures, grading, or use of heavy equipment will mobilize fine sediment already present in the stream and result in turbidity. In addition, a small amount of sediment from the banks may be incidentally introduced into the channel at any Project site.

Short-term increases in turbidity and suspended sediment levels associated with construction may temporarily negatively impact fish survival and growth if they lead to reduced availability of food, reduced feeding efficiency, or reduced ability to see and avoid predators. Small pulses of turbid water can cause salmonids to temporarily move from their established territories into less suitable habitat, possibly increasing competition and predation if the new habitat is of lower quality. Due to low streamflow during the construction period, NMFS expects that any sediment suspended by instream activity would settle to the substrate and return to baseline conditions within 15 minutes to one hour after disturbance. This short duration may not disturb fish enough to abandon their original habitat. Any fish that move into nearby habitat to avoid turbidity are expected to quickly return to the original habitat once the initial disturbance of sediment is over, with negligible effects to their fitness.

Major work in the channel will include use of cofferdams to delineate an area to be dewatered. Fish between the cofferdams will be relocated to habitat nearby, and any sediment introduced during in-water work in the dewatered area will be contained by the cofferdams, preventing it from entering nearby habitat. Once in-water work is complete for the season, sediment within the dewatered area will be introduced to the stream and briefly mobilized when the cofferdams are removed and flow is restored to the reach.

Studies of sediment effects during culvert construction determined that increased sediment accumulation within the streambed was measurable (relative to control levels within) at a range of 358 to 1,442 meters downstream of the culvert (Lachance et al. 2008). Turbidity is therefore expected to extend as far as 1,500 feet downstream of work areas. In tidal areas, this turbidity is expected to clear each day when tides inundate the affected work areas; the incoming tide would generally carry suspended sediments inshore and upstream, until the tide reverses and the turbid water travels in the reverse direction, out of the work area. In freshwater areas, turbidity should decline rapidly once the source of disturbance stops; the volume of water in these areas is expected to stay the same or decline during the construction season, which ends before the rainy season begins. Without disturbance from increased flow, sediment suspended in the water column is expected to rapidly settle onto the stream substrate. Each project will be required to control erosion, cover exposed dirt piles, and revegetate disturbed soils, which NMFS expects will reduce the sediment entering the stream to a great degree. Most of any newly introduced sediment that settles on the stream substrate is expected to exit the system during winter storms with scouring flows.

NMFS expects that the adherence to required protection measures described in section 2.8 of the BA (CDFW 2022) and in the proposed action (section 1.3) will reduce the extent, severity, and duration of turbidity and reduce suspended sediment levels enough that the most severe effect would be a short-term reduction in feeding. NMFS does not expect these temporary effects to feeding to decrease the individual fitness of any listed fish.

2.5.1.6.7 Effects of underwater sound

Temporary behavioral changes that fish may exhibit in response to noise (e.g., from use of explosives or pile driving) include startling, altering behavioral displays, avoidance, displacement, and reduced feeding success. Observations of juvenile coho and steelhead exposed to underwater sound from pile driving noise above the 150 dB behavioral threshold at the Mad River Bridges Highway 101 project indicated that juvenile salmonids quickly habituate to sub-injurious noise and resume normal surface-feeding behavior within a few minutes of the fist pile strikes (Mike Kelly, NMFS, personal observations 2009, 2011). Therefore, NMFS believes that periodic behavioral changes caused by sub-injurious sound exposure will not result in decreased fitness or survival of individual juvenile salmonids.

Barotrauma, or physical injury due to changes in water pressure, will not occur as a result of in-water pile driving carried out under the Program. Most pile driving will be conducted in or adjacent to dry channels, eliminating potential for barotrauma. For pile driving in wetted areas, the In-Water Pile Driving Protection Measures described in the Proposed Action require each project to complete a hydroacoustic assessment and develop a pile driving plan to confirm that underwater sound pressure levels are expected to below the cSEL injury threshold criteria for peak pressure and accumulated sound exposure levels. The pile driving plan will identify the appropriate, site-specific attenuation, sound monitoring, dewatering, or fish relocation measures necessary to avoid injury and mortality. If, after this coordination, agency review of the resulting pile driving plan finds that cSEL levels will exceed the injury threshold levels, the project will require a separate Corps permit and individual ESA Section 7 consultation.

Where pile driving occurs in a wetted channel or floodplain, fish will be relocated to areas where sound levels are safe, as necessary. However, it may not be feasible to dewater some tidal areas sufficiently to detect and remove all juvenile salmonids. Where there is sufficient depth, hydrophones will be deployed in these areas to monitor water pressure and signal the need to stop activities prior to exceedance of pressure threshold levels (see section 1.1.4). In circumstances where the floodplain cannot be effectively dewatered, and water is too shallow to deploy hydrophones, even if attenuation measures are employed NMFS anticipates that some juvenile fish could be killed by barotrauma. In such a circumstance, similar to that described above, the project will require a separate Corps permit and individual ESA section 7 consultation.

2.5.1.6.8 Bio-engineered bank stabilization

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

However, as noted above, the proposed bio-engineering approach is expected to improve habitat conditions relative to what currently exists within the channelized action area. We expect substantially more juvenile fish will be able to successfully rear in these areas after bio-engineering bank stabilization improves habitat conditions. This improvement may not fully counter-balance the ongoing impact on habitat function and carrying capacity caused by extending channelization at that site 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.), which necessitates the use of a habitat-based proxy. The habitat proxy NMFS chose to estimate the extent of fish loss is the length of bio-engineered streambank restored per project (bio-engineered streambank length must be less than 3x the active channel width). Because these sites are very small relative to the stream area available to rearing juveniles throughout the action area, NMFS expects overall reductions in juvenile fish numbers due to bioengineering to be minimal.

2.5.1.9 Annual anticipated exposure estimates and mortality

The annual number of juvenile salmonids of each ESU/DPS that may be exposed to monitoring activities (capture, handling, tissue sampling, and PIT tagging), and the number of these that may be injured or die as a result, is shown in Table 1 (from proposed action section; reproduced for reference below).

Table 1: Annual exposure estimates of juvenile salmonids captured, handled, and tagged during project monitoring, and anticipated injury mortality response (reproduced from the biological opinion's proposed action section).

ESU/DPS	Maximum Number of Juveniles Captured and Handled	Maximum Number of Juveniles PIT tagged	Anticipated injury and mortality (3%)
SONCC coho salmon	2500	25	75
CCC coho salmon	500	50	15
CC Chinook salmon	30	10	1
NC steelhead	9000	900	270
CCC steelhead	1000	100	30
S-CCC steelhead	1000	100	30

The annual number of juvenile salmonids of each ESU/DPS that may be exposed to effects of capture and relocation prior to dewatering, to crushing, and to desiccation during project implementation, and the number of these that may die as a result, are shown in Table 2.

Table 2: *Annual exposure estimates and anticipated injury and mortality response of juvenile salmonid species resulting from capture and relocation prior to dewatering, as well as crushing and desiccation.*

	Juveniles per Year, per ESU/DPS					
	SONCC coho salmon	CCC coho salmon	CC Chinook salmon	NC steelhead	CCC steelhead	S-CCC steelhead
Maximum Number of Juveniles	1650	425	30	8850	1575	1575
3% Mortality	50	13	1	266	47	47

2.5.2 Effects to designated critical habitat

2.5.2.1 Effects of riparian and aquatic habitat disturbance

Effects of riparian vegetation disturbance on designated critical habitat are expected to be minor and temporary. In most cases, entire trees or shrubs in riparian areas that are part of a project footprint will be left in place and their branches or vegetation cut back to establish access. Where entire riparian plants must be removed (e.g., removal of a shrub to create access to place a large wood structure), NMFS expects the loss of riparian vegetation from any given project to be small, and limited to mostly shrubs and an occasional tree. Consistent with the Protection Measures, as much understory brush and as many trees as possible will be retained, to preserve shade and natural bank stabilization benefits. The plant species most likely to be cut back or removed (willows and other shrubs) will generally reestablish quickly (usually within one season). The required revegetation of disturbed riparian areas (and planting ratio of two new plants for each plant removed) described in the Protection Measures will further minimize the effect of any small, temporary loss of vegetation. As such removal of riparian vegetation will not normally remove aquatic habitat elements, any effects to fish are also expected to be minor and limited to temporary changes in shade (shade recovery within two years) and food availability (at former levels by the next spring or summer) until replanted vegetation is established.

NMFS also expects aquatic habitat disturbance to be minor, episodic, and temporary - generally limited to compression of substrate, aquatic plants, and benthic prey from trampling and heavy equipment operation, and disturbance of benthic prey during pile driving activities. Any affected aquatic vegetation and benthic prey are expected to repopulate quickly (within a season).

2.5.2.2 Toxic chemicals

Effects of toxic chemicals on designated critical habitat are expected to be minor and temporary given the extensive protection measures described in the Proposed Action, which should effectively limit or eliminate entry of these chemicals into stream courses. In addition, designated critical habitat would only be temporarily affected by any trace amount of chemicals that enter the water, because contaminants will be swiftly diluted and rapidly flushed from the system, either immediately or after fall rains arrive.

2.5.2.3 Turbidity, sediment mobilization, and deposition of sediment on aquatic substrate

Turbidity, sediment mobilization, and deposition of fine sediment on aquatic substrate may affect water quality and the food resources available for juvenile development, which are two physical and biological features (PBFs) of designated critical habitat for coho salmon, Chinook salmon, and steelhead. When sediment settles out the water column, it may obscure benthic (bottom dwelling) aquatic invertebrates, which may reduce salmonid feeding efficiency. However, the amount of sediment entering waterways from Project activities is expected to be small, given the protection measures and project requirements discussed above. This small amount is not expected to kill or harm benthic aquatic macroinvertebrate prey items or to alter their behavior. Effects to water quality and salmonid prey items are expected to be minor and temporary, lasting from an hour to perhaps a day at a time at any given project site.

2.5.2.4 Dewatering

Benthic aquatic macroinvertebrate populations will die when their habitat is dewatered. As these benthic organisms are part of the food web that provides prey to juvenile salmonids, dewatering will reduce the amount of prey available and temporarily adversely affect the PBF associated with prey resources. The extent of macroinvertebrate loss from any given project may be small because the size of the dewatered area is a small fraction of the total size of the stream systems they occur in, although the dewatered area may represent a larger portion of available summer rearing habitat in any given small stream or reach. These effects will end once in-water work is over each year. Once flow is restored to a dewatered zone, macroinvertebrates from nearby populations typically recolonize it within one to two months (Cushman 1985, Attrill and Thomas 1996, Harvey 1986).

2.5.2.5 Temporary loss of channel habitat and prey resources

Floodplain reconnection projects that involve channel fill for hydraulic reconnection (such as when re-grading floodplains, which involves skimming earth off higher areas and moving it into lower areas) will result in a temporary loss of habitat in the portion of the channel that is filled. Once fall rains arrive, the stream will establish a new stream channel nearby, so upstream and downstream migratory salmonid access should not be impaired. A similar physical volume of habitat as occurred in the original channel should form quickly in the new channel as fall rains scour new pools. Aquatic vegetation and benthic prey are expected to colonize the area quickly (within a season).

2.5.2.6 Preclusion of natural channel form and function

The Program includes use of bio-engineering techniques, including the planting of native plant materials, willow walls, willow siltation baffles, brush mattresses, and brush bundles. These techniques are intended to resist lateral erosion while improving riparian and aquatic habitat. Habitat improvements include increased stream shade, increased production of invertebrates, providing for future recruitment of large woody material to streams, and trapping and binding fine sediment to reestablish riparian areas. The Program's bio-engineering techniques use a minimal amount of hard materials (e.g., rock), and are not intended to include traditional hard engineering techniques. The design guidelines described in the BA (CDFW 2022) minimize the use of boulders and prevent the use of large amounts of rip rap or other hard materials to harden banks or prevent geomorphic processes of erosion from occurring. Further, the Program will not include projects that are merely protecting private property from bank erosion issues.

Bank stabilization, including that achieved through bio-engineering techniques, 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, and by altering the physical land/water interface (i.e., streambank) that provides shelter, food, and other ecosystem benefits to juvenile salmonids. Unlike lining the entire streambank with rock riprap that results in a habitat interface lacking suitable juvenile fish habitat, the proposed bio-engineering methods will instead utilize natural material (e.g., live plantings, logs and root wads, boulders) to craft a streambank that will resist lateral erosion while providing complex rearing, feeding and sheltering habitat that is equivalent or better to than the streambank habitat already present. Replacement of poorly vegetated, eroding stream banks with bio-engineered stabilization and riparian planting will improve existing habitat at project sites, improving salmonid growth and survival.

Of greater concern than streambank habitat impacts is the long-term preclusion of natural fluvial and geomorphic processes resulting from bio-engineering when added to existing streambank stabilization in the action area. In most low gradient streams, the channel will naturally "meander", eroding laterally to dissipate its hydraulic energy while creating a sinuous longitudinal course. Meandering streams also create and maintain both the hydraulic and physical components of instream habitat used by fish and other aquatic species.

While the bio-engineered bank stabilization methods carried out under the Program will benefit degraded salmonid habitat by manually improving riparian and streambank habitat, the achieved habitat quality and persistence may fall short of what could be achieved naturally through dynamic channel processes if unhampered by the bank stabilization. Because of the perpetual nature of most bank stabilization structures, any impacts experienced by critical habitat will be long-term. However, as noted above, the proposed bio-engineering approach is expected to improve habitat conditions relative to what currently exists within those portions of the action area where these practices are implemented. This improvement may not fully counter-balance the ongoing impact on habitat function and carrying capacity caused by extending channelization at that site into the foreseeable future, but instead compensates for it to a fair degree at the site level. Remaining adverse effects to critical habitat will be minimal and limited to small site specific areas.

2.5.3 Benefits to species and their critical habitats

Degraded habitat was a major factor in the ESA listings of coho salmon, Chinook salmon, and steelhead throughout the action area, and it remains a major limitation on recovery of these species (Williams et al. 2016). All projects carried out under the Program are expressly designed to restore, enhance, or protect anadromous salmonid habitat. Habitat improvements support rebuilding of fish populations over time, because they enable improved growth and reproduction of individual fishes. In addition to creating new habitat or restoring existing habitat, most projects will also restart natural processes that create and maintain this habitat into the future. For example, placing a large habitat structure in a river provides fish with cover and habitat from the structure itself. In addition, when winter flows interact with the structure they will scour pools from the existing sediment nearby, and scour from flows each winter will maintain the pools over time. Water conservation projects are particularly critical, as they can relatively rapidly change the amount of water in the river, saving fish from death by desiccation as well as supporting their growth and development. Ongoing implementation of habitat restoration projects throughout the RGP-12 area has been and continues to be a major driver in regional recovery of these species (NMFS 2016a, NMFS 2016b, NMFS 2016c, NMFS 2016d, NMFS 2016e). The Program's wide geographic scope results in projects occurring each year in many watersheds important to species recovery, spreading the benefits of this restoration beyond a single watershed.

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 and 402.17(a)]. 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 and funded habitat restoration activities on non-Federal lands and without Federal permit needs or funding, road work, timber harvest, and residential growth. NMFS assumes these activities, and similar resultant effects [as described in the Status of the Species (Section 2.2) and Environmental Baseline (Section 2.4) sections within this document] on listed salmonids 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 earlier in the discussion of Environmental Baseline (Section 2.4).

2.7 Integration and Synthesis

The Integration and Synthesis section is the final step in assessing the risk that the proposed action poses to species and critical habitat. 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 diminish the value of designated or proposed critical habitat as a whole for the conservation of the species.

The abundance of SONCC coho salmon, CCC coho salmon, CC Chinook salmon, NC steelhead, CCC steelhead, and S-CCC steelhead has declined from historic numbers. Nearly all populations of SONCC coho salmon are at a high risk of extinction, but SONCC coho salmon are still found in all major river basins within the ESU. The overall risk of extinction for the CCC coho salmon ESU is high due to low abundance, range constriction (especially in the south portion of the range), fragmentation, and loss of genetic diversity. CC Chinook salmon have a fragmented population structure, and the geographic distribution within the ESU has been reduced, particularly in southern and spring-run populations. Long-term population trends suggest that many populations of NC steelhead have a negative growth rate. CCC steelhead numbers are substantially reduced from historical levels. Populations of S-CCC steelhead throughout the DPS have exhibited a long-term negative trend since at least the mid-1960s. The most recent status review reaffirmed the endangered status of CCC coho salmon (NMFS 2016b) and the threatened status of SONCC coho salmon (NMS 2016a), CC Chinook salmon (NMFS 2016b), NC steelhead (NMFS 2016b), CCC steelhead (NMFS 2016c), and S-CCC steelhead (NMFS 2016e).

Habitat degradation has been a major factor in the decline of these species, and poor habitat conditions continue to limit their recovery potential. In addition to ongoing concerns such as fine sediment and poor water quality resulting from legacy land management practices, persistent drought conditions across the entire action area impact water quantity and result in juvenile mortality as well as suppression of fish growth. Actions to restore habitat make up the vast majority of needed actions identified in each species' recovery plan. As described in the status of species and cumulative effects sections, NMFS expects that ongoing Federal and non-Federal actions to support human activities will continue. Some of these activities are expected to incidentally harm these species or adversely affect their designated critical habitat (e.g., agricultural practices, water withdrawals/diversions, road work, and timber harvest). Habitat restoration activities sponsored by state, federal, and private entities, as well as regulatory changes, are expected to provide an overall benefit to these species and their habitat.

The Program will continue into the future and benefits from past Program restoration actions will continue to accrue as the Program continues. For example, increased access to good spawning habitat that results from a barrier remediation project that restores access to good spawning habitat will benefit spawners every year into the future. During each year of the proposed action, up to 4,150 SONCC coho salmon, 925 CCC coho salmon, 60 CC Chinook salmon, 17,850 NC steelhead, 2,570 CCC steelhead, and 2,570 S-CCC steelhead may be captured and handled (relocation, measuring, tagging) during execution of Program activities across the entire Action Area. The vast majority of these juvenile fish, as well as other fish exposed to other habitat changes associated with the program (e.g., temporary elevated turbidity, etc.) will avoid detrimental effects, aside from potential temporary behavioral impacts to feeding behavior. As noted earlier, these behavioral impacts will likely be negligible, given their short duration and sub-injurious nature. At most, NMFS estimates that 3% of these juvenile fish may be injured or killed as a result of Program relocation, measuring, and tagging activities each year, or up to 125 SONCC coho salmon, 28 CCC coho salmon, 2 CC Chinook salmon, 536 NC steelhead, 78 CCC steelhead, and 78 S-CCC steelhead.

NMFS also anticipates small losses of juvenile listed salmonids resulting from channelization of portions of streams using bio-engineering techniques. Because these sites are very small relative to the stream area available to rearing juveniles throughout the action area, NMFS expects overall reductions in juvenile fish numbers due to bioengineered stream channelization to be minimal.

Any mortalities from the Program will be spread across project locations within the extensive action area, which spans multiple diversity strata of each of the three-salmonid species. At most, 3% of the fish captured on any given day at any given project would perish, leaving the majority of the fish in any location to persist unharmed (e.g., of 30 coho salmon relocated at Creek x on Day y, perhaps one would die). Similarly, any losses in carrying capacity due to streambank stabilization are likely minor and limited to the site level. Thus, while the abundance of juveniles in any given location may be slightly reduced, these numbers would likely be insignificant at the population level. In addition, NMFS expects the distribution of juvenile fish across the action area to generally remain unchanged.

NMFS does not expect juvenile mortality resulting from Program activities to impact future adult returns for SONCC coho salmon, CCC coho salmon, CC Chinook salmon, NC steelhead, CCC steelhead or S-CCC steelhead. Juvenile salmonids rearing within the action area will tend to occur in areas with the best habitat, while the Program's restoration activities will focus on areas with poor habitat; therefore, many juvenile salmonids occurring throughout the action area would not be subjected to potential injury or death from construction activities associated with the Program's projects, because they won't be present where these activities are occurring. In NMFS' judgment, these juveniles, along with those occurring in construction areas that are not adversely affected by Program activities, are likely to result in enough future spawning adult fish to outweigh any losses resulting from relocation efforts within the action area.

Minor or temporary adverse effects to critical habitat are expected during construction of projects. Some Program activities may prevent lateral channel migration to some degree, which can limit the degree of habitat improvement possible on a site-specific basis. However, the use of native riparian plants and logs/rocks to retard or stop such channel migration will create essential components of ESA-listed salmonid critical habitat where they do not currently exist, or enhance critical habitat where it is already functional. Further, the requirement that the bioengineered streambank length must be less than 3 times the active channel width ensures that only a small portion of a stream would be stabilized during any Program project. Overall, NMFS expects the

Program will improve critical habitat by improving and enhancing a number of PBFs for all listed salmonids. NMFS expects this habitat improvement will improve the spawning and rearing success of subsequent generations, and so improve the distribution and abundance of SONCC coho salmon, CCC coho salmon, CC Chinook salmon, NC steelhead, CCC steelhead, and S-CCC steelhead across the action area over time.

Inland portions of the action area could be subject to higher average summer air temperatures and lower total precipitation levels due to climate change. Although the total precipitation levels may decrease, the average rainfall intensity has increased and is expected to continue to increase in the future. Higher inland air temperatures would likely warm associated stream temperatures. Reductions in the amount of precipitation would reduce stream flow levels and estuaries may also experience changes in productivity due to changes in freshwater flows, nutrient cycling, and sediment amounts. Much of the action area is in the coastal fog belt which is likely to ameliorate many climate impacts for the foreseeable future relative to inland areas. Because most Program activities will restore habitat-forming processes, NMFS expects it will help improve the resilience of species and habitats to climate change across the action area. Overall, the Program is unlikely to appreciably reduce the likelihood of survival and recovery of SONCC coho salmon, CCC coho salmon, CC Chinook salmon, NC steelhead, CCC steelhead, or S-CCC steelhead; further, the Program is unlikely to appreciably diminish the value of designated critical habitat to the conservation of these species.

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 proposed action, the effects of other activities caused by the proposed action, and the cumulative effects, it is NMFS' biological opinion that the proposed action is not likely to jeopardize the continued existence of SONCC coho salmon, CCC coho salmon, CC Chinook salmon, NC steelhead, CCC steelhead or S-CCC steelhead, or destroy or adversely modify 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). "Harass" is further defined by interim guidance as to "create the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering." "Incidental take" is defined 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.

The take exemption conferred by this incidental take statement is based upon the proposed action occurring as described in the biological opinion and in more detail in the Biological Assessment.

2.9.1 Amount or Extent of Take

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

2.9.1.1 Annual anticipated exposure estimates and mortality

The annual number of juvenile salmonids of each ESU/DPS that may be exposed to monitoring activities and that may be exposed to adverse effects of project construction and monitoring activities, and of those the number that may die, are described in Table 1 and Table 2 are summarized below.

In each reporting year (January 1-December 31), NMFS anticipates up to 2,500 juvenile SONCC coho salmon may be captured and handled for monitoring each year, and up to 25 of these may also be PIT-tagged (Table 1). In addition, up to 1,650 juvenile SONCC coho salmon may be exposed to capture and relocation prior to dewatering, as well as crushing and desiccation (Table 2). Overall, NMFS estimates that up to 3% of these juveniles may be injured or killed during the identified Program activities each year, or 125 juvenile SONCC coho salmon.

In each reporting year, NMFS anticipates up to 500 juvenile CCC coho salmon may be captured and handled for monitoring each year, and up to 50 of these may also be PIT-tagged (Table 1). In addition, 425 juvenile CCC coho salmon may be exposed to capture and relocation prior to dewatering, as well as crushing and desiccation (Table 2). Overall, NMFS estimates that up to 3% of juveniles may be injured or killed during the identified Program activities each year, or 28 juvenile CCC coho salmon.

In each reporting year, NMFS anticipates up to 30 juvenile CC Chinook salmon may be captured and handled for monitoring each year, and up to 10 of these may also be PIT-tagged (Table 1). In addition, 30 juvenile CC Chinook salmon may be exposed to capture and relocation prior to dewatering, as well as crushing and desiccation (Table 2). Overall, NMFS estimates that up to 3% of juveniles may be injured or killed during the identified Program activities each year, or 2 juvenile CC Chinook salmon.

In each reporting year, NMFS anticipates up to 9,000 juvenile NC steelhead may be captured and handled for monitoring each year, and up to 900 of these may also be PIT-tagged (Table 1). In addition, up to 8,850 juvenile NC steelhead may be exposed to capture and relocation prior to dewatering, as well as crushing and desiccation (Table 2). Overall, NMFS estimates that up to 3% of juveniles may be injured or killed during the identified Program activities each year, or 536 juvenile NC steelhead.

In each reporting year, NMFS anticipates up to 1,000 juvenile CCC steelhead may be captured and handled for monitoring each year, and up to 100 of these may also be PIT-tagged (Table 1). In addition, up to 1,575 juvenile CCC steelhead may be exposed to capture and relocation prior to dewatering, as well as crushing and desiccation (Table 2). Overall, NMFS estimates that up to

3% of juveniles may be injured or killed during the identified Program activities each year, or 78 juvenile CCC steelhead.

In each reporting year, NMFS anticipates up to 1,000 juvenile S-CCC steelhead may be captured and handled for monitoring each year, and up to 100 of these may also be PIT-tagged (Table 1). In addition, up to 1,570 juvenile S-CCC steelhead may be exposed to capture and relocation prior to dewatering, as well as crushing and desiccation (Table 2). Overall, NMFS estimates that up to 3% of juveniles may be injured or killed during the identified Program activities each year, or 78 juvenile S-CCC steelhead.

NMFS also anticipates that listed salmonids will be adversely affected by channelization of portions of streams achieved using bio-engineering techniques. Quantifying the number of individuals lost from the harm caused by the proposed stream channelization is inherently difficult. Complex and variable components such as individual fish behavior and how that behavior adapts to changes in habitat, will primarily influence the number of fish in the action area that are harmed. In addition, finding dead individuals will be difficult due to their small size and the presence of scavengers. In such circumstances, NMFS cannot provide a precise amount of take that would be caused by the proposed action and instead uses one or more surrogates to estimate the extent of incidental take. NMFS will use the length of bio-engineered streambank constructed per project as a surrogate for the extent of incidental take resulting from channelization of streams using bio-engineering techniques. If the length of streambank bio-engineered by the Project is longer than the active channel width multiplied by 3, the extent of take will have been 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 species or destruction or adverse modification of critical habitat.

2.9.3 Reasonable and Prudent Measures

"Reasonable and prudent measures" are measures that are necessary or appropriate to minimize the impact of the amount or extent of incidental take (50 CFR 402.02).

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

1. Minimize the amount or extent of incidental take of listed salmonids resulting from project implementation activities authorized by RGP-12.

2. Ensure that implementers of the restoration projects and monitoring activities authorized by RGP-12 will minimize take of listed salmonids, monitor and report take of listed salmonids, and where feasible, obtain specific project information to better assess the effects and benefits of restoration projects authorized through RGP-12.

2.9.4 Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the ESA, the Federal action agency must comply (or must ensure that any applicant complies) with the following terms and conditions. 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 ITS (50 CFR 402.14). If the entity to whom a term and condition is directed does not comply with the following terms and conditions, protective coverage for the proposed action would likely lapse.

1) The following terms and conditions implement reasonable and prudent measure 1: Minimize the amount or extent of incidental take of listed salmonids resulting from project implementation activities authorized by RGP-12.

    a) The Corps and/or CDFW shall contact NMFS within 48 hours if injuries or mortality at any restoration project or monitoring site on any given day exceed 3% of the number of captured fish for any listed species. Fish capture and/or relocation will cease at the project site until NMFS is contacted. NMFS will review the activities resulting in take and determine if modified methods or additional protective measures are required before fish handling at the site may resume.

2) The following terms and conditions implement reasonable and prudent measure 2: Ensure that implementers of the restoration projects and monitoring activities authorized by RGP-12 minimize, monitor, and report take of listed salmonids, and, where feasible, obtain specific project information to better assess the effects and benefits of restoration projects authorized through RGP-12.

    a) In addition to the information that will be provided in the annual notification to NMFS (described further in section 1.1.1.3 of the proposed action section), the Corps and/or CDFW shall describe the number of small dam projects per HUC-10, and the number of floodplain reconnection projects over 1,000 acres per HUC-10, across all projects authorized through RGP-12 for that year.

       The annual notification shall be submitted to the following three NMFS contacts no later than March 15:

       NMFS Northern California Office (Arcata):
       Jeffrey.Jahn@noaa.gov
       Julie.Weeder@noaa.gov
       NMFS North Central Coast Office (Santa Rosa)
       Erin.Seghesio@noaa.gov

    b) Throughout the reporting year, the Corps and/or CDFW shall track the take resulting from all implementation and monitoring activities carried out under the Program. If the total number of fish of any species killed during Program activities approaches or exceeds the number of fish identified in the ITS and listed in the last column of Table 1 or bottom row of Table 2, the Corps and/or CDFW shall immediately notify the South

Coast Branch Chief of the NMFS Northern California Office, Jeffrey Jahn, at 707-825-5173 or Jeffrey.Jahn@noaa.gov.

c) The annual report of the project and monitoring activities that occurred during the previous reporting year (January 1- December 31), which will include the information described in section 1.1.1.3 of the proposed action section, shall be submitted to the following three NMFS contacts no later than March 1 of each year: Jeffrey.Jahn@noaa.gov, Julie.Weeder@noaa.gov, and Erin.Seghesio@noaa.gov.

d) The Corps and/or CDFW shall coordinate with NMFS on an ongoing basis (at least twice per year) to review the results of implementation, effectiveness, and validation monitoring, modify how such monitoring is carried out by applicants and CDFW, and assess if these results suggest opportunities to reduce impacts on listed salmonids and their habitat, to advance restoration success, or both. This coordination shall occur through the SHARE team (described further in section 1.3.1 of the BA (CDFW 2022), or another approach mutually agreed upon by the Corps, CDFW, and NMFS.

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 no ESA conservation recommendations for the Corps at this time.

2.11 Reinitiation of Consultation

This concludes formal consultation for the Corps' reissuance of RGP-12 to CDFW.

Under 50 CFR 402.16(a): "Reinitiation of consultation is required and shall be requested by the Federal agency or by the Service where discretionary Federal agency involvement or control over the action has been retained or is authorized by law and: (1) If the amount or extent of taking specified in the incidental take statement is exceeded; (2) If new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not previously considered; (3) If the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the biological opinion or written concurrence; or (4) If a new species is listed or critical habitat designated that may be affected by the identified action."

2.12 "Not Likely to Adversely Affect" Determinations

The ESA-listed threatened southern DPS of North American green sturgeon (*Acipenser medirostris*) and threatened southern DPS of Pacific eulachon (*Thaleichthys pacificus*) and their designated critical habitats occur within the action area. The Corps determined the proposed action may affect, but is not likely to adversely affect southern DPS green sturgeon, southern DPS eulachon or their critical habitats.

2.12.1 Southern DPS Green Sturgeon

Southern DPS green sturgeon inhabit estuaries along the west coast during the summer and fall months (Moser and Lindley 2007). The Southern DPS of North American green sturgeon primarily spawn in the deep turbulent sections of the upper reaches of the Sacramento River. As juvenile green sturgeon age, they migrate downstream and live in the lower San Francisco Bay delta and bay, spending from three to four years there before entering the ocean. Green sturgeon juveniles, subadults, and adults (pre-and post-spawning) are present in San Francisco Bay at various times throughout the entire year. Green sturgeon likely optimize their growth opportunities in summer by foraging in the relatively warm waters of estuaries (Moser and Lindley 2007). Green sturgeon forage on benthic prey items throughout the estuary, notably shallow tidal flats dominated by burrowing shrimp and other benthic prey items (Dumbauld et al. 2008). Sub-adults range from 65-150 cm total length from first ocean entry to size at sexual maturity. Sexually mature adults range from 150-250 cm total length.

Green sturgeon are also known to use the North Humboldt Bay heavily (Goldsworthy et. al. 2016, Pinnix 2008). Since juvenile southern DPS green sturgeon rear in their natal streams in upper reaches of the Sacramento River only sub-adult and adult Southern DPS green sturgeon are present in Humboldt Bay and are the only life stages of Southern DPS green sturgeon that could be exposed to the effects of the Project. Data collected by the USFWS indicate that green sturgeon are found more frequently in the North Bay portion of Humboldt Bay. Green sturgeon adults and subadults are temporary residents in Humboldt Bay from June through October, utilizing North Bay as summer-fall holding or feeding habitat, and the deeper waters of the North Bay Channel as a migratory corridor between the Pacific Ocean and Arcata Bay (Pinnix 2008). Green sturgeon are known to move rapidly within an estuary and travel within the top 6.5ft of a water column over deeper water at a speed of approximately 1.8ft per second. According to a study in the San Francisco Bay, green sturgeon that were near the surface of the water were also reported to swim in swift flowing regions of the bay, and were oriented in the direction of the current. The green sturgeon in Humboldt Bay will likely exhibit similar behavior and are expected to use the deeper waters of the Humboldt Bay Entrance Bay and the Humboldt Bay North Bay Channel for migration.

The Corps has determined that the proposed action may affect, but is not likely to adversely affect, southern DPS green sturgeon and its designated critical habitat (CDFW 2022). Green sturgeon in San Francisco Bay are outside the action area and will not be affected by the Program. Low numbers of adult southern DPS green sturgeon may be present at or near project sites within Humboldt Bay and could be exposed to brief periods of turbidity or acoustic noise during the high tidal cycles when they have access to the action area. The turbidity related to construction activities and dredging within the estuary is expected to be brief and acoustic noise is expected to be well below levels that cause any effects other than behavioral changes. Any minor increases in sediment and turbidity that convey to the estuary environment from tributaries will quickly dissipate within the larger spatial area of the receiving water body. Green sturgeon are benthic feeders typically accustomed to turbidity in their feeding environment, so temporary increases in turbidity within the estuary are not expected to reduce feeding opportunities for green sturgeon. The majority of southern DPS green sturgeon are found in the North Bay and Entrance Bay, and most will not be exposed to possible effects to benthic food resources where impacts to the substrate may occur. Because prey resources will only be temporarily affected, and there is ample suitable habitat elsewhere, we do not expect any fitness related consequences to individuals.

Migratory corridors for southern DPS green sturgeon may also be temporarily affected by increases in turbidity. However, turbidity is unlikely to significantly affect southern DPS green sturgeon migratory behaviors as the species has reduced eyesight and relies on other senses to navigate. The action is not expected to have more than negligible effects on temperature, salinity, or dissolved oxygen. Minimization measures are likely to avoid introducing significant amounts of contaminants (fuel, etc.) into the action area. Such toxics would be further diluted by tides and currents.

As described above, the proposed action is not expected to have more than minor impacts to the physical, chemical, and biological features of critical habitat for the southern DPS of green sturgeon in the action area. Similarly, for the reasons described above, the effects of the proposed action on southern DPS green sturgeon individuals in the action area are considered insignificant. Therefore, we concur that the proposed action is not likely to adversely affect the SDPS green sturgeon or its critical habitat.

2.12.2 Southern DPS of Pacific eulachon

The southern DPS of Pacific eulachon (*Thaleichthys pacificus*) is listed as threatened under the Endangered Species Act (50 CFR 223.102(e)). Fish from the Southern DPS of Pacific eulachon may be within the action area in the Lower Klamath River, Redwood Creek, and Mad River and their estuaries during certain times of the year. The peak spawning entry of eulachon into river systems is typically during February and March (75 FR 13012), and Larson and Belchik (1998) noted that spawning migrations of eulachon have been found in the Lower Klamath River as early as December and as late as May. Newly hatched larvae are immediately washed downstream after hatching a few weeks after spawning (Moyle 2002). CDFW does not expect eulachon will be present during restoration project implementation due the work windows (June 15 - November 1) not coinciding with when adult and juvenile eulachon will be in the action area (winter - spring). CDFW also does not expect eulachon will be encountered while performing effectiveness monitoring at other times of year due to past monitoring results. NMFS agrees that no life stages of eulachon are expected to be present in the action area during the construction season between June 15 and November 1, that encountering eulachon during monitoring activities is extremely unlikely, and that therefore all of the effects of the Proposed Action would be discountable for individual eulachon.

The PBFs for southern DPS eulachon critical habitat are: (1) freshwater spawning and incubation sites with water flow, quality and temperature conditions and substrate supporting spawning and incubation, (2) freshwater and estuarine migration corridors free of obstruction and with water flow, quality and temperature conditions supporting larval and adult mobility, and with abundant prey items supporting larval feeding after the yolk sac is depleted, and (3) nearshore and offshore marine foraging habitat with water quality and available prey, supporting juveniles and adult survival (50 CFR 226.222(b)). The proposed action has the potential to affect the first two PBFs of southern DPS eulachon critical habitat, which relate to freshwater spawning and incubation sites and freshwater migration corridors in the action area. The potentially affected components of the freshwater and estuarine PBFs include substrate, water quality, passage, and forage.

While the proposed in-stream portions of the proposed action could disturb areas of potential spawning substrate, the streambed would return to a natural condition after the first few heavy rains of winter. Adult eulachon would not likely spawn in the location until after this time; therefore, disturbance to spawning substrate would be temporary and insignificant. Increases in turbidity during the first heavy winter rains would be short and of low magnitude, representing a small percentage of overall turbidity compared to background levels, and are not expected to decrease the quality of downstream spawning and rearing habitat or effect prey in any measurable way. These potential impacts to critical habitat will not be sustained long enough, or occur at sufficient intensity, to adversely affect downstream adult spawning, migration corridors, or juvenile rearing habitat.

Based on these analyses, NMFS concurs with Corp's determination that the proposed action is not likely to adversely affect southern DPS eulachon and their critical habitat.

3.0 MAGNUSON–STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT ESSENTIAL FISH HABITAT RESPONSE

Section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) directs Federal agencies to consult with NMFS on all actions or proposed actions that may adversely affect Essential Fish Habitat (EFH). Under the MSA, this consultation is intended to promote the conservation of EFH as necessary to support sustainable fisheries and the managed species' contribution to a healthy ecosystem. For the purposes of the MSA, EFH means "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity", and includes the physical, biological, and chemical properties that are used by fish (50 CFR 600.10). 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) of the MSA also requires NMFS to recommend measures that can be taken by the action agency to conserve EFH. Such recommendations may include measures to avoid, minimize, mitigate, or otherwise offset the adverse effects of the action on EFH [CFR 600.905(b)].

This analysis is based, in part, on the EFH assessment provided by the Corps and the descriptions of EFH for Pacific Coast Salmon (Salmon) (PFMC 2016), Pacific Coast Groundfish (Groundfish) (PFMC 2019a), and Coastal Pelagic Species (Pelagics) (PFMC 2019b) contained in the fishery management plans (FMPs) developed by the Pacific Fishery Management Council (PFMC) and approved by the Secretary of Commerce.

3.1 Essential Fish Habitat Affected by the Project

Essential Fish Habitat is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" (16 U.S.C. 1802[10]). "Waters" include aquatic areas and their associated physical, chemical, and biological properties that are used by fish, and may include areas historically used by fish where appropriate; "substrate" includes sediment, hard bottom, structures underlying the waters, and associated biological communities; "necessary" means habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and "spawning, breeding, feeding, or growth to maturity" covers a species' full life cycle (50 CFR 600.10). The term "adverse effect" means any impacts which reduce the quality and/or quantity of EFH. Adverse effects may include direct or indirect physical, chemical, or biological alterations of the waters or substrates and loss of, or injury to, benthic organisms, prey species, and their habitats, and other ecosystem components, if such modifications reduce the quality and/or quantity of EFH. Adverse effects to EFH may result from actions occurring within EFH or outside of it and may include site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.910). The EFH consultation mandate applies to all species managed under a Fishery Management Plan (FMP) that may be present in the action area.

The Salmon, Groundfish, and Pelagics FMPs describe EFH that will be adversely affected by the Project. Furthermore, the action area is part of designated Habitat Areas of Particular Concern (HAPCs) for federally managed fish species under the Salmon FMP and the Groundfish FMP. HAPCs are described in the regulations as subsets of EFH that are identified based on one or more of the following considerations: the importance of the ecological function provided by the habitat; the extent to which the habitat is sensitive to human-induced environmental degradation; whether, and to what extent, development activities are, or will be stressing the habitat type; and the rarity of the habitat type (50 CFR 600.815(a)(8)). Designated HAPCs are not afforded any additional regulatory protection under MSA; however, federal projects with potential adverse impacts to HAPCs are more carefully scrutinized during the consultation process. The action area includes all of the HAPCs designated for the Salmon fishery: Complex Channel and Floodplain Habitat, Thermal Refugia, Spawning Habitat, Estuaries, and Marine and Estuarine Submerged Aquatic Vegetation. It also includes two Groundfish HAPCs: Estuaries and Seagrass.

3.2 Adverse Effects on Essential Fish Habitat

Coho salmon and Chinook salmon are expected to occur seasonally within the action area. The Program's effects on salmon EFH are very similar to effects on coho salmon and Chinook salmon critical habitat, which are described in the effects section (2.5). The adverse effects to EFH for managed species in the Salmon FMP, Groundfish FMP, and Pelagics FMP, as well as to the HAPCs for salmon and groundfish species, are described below.

Temporary effects of construction, including dewatering, pile driving, and water quality degradation from sedimentation and turbidity, will cause adverse effects to EFH for all three FMPs. These construction activities will adversely affect the salmon HAPCs for Complex Channel and Floodplain Habitat, Estuaries, and Submerged Aquatic Vegetation, and the Estuaries and Seagrasses HAPCs for groundfish. In addition, small portions of salmonid EFH, although improved by bioengineering work to stabilize channels, will still suffer some long-term loss of habitat value as described above in the biological opinion's effects section.

The Program includes components that may disrupt, harm, or kill prey items for MSA-managed species, including the likely disruption and potential death of aquatic macroinvertebrates and MSA-managed fish species (such as northern anchovies and krill) when EFH is subjected to heavy equipment work or pile driving and prey items desiccate or suffer crushing injury.

3.3 Essential Fish Habitat Conservation Recommendations

Many of the adverse effects from the proposed action are temporary, as water quality and other disturbances will subside and improve over time. There may also be short-term reductions in eelgrass parameters shortly after each year's construction period, but eelgrass parameters are expected to begin to improve upon restoration of the tidal prism. Disruption, injury, and death of prey items will temporarily reduce the quality and quantity of EFH in the action area and interrupt the ability of EFH to provide the habitat needed for species to grow to maturity. Overall, the Program will improve and enhance the quantity and quality of EFH in the action area. NMFS did not identify any Conservation Recommendations for the Program.

3.4 Supplemental Consultation

The Corps must reinitiate EFH consultation with NMFS if the proposed action is substantially revised in a way that may adversely affect EFH, or if new information becomes available that affects the basis for NMFS' EFH Conservation Recommendations [50 CFR 600.920(l)].

4.0 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 US Army Corps of Engineers. Other interested users include CDFW and entities implementing restoration projects under RGP-12, citizens of affected areas, and others interested in the conservation of the affected ESUs/DPSs. Individual copies of this opinion were provided to the US Army Corps of Engineers and CDFW. The document will be available within 2 weeks at the NOAA Library Institutional Repository [https://repository.library.noaa.gov/welcome]. The format and naming adhere 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 part 600.

Best Available Information: This consultation and supporting documents use the best available information, as referenced in the References section. The analyses in this opinion and EFH consultation contain more background on information sources and quality.

Referencing: All supporting materials, information, data and analyses are properly referenced, consistent with standard scientific referencing style.

Review Process: This consultation was drafted by NMFS staff with training in ESA and MSA implementation, and reviewed in accordance with West Coast Region ESA quality control and assurance processes.

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