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

April 10, 2023 **Refer to NMFS No:** WCRO-2022-01873

James Mazza
Regulatory Division Chief
Department of the Army
San Francisco District, Corps of Engineers
450 Golden Gate Avenue
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 Renewal of Regional General Permit 18 - Activities Associated with the Santa Clara Valley Habitat Conservation Plan (Corps File No. 2012-00302S)

Dear Mr. Mazza:

Thank you for your letters of December 3, 2020, July 28, 2022, and November 3, 2022, requesting reinitiation 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 renewal of Regional General Permit 18 (RGP 18) in Santa Clara County, California. RGP 18 authorizes 13 categories of activities that are associated with the Santa Clara Valley Habitat Conservation Plan (Habitat Plan). The Habitat Plan was prepared by six Santa Clara County partners (County of Santa Clara, City of San Jose, City of Morgan Hill, City of Gilroy, Santa Clara Valley Water District, and Santa Clara Valley Transportation Authority) and permitted by the U.S. Fish and Wildlife Service and the California Department of Fish and Wildlife in 2013. The Santa Clara Valley Habitat Agency is responsible for executing the requirements of the Habitat Plan, including the permit requirements of RGP 18.

The enclosed programmatic biological opinion is based on our review of the proposed activities that would be authorized by RGP 18 and describes NMFS' analysis of potential effects on threatened Central California Coast (CCC) steelhead (*Oncorhynchus mykiss*) and South-Central California Coast (S-CCC) steelhead (*O. mykiss*) and designated critical habitat in accordance with section 7 of the ESA. In the enclosed opinion, NMFS concludes activities authorized under RGP 18 are not likely to jeopardize the continued existence of these species; nor is it likely to adversely modify critical habitat. However, NMFS anticipates that take of CCC and S-CCC steelhead is reasonably certain to occur as a result of the proposed action. Therefore, an incidental take statement with terms and conditions is included with the enclosed opinion. NMFS has also found that the proposed project may affect, but is not likely to adversely affect Southern Distinct Population Segment green sturgeon (*Acipenser medirostris)* or its designated critical habitat in accordance with section 7 of the ESA.

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 [16 U.S.C. 1855(b)] for this action. NMFS has determined that the proposed action would adversely affect EFH for various life stages of fish species managed with the Pacific Coast Salmon Fishery Management Plan (FMP). However, because the proposed action contains adequate measures to avoid or reduce these adverse effects, NMFS has no EFH Conservation Recommendations to provide at this time.

Please contact Jodi Charrier of the California Coastal Office in Santa Rosa at 707-575-6069 or jodi.charrier@noaa.gov if you have any questions concerning this consultation, or if you require additional information.

Sincerely,

Alecia Van Atta
Assistant Regional Administrator
California Coastal Office

Enclosure

cc: Sarah Firestone, Corps of Engineers (Sarah.M.Firestone@usace.army.mil)
Kathryn Gaffney, ICF (Kathryn.Gaffney@icf.com)
Ed Sullivan, Valley Habitat Authority (Edmund.Sullivan@scv-habitatagency.org)
Gerry Haas, Valley Habitat Authority (Gerry.Haas@scv-habitatagency.org)
Copy to E-File FRN 151422WCR2015SR00297

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

Regional General Permit 18 for Activities Associated with the
Santa Clara Valley Habitat Conservation Plan/Natural Community Conservation Plan

NMFS Consultation Number: WCRO-2022-01873
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?	Is Action Likely to Adversely Affect Critical Habitat?	Is Action Likely to Destroy or Adversely Modify Critical Habitat?
Central California Coast steelhead distinct population segment (DPS) (*Oncorhynchus mykiss*)	Threatened	Yes	No	Yes	No
South-Central California Coast steelhead DPS (*O. mykiss*)	Threatened	Yes	No	Yes	No
Southern DPS of North American Green Sturgeon (*Acipenser medirostris*)	Threatened	No	N/A	No	N/A

Essential Fish Habitat and NMFS' Determinations

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

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

Issued By:

Alecia Van Atta
Assistant Regional Administrator
California Coastal Office

Date: April 10, 2023

TABLE OF CONTENTS

1. INTRODUCTION

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

1.1 Background

NOAA's National Marine Fisheries Service (NMFS) prepared the biological opinion (opinion) and incidental take statement (ITS) portions of this document in accordance with section 7(b) of the Endangered Species Act (ESA) of 1973 (16 USC 1531 et seq.), as amended, and implementing regulations at 50 CFR 402. We also completed an essential fish habitat (EFH) consultation on the proposed action, in accordance with section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C. 1801 et seq.) and implementing regulations at 50 CFR 600.

We completed pre-dissemination review of this document using standards for utility, integrity, and objectivity in compliance with applicable guidelines issued under the Data Quality Act (DQA) (section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001, Public Law 106-554). The document will be available within two weeks at the NOAA Library Institutional Repository [https://repository.library.noaa.gov/welcome]. A complete record of this consultation is on file at NMFS North-Central Coast Office in Santa Rosa, California.

1.2 Consultation History

The Santa Clara Valley Habitat Agency (Habitat Agency) has been working with the U.S. Army Corps of Engineers (Corps) and NMFS since 2012 to develop a programmatic approach to permit activities covered by the Santa Clara Valley Habitat Conservation Plan (Habitat Plan, ICF 2012). On November 1, 2012, NMFS received a copy of the Habitat Agency's application to the Corps for a Regional General Permit (RGP) for implementation of activities covered under the Habitat Plan.

On December 7, 2015, the Corps provided a letter to NMFS initiating consultation pursuant to Section 7 of the ESA and EFH for the proposed issuance of a 5-year RGP to the Habitat Agency for implementation of a subset of the activities in the Habitat Plan. During consultation it was determined that the majority of activities to be authorized by the RGP contained sufficient measures to avoid adverse effects to listed fish and designated critical habitat under the jurisdiction of NMFS. Accordingly, NMFS and the Corps agreed to conduct a programmatic consultation on the actions covered by the RGP that were not likely to adversely affect ESA-listed fish and designated critical habitat. For actions authorized by the RGP that may result in adverse effects to listed fish and/or critical habitat, the Corps and NMFS agreed to conduct individual section 7 consultations. By letter dated December 23, 2015, NMFS concurred with the Corps that activities to be covered under the RGP that do not require de-watering of anadromous salmonid streams are not likely to adversely affect federally-threatened Central California Coast (CCC) or South-Central California Coast (S-CCC) steelhead, or the Southern Distinct Population Segment (sDPS) of North American green sturgeon, and designated critical habitat.

On January 15, 2016, the Corps issued a 5-year RGP to the Habitat Agency for certain activities related to the Habitat Plan under Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. Section 403 et seq.) and Section 404 of the Clean Water Act of 1972, as amended (33 U.S.C. § 1344 et seq.). For projects proposed on steelhead-bearing streams in the RGP area, the Corps agreed to notify NMFS and provide project-specific plans at least 6 weeks prior to the Corps' authorization. During the 5-year term of the RGP (2016-2021) one project was submitted to NMFS: City of San Jose Stormwater Outfall Repair/Replacement Project (Corps File No. 2017-00081S). Due to the need to dewater steelhead streams for construction at some outfall sites, the project did not qualify for inclusion under the RGP programmatic consultation between NMFS and the Corps. Therefore, an individual section 7 consultation was performed by NMFS and the Corps for San Jose Outfall Repair/Replacement Project (NMFS WCRO-2017-00930; July 11, 2017).

On October 5, 2016, representatives from NMFS and the Habitat Agency met in person at the NMFS office in Santa Rosa and agreed to the development of a programmatic biological opinion that would address implementation of RGP covered activities where stream dewatering is required. The Habitat Agency submitted a draft biological assessment to NMFS for review in August 2017. In response to comments provided by NMFS, the Habitat Agency revised the document and resubmitted the biological assessment to NMFS in August 2018. In November 2018 representatives with the Habitat Agency and NMFS discussed modifications to project limits and activity descriptions. Discussions between NMFS and the Habitat Agency continued in February 2019 regarding proposed activities and avoidance/minimization measures.

By letter dated December 3, 2020, the Corps reinitiated consultation with NMFS to address renewal of the RGP and to address activities requiring dewatering for construction in streams with listed anadromous fish. The Corps also provided a Programmatic Biological Assessment for the Santa Clara Valley Habitat Plan Regional General Permit prepared by ICF dated November 2020 (BA, ICF 2020). On February 25, 2021, NMFS and Corps personnel held a phone call to discuss the RGP renewal timeline and covered activities.

On September 10, 2021, NMFS requested that the Corps clarify several activities and measures included in the project description. A meeting with the Corps, NMFS, and the Habitat Agency was held on October 5, 2021, to discuss the project description and clarify the proposed avoidance and minimization measures. At this meeting, the Habitat Agency agreed to incorporate a work window for activities conducted in steelhead streams. The Habitat Agency also agreed to provide an updated project description for Chapter 2 of the BA. The updated project description was transmitted to NMFS and the Corps on December 9, 2021.

On February 17 and March 17, 2022, NMFS provided additional questions and comments to the Habitat Agency regarding the December 9, 2021 project description. The Habitat Agency agreed to revise the description and provide an updated draft to NMFS. On April 26, 2022, another draft project description was provided to NMFS and the Corps for review. NMFS provided comments on the April 26, 2022 draft to the Corps and Habitat Agency via email on July 1, 2022.

On July 22, 2022, the Habitat Agency provided additional revisions on the BA and project description to NMFS and the Corps. By letter dated July 28, 2022, the Corps transmitted an updated request to NMFS for reinitiation of the Section 7 consultation.

On July 29, 2022, NMFS suggested the Corps re-assess their effects determination for the sDPS of green sturgeon because the proposed permit area is outside of any tidally influenced habitat where the species could likely occur. The Corps evaluated the information provided in the final project description and notified NMFS that they have changed their effects determination for green sturgeon to "not likely to adversely affect" via a July 29, 2022, email.

On August 8, 2022, NMFS emailed the Habitat Agency and the Corps to confirm if work on water diversion structures was included under this RGP. Language prohibiting the authorization of water intake structures was included in the July 2022 BA; however, this activity was still referenced elsewhere in the BA. NMFS also requested clarification regarding the duration of the Corps' RGP 18. The Corps confirmed the RGP has a 5-year duration, and could be extended in 5-year increments indefinitely. In response to this information, NMFS agreed to conduct a long-term analysis in this biological opinion.

To confirm the revised determination regarding potential effects to green sturgeon, the Corps provided a letter to NMFS on November 3, 2022, requesting NMFS' concurrence with the Corps' determination that the proposed RGP is not likely to adversely affect the sDPS of green sturgeon or its designated critical habitat. In addition, the Habitat Agency's consultant team provided NMFS and the Corps with a memorandum on November 5, 2022, that amends the BA's analysis and findings regarding green sturgeon.

Via email from the Habitat Agency's consultant team to NMFS on November 7, 2022, it was clarified that activities proposed under the RGP in streams with listed fish would not include the construction of "non-bridge" crossings.

To address the various updates to the project description since completion of the July 2022 BA, the Corps provided NMFS with an updated BA on April 3, 2023. The April 2023 BA included the following updates:

- Annual limits were placed on the number of large woody debris (LWD) removal projects (see Section 2.3, Table 2-1, Avoid and Minimization Measure A-109).
- Section 2.3.2.5 – RGP A-5. Program limits updated to reflect the maximum number of LWD removal projects per year in streams containing listed anadromous fish.
- Section 2.5.3 - Clarified the implementation process and information that will be submitted with a project notification package.
- All mention of "water intakes" were removed as a covered activity in the proposed action and throughout the BA.

On July 5, 2022, the U.S. District Court for the Northern District of California issued an order vacating the 2019 regulations that were revised or added to 50 CFR part 402 in 2019 ("2019 Regulations," see 84 FR 44976, August 27, 2019) without making a finding on the merits. On September 21, 2022, the U.S. Court of Appeals for the Ninth Circuit granted a temporary stay of

the district court's July 5 order. On November 14, 2022, the Northern District of California issued an order granting the government's request for voluntary remand without vacating the 2019 regulations. The District Court issued a slightly amended order two days later on November 16, 2022. As a result, the 2019 regulations remain in effect, and we are applying the 2019 regulations here. For purposes of this consultation and in an abundance of caution, we considered whether the substantive analysis and conclusions articulated in the biological opinion and incidental take statement would be any different under the pre-2019 regulations. We have determined that our analysis and conclusions would not be any different.

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 (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 renew RGP 18 for 13 categories of activities that are associated with the Habitat Plan. The Habitat Plan was prepared by six Santa Clara County partners (County of Santa Clara, City of San Jose, City of Morgan Hill, City of Gilroy, Santa Clara Valley Water District, and Santa Clara Valley Transportation Authority) and permitted by the U.S. Fish and Wildlife Service and the California Department of Fish and Wildlife in 2013. Covered activities are primarily associated with urban and rural development including a variety of road, water, and other infrastructure construction and maintenance activities, as well as conservation strategy implementation activities. The Corps' RGP 18 provides authorization under Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. Section 403 et seq.) and Section 404 of the Clean Water Act of 1972, as amended (33 U.S.C. § 1344 et seq.). The Habitat Agency is responsible for executing the requirements of the Habitat Plan, including the permit requirements of RGP 18.

The RGP is intended to simplify the Corps' authorization of Habitat Plan program activities with the overarching goal of promoting ecologically compatible growth and development in Santa Clara County. The Corps has the authority to renew the RGP 18 every 5 years indefinitely. The Corps will notify NMFS during the pre-application phase of each 5-year RGP renewal and request that NMFS review the Program (including annual reports) to confirm that:

1. The amount or extent of incidental take specified in the opinion's incidental take statement (ITS) has not been exceeded;
2. There is no new information that reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion;
3. The identified action has not been subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the opinion; and
4. No new species are listed or critical habitat designated that may be affected by the action.

Eighteen activities within thirteen categories could occur within the permit area of the Habitat Plan (Figure 1). The permit area is 508,669 acres within Santa Clara County. The area includes almost all of the City of San Jose, all of the City of Morgan Hill, and all of the City of Gilroy.

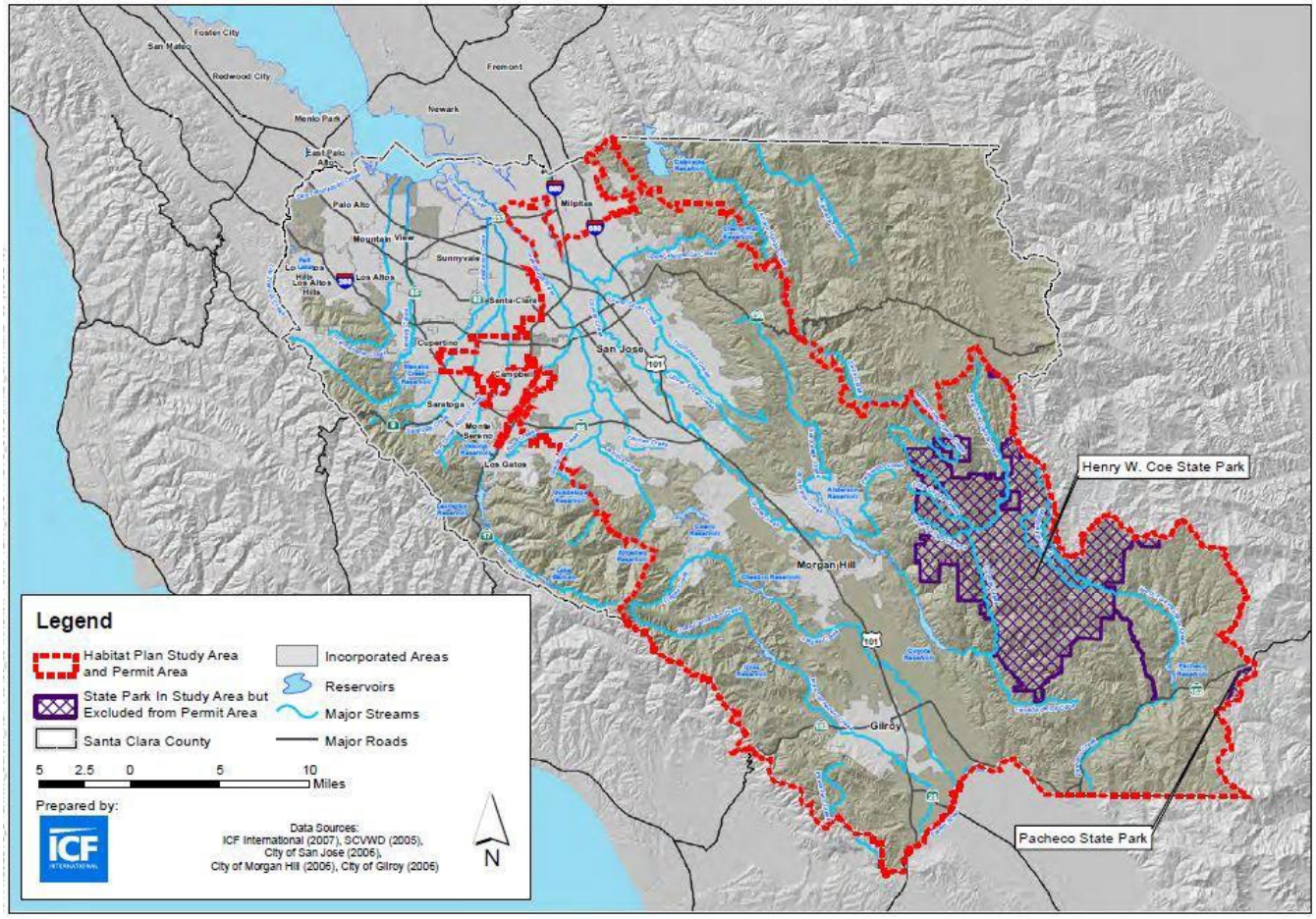

Figure 1. Santa Clara Valley Habitat Plan RGP area outlined in red (Source: ICF 2020).

Streams and sub-watersheds within the permit area include the following rivers and creeks with steelhead:

- Coyote Creek
    - Upper Penitencia Creek (Arroyo Aguague)
- Guadalupe River
    - Alamitos Creek
    - Calero Creek
    - Guadalupe Creek
- Pajaro River
    - Uvas Creek (Bodfish, Little Arthur, and Tar Creeks)
    - Llagas Creek
    - Pacheco Creek (South Fork Pacheco and Cedar Creeks)
    - Pascadero Creek

The permit area includes 583 acres of wetlands and over 2,300 miles of stream, although stream miles occupied by anadromous salmonids are considerably less. Bayland habitats were excluded from the permit area to avoid covering habitats specific to salt marshes and other saline habitats

and to avoid duplicating other substantial planning efforts underway in the Baylands (e.g., South Bay Salt Ponds Restoration Project). The boundary of the Baylands was determined using color aerial photographs, historical maps of tidal areas, and data from the Baylands Ecosystem Goals Project. The northern boundary of the permit area is the northern edge of the "bufferlands" of the San Jose-Santa Clara Regional Wastewater Facility on Zanker Road.

The 13 categories of covered activities in this RGP 18 are listed below:

- RGP A-1: Linear Transportation Projects (bridges, roads, highways, pedestrian bridges, bike paths)
- RGP A-2: Culvert Repair, Replacement, Removal and Installation
- RGP A-3: Outfall Repair, Replacement, Removal and Installation
- RGP A-4: Sediment Removal
- RGP A-5: Removal of Vegetation and Storm Debris Involving Soil Disturbance
- RGP A-6: Temporary Construction Access and Dewatering
- RGP A-7: Recreational Facility Construction, Reconstruction, and Maintenance
- RGP A-8: Restoration, Establishment, and Enhancement Activities Involving Soil Disturbance, Including Removal and Modification of Fish Passage Impediments
- RGP A-9: Installation of Fish Screens
- RGP A-10: Bank Stabilization
- RGP A-11: Minor Maintenance of Levees, Canals, and Ditches
- RGP A-12: Surveying Activities, Including Installation and Maintenance of Scientific Measurement Devices
- RGP A-13: Utility Repair, Removal, Replacement, and Installation

All of the above-listed activities were also included in the Corps' 2016 RGP 18 and were addressed in the NMFS December 23, 2015, Letter of Concurrence with the Corps, A description of each covered activity, specific minimization measures including annual and program limits for each activity, and program reporting requirements and procedures for the RGP were also provided as part of the 2015 consultation. However, for threatened CCC and SCCC steelhead, the 2016 RGP 18 did not allow dewatering of streams with listed anadromous fish, nor fish capture and relocation. In-water project construction was restricted to non-anadromous waterways or periods when anadromous waterways are naturally dry. By incorporating these measures, in-water construction activities would only occur when CCC and SCCC steelhead were not present at work sites. Therefore, the effects to listed species due to the implementation of RGP activities as part of the 2015 consultation were considered insignificant and not likely to adversely affect CCC and SCCC steelhead.

The primary difference between the 2016 RGP and the revised 2021 RGP is that the above-listed activities may now include dewatering and fish relocation. Two activities, (1) water intake structure repair, replacement, and installation; and (2) discharges associated with development, that were included in the 2015 consultation were removed and are no longer covered activities under the revised RGP.

1.3.1 RGP Activity A-1: Linear Transportation Projects

Activities required for crossings of waters of the United States associated with the construction, expansion, modification, improvement, or removal of linear transportation projects (e.g., bridges, roads, highways, pedestrian bridges, bike paths) in waters of the United States. Any stream channel modification, including bank stabilization, is limited to the minimum necessary to construct or protect the linear transportation project; such modifications must be in the immediate vicinity of the project.

Linear transportation projects may require use of heavy equipment such as scrapers, dozers, backhoes, excavators, cranes, loaders, dump trucks, and other earth moving equipment. Some projects may require equipment and vehicles to be operated in the stream channel. Where construction activities are required in flowing streams, cofferdams or berms would be used to dewater the work site and isolate it from flowing water.

Program and project limits for linear transportation projects are as follows:

- Program limits: 17.5 acres over 5 years
- Project limits: 0.5 acre, 300 linear feet of channel

1.3.2 RGP Activity A-2: Culvert Repair, Replacement, Removal and Installation

Culvert repair and replacement may include removal and replacement of existing culverts, repairs to headwalls, end walls, down drains, flared end sections, rock energy dissipaters, and rock slope protection (RSP). Culvert installation may include construction of headwalls, end walls, down drains, flared end sections, rock energy dissipaters, and RSP. Culverts may be repaired or replaced by excavation and backfilling with native soils or concrete around the culvert. New culverts may be installed by excavation and backfilling (with native soils or concrete slurry), or by pipe jacking (advancing the pipe through the ground with thrust). Earth plugs may be used to contain slurry mixtures. Backfill areas may be paved after the culvert is repaired, replaced, removed, or installed; in rural settings, the area may be left as compacted earth and gravel.

Culvert repair, replacement, removal, and installation may require use of heavy equipment such as scrapers, dozers, backhoes, excavators, cranes, loaders, dump trucks, and other earth moving equipment. Some projects may require equipment and vehicles to be operated in the stream channel. Where construction activities are required in flowing streams, cofferdams or berms would be used to dewater the work site and isolate it from flowing water.

Program and project limits for culvert projects are as follows:

- Program limits: 11 acres over 5 years
- Project limits: 0.5 acre and 300 linear feet of channel

1.3.3 RGP A-3: Outfall Repair, Replacement, Removal, and Installation

No water intake structures may be repaired, replaced, or installed under this project action. Water intake structures may be removed under this project action. Activities include the repair and replacement of existing outfalls and installation of new outfalls associated with stormwater management facilities. Activities are related to the construction or modification of outfall structures, where the effluent from the outfall is authorized, conditionally authorized, or specifically exempted by, or otherwise in compliance with regulations issued under the National Pollutant Discharge Elimination System Program (section 402 of the Clean Water Act).

Outfall repair, replacement, removal, and installation may require use of heavy equipment such as scrapers, dozers, backhoes, excavators, cranes, loaders, dump trucks, and other earth moving equipment. Although most work can usually be accomplished with equipment operated from the top of bank, some projects may require equipment and vehicles to be operated in the stream channel. Where construction activities are required in flowing streams, cofferdams or berms would be used to dewater the work site and isolate it from flowing water.

Program and project limits for outfall projects are as follows:

- Program limits: 7.5 acres over 5 years
- Project limits: 0.25 acre and 100 linear feet of channel

1.3.4 RGP A-4: Sediment Removal

Project Action RGP A-4 is not for use by Habitat Plan Co-Permittee. Santa Clara Valley Water, as it has its own permitting program to cover this activity.

Mechanical sediment removal required when accumulated sediment reduces a channel's flow conveyance capacity and prevents facilities or appurtenant structures from functioning as intended. Sediment removal may occur along a channel reach, or at a small site such as a stream gauge, and would be done to match pre-sedimentation geomorphic features (e.g., channel sinuosity). Sediment removal may also be needed for pond maintenance.

Sediment removal may require use of heavy equipment such as scrapers, dozers, backhoes, excavators, cranes, loaders, dump trucks, and other earth moving equipment. Some projects may require equipment and vehicles to be operated in the stream channel. Where construction activities are required in flowing streams, cofferdams or berms would be used to dewater the work site and isolate it from flowing water.

Program and project limits for sediment removal projects are as follows:

- Program limits: 10 acres over 5 years
- Project limits: 0.25 acre, 300 linear feet of channel, 500 cubic yards of sediment removal

1.3.5 RGP Activity A-5: Removal of Vegetation and Storm Debris Involving Soil Disturbance

Vegetation that has detached from the bank and fallen into the stream and storm debris management activities involving hand or mechanical removal of vegetation and storm debris by scraping, discing, grading, excavating or other methods that result in soil disturbance. Vegetation management activities may occur along creeks, near bridges, or at stream gauges. Pesticide use is not covered under this programmatic consultation.

Removal of vegetation and storm debris involving soil disturbance may require use of heavy equipment such as dozers, backhoes, excavators, loaders, dump trucks, and potentially other earth moving equipment. Although most work can usually be accomplished with equipment operated from the top of bank, some projects may require equipment and vehicles to be operated in the stream channel. Where construction activities are required in flowing streams, cofferdams or berms would be used to dewater the work site and isolate it from flowing water.

Large woody debris (LWD) is defined as downed trees, logs, and other large woody material within the stream channel that has a minimum diameter of 12 inches and a minimum length of 6 feet. In all streams with listed anadromous fish, LWD will be retained unless it is threatening a structure, or is causing excessive bank failure and increasing sediment loading to the stream. LWD will be assessed and managed in the following priority: (1) retaining the LWD feature; (2) modifying the LWD feature through repositioning to ameliorate the threat; (3) removing and replacing the LWD feature in another location to ameliorate the threat; or (4) removing the LWD feature from the stream channel. If removal is required, no more than two LWD removal projects may be conducted per year. When feasible, woody material that cannot be reused on site will be retained for future restoration projects (see Avoidance and Minimization Measure A-109).

Program and project limits for vegetation and debris removal projects are as follows:

- Program limits: No more than 10 LWD removal projects over 5 years
- Project limits: LWD is defined as downed trees, logs, and other large woody material within the stream channel that has a minimum diameter of 12 inches and a minimum length of 6 feet.

1.3.6 RGP Activity A-6: Temporary Construction Access and Dewatering

Construction of temporary access ramps; construction of cofferdams and berms to temporarily isolate in-channel construction activities from the active stream; and pumping of wet areas to temporarily expose the channel bottom in the designated construction area.

Installation of temporary access may require use of heavy equipment such as scrapers, dozers, backhoes, excavators, cranes, loaders, dump trucks, and other earth moving equipment. Although most work can usually be accomplished with equipment operated from the top of bank, some projects may require equipment and vehicles to be operated in the stream channel. Where

construction activities are required in flowing streams, cofferdams or berms would be used to dewater the work site and isolate it from flowing water.

Program and project limits for temporary construction access and dewatering activities are as follows:

- During each construction season, there must be at least 2 river miles between dewatering projects in salmonid-bearing streams.
- Program limits: 5 projects per year, and 25 projects over 5 years.
- Project limits: 0.1 acre, 400 linear feet of channel (to allow for 50 feet on either side of the 300-foot limits detailed above). Channel lengths more than 400 linear feet may be dewatered for restoration projects if approved by NMFS.

1.3.7 RGP Activity A-7: Recreational Facility Construction, Reconstruction, and Maintenance

Construction of recreational facilities including trails, ponds, and other facilities. Other facilities may include portions of buildings, educational displays, and other non-water dependent structures that may encroach into jurisdictional waters when complete avoidance is not practicable. Maintenance of existing recreational trail stream crossings and construction of new recreational trail stream crossings, include bicycle, pedestrian, or equestrian bridges may be authorized under this activity category.

Recreational facility construction, reconstruction, and maintenance may require use of heavy equipment such as scrapers, dozers, backhoes, excavators, cranes, loaders, dump trucks, and other earth moving equipment. Some projects may require equipment and vehicles to be operated in the stream channel. Where construction activities are required in flowing streams, cofferdams or berms would be used to dewater the work site and isolate it from flowing water.

Program and project limits for recreational facility projects are as follows:

- Program limits: 6.25 acres over 5 years
- Project limits: 0.25 acre, 200 linear feet of channel

1.3.8 RGP Activity A-8: Restoration, Establishment, and Enhancement Activities Involving Soil Disturbance, Including Removal and Modification of Fish Passage Impediments

Activities in waters of the United States associated with the restoration, enhancement, and establishment of streams, wetlands, and open waters, provided those activities result in net increases in aquatic resource functions and services. To be authorized by this RGP, the aquatic habitat restoration, enhancement, or establishment activity must be planned, designed, and implemented so that it results in aquatic habitat that resembles an ecological reference. An ecological reference may be based on the characteristics of an intact aquatic habitat or riparian area of the same type that exists in the region. An ecological reference may be based on a conceptual model developed from regional ecological knowledge of the target aquatic habitat type or riparian area.

Activities authorized under this category include, but are not limited to: the removal of accumulated sediments; the installation, removal, and maintenance of small water control structures, dikes, and berms, as well as discharges of dredged or fill material to restore appropriate stream channel configurations after small water control structures, dikes, and berms, are removed; the installation of current deflectors; the enhancement, restoration, or establishment of riffle and pool stream structure; the placement of in-stream habitat structures; modifications of the stream bed and/or banks to restore or establish stream meanders; the backfilling of artificial channels; the removal of existing drainage structures, such as drain tiles, and the filling, blocking, or reshaping of drainage ditches to restore wetland hydrology; the installation of structures or fills necessary to establish or re-establish wetland or stream hydrology; the construction of open water areas; activities needed to reestablish vegetation, including plowing or discing for seed bed preparation and the planting of appropriate wetland species; re-establishment of submerged aquatic vegetation in areas where those plant communities previously existed; mechanized land clearing to remove non-native invasive, exotic, or nuisance vegetation; and other related activities. Only native plant species will be planted at the site.

Activities covered under this RGP category will be implemented solely for the purpose of restoring habitat function. For instance, installation of current deflectors may serve to create flow complexity and eddies in areas where channel bed modifications are needed to break up long sections of simplified stream channel. Modifications of the stream bed and/or banks to restore or establish stream meanders, the backfilling of artificial channels, and the removal of existing drainage structures will be unrelated to halting erosion to protect existing structures. See *RGP Activity A-10: Bank Stabilization,* detailed below, for a description of bank stabilization projects and associated BMPs and project limits that may be implemented with the intent of protecting threatened infrastructure.

This activity category includes modification of non-tidal waters, including expansion or enhancement of non-tidal wetlands, re-meandering of streams, and aligning of streams into historical channels, provided there are net increases in aquatic resource functions and services. Except for the above-mentioned modification of non-tidal waters, this category does not authorize the conversion of a stream or natural wetlands to another aquatic habitat type (e.g., stream to wetland or vice versa) or uplands. Changes in wetland plant communities that occur when wetland hydrology is more fully restored during wetland rehabilitation activities are not considered a conversion to another aquatic habitat type. This activity category does not authorize stream channelization. Compensatory mitigation is not required as the included activities must result in net increases in aquatic resource functions and services.

Stream restoration activities include: geomorphic enhancement, including physical re-configuration of channels and installation of structures to enhance channel complexity, based on California Department of Fish and Wildlife (CDFW) and NMFS guidelines for salmonid habitat enhancement; riparian planting; removal of invasive vegetation; creating and expanding existing floodplain habitats and side channel habitats; and gravel augmentation to enhance spawning habitat. To implement these improvements, short channel segments may require temporary dewatering or bypass to allow construction.

Removal of fish passage impediments may include removal of in-stream concrete low-flow crossings, culverts, weirs, concrete aprons under bridges, and possibly other features that create shallow water depths, vertical drops, or water velocities that exceed the swimming and leaping ability of fish. Such impediments may be modified to allow passage, or completely removed. In some cases, existing small culverts that impede fish passage may be replaced with bridged weir structures to provide access to tributary streams.

Projects that aim to restore, establish, or enhance stream habitat may be exempt from the limits established for dewatering, and sediment removal. Restoration projects may require more than 400 linear feet of channel be dewatered to complete work. Under these circumstances, longer lengths of channel may be dewatered to complete the project and reduce the impact of multiple dewatering events on stream and riparian habitat. If multiple lengths of channel dewatering are undertaken to complete a single habitat restoration, establishment, or enhancement project, they will be counted as a single project towards the dewatering project limit of 5 per year and 25 projects over the 5-year term of the RGP (RGP A-6 limits). Bank stabilization projects that are part of a larger restoration project will be covered under activity RGP A-10.

To avoid cumulative impacts from the effects of project construction (e.g., sedimentation, turbidity, reduced riparian and upland vegetation), restoration, establishment, and enhancement projects must adhere to a reduced program proximity limit of one river mile. This means that restoration, establishment, and enhancement projects must be one river mile away from other in-channel projects that require dewatering within the same construction season.

Individual project plans will be submitted to NMFS. If NMFS agrees that the project will result in a net positive impact on stream habitat, the project will be eligible for the exceptions outlined above. The Corps and its permittee will encourage project applicants to seek technical assistance from NMFS in the planning stages of any restoration, establishment, or enhancement project to streamline the review process.

Heavy equipment such as scrapers, dozers, backhoes, excavators, cranes, loaders, dump trucks, and other earth moving equipment may be used to complete the work. Some projects may require equipment and vehicles to be operated in the stream channel. Where construction activities are required in flowing streams, cofferdams or berms would be used to dewater the work site and isolate it from flowing water.

Program and project limits for restoration projects are as follows:

- Program limits: the same as dewatering and sediment, unless NMFS agrees to larger areas. Must report on annual impacts.
- Project limits: the same as dewatering and sediment, unless NMFS agrees to larger areas, AND: projects must be 1 mile away from other in-channel projects that require dewatering within the same construction season, must document net increases in aquatic resource functions and services.

1.3.9 RGP Activity A-9: Installation of Fish Screens

Fish screens may be installed on existing unscreened water intakes. Fish screens may also be installed to isolate creeks from off-channel recharge ponds and lakes to prevent movement of fish in and out of these lakes and to support recreational fishing opportunities in these lakes. Fish screen structures typically consist of concrete structures with metal screens with appropriately sized openings to prevent entrainment of fish with diverted water. Fish screen structures may include a minimum amount of concrete or rock riprap as needed to stabilize banks and control erosion. This Corps permit does not cover water withdrawals.

Heavy equipment such as scrapers, dozers, back hoes, excavators, cranes, loaders, dump trucks, and other earth moving equipment may be used to complete the work. Although most work can usually be accomplished with equipment operated from the top of bank, some projects may require equipment and vehicles to be operated in the stream channel. Where construction activities are required in flowing streams, cofferdams or berms would be used to dewater the work site and isolate it from flowing water.

Program and project limits for fish screen projects are as follows:

- Program limits: 2.5 acres over 5 years
- Project limits: 0.1 acre

1.3.10 RGP Activity A-10: Bank Stabilization

Bank stabilization involves repairing and stabilizing channel banks and levees that are eroding or need erosion protection. There are a wide range of potential bank repair treatment options depending on site conditions and long-term maintenance issues. The primary treatment options include hardscape, hybrid, or softscape (also known as bio-engineered). Hardscape is defined as including only hard materials such as riprap, concrete, or boulders and lacking completely in vegetative materials. Softscape is defined as consisting of predominantly vegetative materials; methods may include covering hard materials with soil and replanting, regrading and planting the stream bank; and incorporating elements of habitat complexity such as large woody debris and root wads into soft designs. Hybrid methods include designs that incorporate both hard and soft elements; these may include riprap or boulders planted with vegetation or woody plants and large wood anchored to the bank. Softscape and hybrid methods are preferred, as they provide more habitat value for salmonids, and will be utilized wherever feasible. Bank stabilization projects will incorporate bio-engineering (softscape) into the design to the maximum extent feasible. Bank stabilization projects that are comprised strictly of hardscape features are not applicable under this program.

Bank stabilization projects will only occur at sites where existing structures and infrastructure are threatened. Repair of existing bank stabilization structures may be performed. During the bank stabilization assessment process, sites with destabilized banks are evaluated for their soil conditions, channel and bank scour velocities, slope stability, channel form/position, and other active geomorphic conditions. Consideration of the cause of the bank failure (overland runoff, bank slumping, undersized culvert upstream, etc.) is also critical to determination of the

appropriate treatment approach. Where practicable and appropriate, bank stabilization projects will also address the cause of the bank failure.

Bank stabilization may require use of heavy equipment such as scrapers, dozers, backhoes, excavators, cranes, loaders, dump trucks, and other earth moving equipment. Although most work can usually be accomplished with equipment operated from the top of bank, some projects may require equipment and vehicles to be operated in the stream channel. Where construction activities are required in flowing streams, cofferdams or berms would be used to dewater the work site and isolate it from flowing water.

Program and project limits for bank stabilization projects are as follows:

- Program limits: 2.5 acres over 5 years; hardscape features within the total 2.5 acres of bank stabilization projects over 5 years is limited to 0.125 acres.
- Project limits: 0.1 acre, 300 linear feet of channel, and separated by at least 1,500 feet from other bank stabilization projects.

1.3.11 RGP Activity A-11: Minor Maintenance of Levees, Canals, and Ditches

Minor maintenance activities are routine small-scale activities performed to make repairs and keep facilities operational. Maintenance activities may occur along levees, canals, and ditches and at stream gauges and would not change the footprint of existing facilities. Specific actions could include replacement of concrete linings, pipes, valves or similar structures; replacement of weirs; minor erosion repair; and other minor maintenance activities.

Minor maintenance of levees, canals, and ditches may require use of heavy equipment such as scrapers, dozers, backhoes, excavators, cranes, loaders, dump trucks, and other earth moving equipment. Although most work can usually be accomplished with equipment operated from the top of bank, some projects may require equipment and vehicles to be operated in the stream channel. Where construction activities are required in flowing streams, cofferdams or berms would be used to dewater the work site and isolate it from flowing water.

Program and project limits for minor maintenance activities are as follows:

- Program limits: 4 acres over 5 years
- Project limits: 0.2 acre

1.3.12 RGP Activity A-12: Surveying Activities, Including Installation and Maintenance of Scientific Measurement Devices

Survey activities includes core sampling, seismic exploratory operations, plugging of seismic shot holes and other exploratory-type bore holes, exploratory trenching, soil surveys, sampling, sample plots or transects for wetland delineations, and historic resources surveys. Under this category, the term “exploratory trenching” means mechanical land clearing of the upper soil profile to expose bedrock or substrate, for the purpose of mapping or sampling the exposed

material. The area in which the exploratory trench is dug must be restored to its pre-construction elevation upon completion of the work and must not drain a water of the United States.

In wetlands, the top 6 to 12 inches of the trench should normally be backfilled with topsoil from the trench. This category includes the construction of temporary pads, provided the area of fill or excavation does not exceed 0.08 acre in waters of the U.S. Drilling and the discharge of excavated material from test wells for oil and gas exploration are not authorized under this category; the plugging of such wells is authorized. Fill placed for roads and other similar activities is not authorized under this category. Surveying activities under this category do not include installation of any permanent survey structures. Projects to be authorized under this category must include anticipated start and end dates for the surveying activities.

Devices, whose purpose is to measure and record scientific data, include staff gages, piezometers, tide and current gages, meteorological stations, water recording and biological observation devices, water quality testing and improvement devices, and similar structures. Small weirs and flumes constructed primarily to record water quantity and velocity are also authorized provided the area of fill or excavation within waters of the U.S. is limited to 25 cubic yards. Upon completion of the use of the device to measure and record scientific data, the measuring device and any other structures or fills associated with that device (e.g., foundations, anchors, buoys, lines, etc.) must be removed to the maximum extent practicable and the site restored to pre-construction elevations. Scientific measurement device installation projects to be authorized under this category must include anticipated start and end dates for use of the installed device. For devices that would be used for long-term surveying activities, the applicant shall include a written explanation of the need for long-term surveying, and an estimated duration of the long-term survey period.

Installation and maintenance of scientific measurement devices may require use of heavy equipment such as scrapers, backhoes, excavators, cranes, loaders, dump trucks, and other earth moving equipment. Although most work can usually be accomplished with equipment operated from the top of bank, some projects may require equipment and vehicles to be operated in the stream channel. Where construction activities are required in flowing streams, cofferdams or berms would be used to dewater the work site and isolate it from flowing water.

Program and project limits for survey activities are as follows:

- Program limits: 0.8 acres over 5 years
- Project limits: 0.08 acre

1.3.13 RGP Activity A-13: Utility Repair, Removal, Replacement, and Installation

Activities required for the construction, maintenance, repair, and removal of utility lines and associated facilities in waters of the United States. This category includes the construction, maintenance, or repair of utility lines and the associated excavation, backfill, or bedding for the utility lines, in all waters of the United States, provided there is no change in pre-construction contours. A “utility line” is defined as any pipe or pipeline for the transportation of any gaseous, liquid, liquescent, or slurry substance, for any purpose, and any cable, line, or wire for the

transmission for any purpose of electrical energy, telephone, and telegraph messages, internet, and radio and television communication. The term "utility line" does not include activities that drain a water of the United States, such as drainage tile or French drains, but it does apply to pipes conveying drainage from another area.

Utility repair, removal, replacement, and installation may require use of heavy equipment such as scrapers, dozers, backhoes, excavators, cranes, loaders, dump trucks, and other earth moving equipment. Although most work can usually be accomplished with equipment operated from the top of bank, some projects may require equipment and vehicles to be operated in the stream channel. Where construction activities are required in flowing streams, cofferdams or berms would be used to dewater the work site and isolate it from flowing water.

Program and project limits for utility projects are as follows:

- Program limits: 3 acres over 5 years
- Project limits: 0.2 acre
- New installation and replacement requiring ground disturbance in the 100-year floodplain is not covered.

1.3.14 Avoidance and Minimization Measures

All RGP-covered activities as listed above, are also Habitat Plan-covered activities. The Habitat Plan requires the incorporation of conditions on covered activities to avoid and minimize potential impacts on covered species. These conditions include a number of avoidance and minimization measures (AMMs) that address potential impacts to listed species such as: in-stream work windows, water diversion or dewatering, fish relocation, culvert design, bank stabilization, and erosion and turbidity. These AMMs are also required for RGP-covered activities.

Proposed AMMs related to steelhead and steelhead streams are presented in the project's BA on Tables 2-1, 2-2, and 2-3, and in Appendix B. These AMMs are also presented in Appendix A of this opinion. Table 1 of this opinion presents required AMMs by RGP activity type.

1.3.15 Compensatory Mitigation

The conservation strategy within the Habitat Plan (ICF 2012) provides mitigation for direct, indirect, temporary, and permanent impacts on other non-listed species and a suite of natural communities, including wetlands and other waters. This conservation strategy contributes to species recovery through the protection (preservation), restoration, and management (enhancement) of natural communities and species habitat. The three components of compensatory mitigation as defined in the Corps' 2008 Final Rule (CFR 332.3(a)(2)) are:

- Land acquisition (preservation)
- Restoration and creation (establishment)
- Management (enhancement), monitoring, and adaptive management

Land acquisition and restoration and creation requirements from the Habitat Plan and the RGP, as related to streams and riparian vegetation, are summarized in Table 2. To meet these mitigation requirements, the Habitat Plan requires fees to be paid for impacts on wetlands, waters, and riparian land cover types (ICF 2012) Over the first several years of Habitat Plan implementation, the Habitat Agency has observed that these fees serve as incentive for avoiding impacts to wetlands and waters (ICF 2012).

The Habitat Agency is pursuing the establishment of an In-Lieu Fee (ILF) program that will work in conjunction with the RGP and the existing Habitat Plan mitigation program, including the current Habitat Plan aquatic resources mitigation fees collected by the Habitat Agency (ICF 2012).

Table 1. Minimum Required Avoidance and Minimization Measures for Each Project Action (see Appendix A of this opinion for description of Avoidance and Minimization Measures)

	Avoidance and Minimization Measure*																			
	A-15	A-25	A-47	A-56	A-109	F-0	F-1	F-2	F-3	F-4	F-5	F-6	F-7	F-8	F-9	F-10	F-11	F-12	RGP-2	HP-110
RGP A-1	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	
RGP A-2	x	x	x	x		x	x	x	x		x	x	x	x	x	x			x	
RGP A-3	x	x		x		x		x	x		x	x	x	x	x	x				
RGP A-4	x	x		x		x			x			x	x	x	x	x				
RGP A-5	x	x		x	x	x						x	x	x	x	x				x
RGP A-6	x	x		x		x						x	x	x	x	x				
RGP A-7	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x		x	
RGP A-8	x	x		x	x	x	x	x	x		x	x	x	x	x	x				
RGP A-9	x	x		x		x	x	x	x		x	x	x	x	x	x		x	x	
RGP A-10	x	x		x	x	x			x		x	x	x	x	x	x		x		
RGP A-11	x	x		x		x	x	x	x		x	x	x	x	x	x			x	
RGP A-12	x	x		x		x						x	x	x	x	x				
RGP A-13	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x			x	

* "A" AMMs are Habitat Plan AMMs (included in Appendix A) as modified for this programmatic consultation.
"F" AMMs are new AMMs developed for this programmatic consultation.
"RGP" AMMs are Habitat Plan AMMs (included in Appendix A) as modified for the RGP.
"HP" AMMs are Habitat Plan AMMs (included in Appendix A).

Table 2. Summary of Habitat Plan Mitigation Ratios and Estimated Preservation, Restoration, and Creation Requirements.

Aquatic Land Cover Type (acres)	Total in Study Area	Estimated Permanent Impact (acres)	Estimated Temporary Impact (acres)	Preservation Requirements[a]			Restoration and Creation Requirements					Minimum Preservation and Total Restoration/ Creation if All Impacts Occur	Overall Preservation and Restoration/ Creation to Impacts Ratio
				Preservation Ratio[b]	Preservation to Mitigate Impacts (acres)	Minimum Preservation Regardless of Impacts (acres)	Mitigation Ratio[b,c]		Restoration/ Creation to Mitigate Impacts (acres)	Restoration/ Creation to Contribute to Recovery (acres)	Total Restoration/ Creation if All Impacts Occur (acres)		
							Restoration	Creation					
Riparian Forest and Scrub													
Willow riparian forest and scrub/ Mixed riparian forest and woodland	6,310	289	204	2:1	578	250	1:1		289	50	339	917	3.2:1
Central California sycamore alluvial woodland	373	7	6	2:1	14	40	2:1		14		14	54	7.7:1
Aquatic													
Riverine (miles)	2,392	9.4	48.0	3:1	28.2	100.0	1:1		9.4	1.0	10.4	110.4	11.7:1

[a] All preserved lands will be managed for the benefit of covered species as described in the Habitat Plan Chapter 5.
[b] Preservation and restoration/creation ratios are applied to permanent impacts only.
[c] Restoration and creation requirements are in addition to preservation requirements.

1.3.16 Implementation

The Habitat Agency and the Corps propose the following implementation procedures for ensuring actions conducted under the RGP fully comply with all required AMMs and other measures:

1. **Pre-Project Planning.** The Habitat Agency will work with NMFS prior to the design-phase of individual projects as necessary, to ensure that projects are designed and constructed in a way that avoids and minimizes effects to listed species and their critical habitat to the maximum extent practicable.

2. **Habitat Agency Review.** For each project proposed to be covered under this Program, the Habitat Agency will review the project to determine whether it meets all required criteria and is therefore appropriately considered to be part of the Program.

3. **Electronic Notification.** Once the Habitat Agency determines that a project satisfies the necessary criteria, the Habitat Agency will submit a project package to NMFS for review at least 30 days prior to the start of construction. The project package should be submitted electronically to the San Francisco Bay Branch Chief (gary.stern@noaa.gov) and Central Coast Branch Chief (mandy.ingham@noaa.gov) at NMFS' Santa Rosa office and the Corps project manager will be copied.

    a. The project package must include the following items:
        i. Detailed project description
        ii. Design plans that are at least 60 percent complete
        iii. Confirmation that mitigation for listed salmonid impacts have been identified and fees paid to the Habitat Agency
    b. All new and replacement in-channel structures must meet NMFS' fish passage criteria for salmonid streams (i.e. bridges, culverts, fish screens).

4. **Reporting**. The Habitat Agency or their applicant will submit the following reports to the NMFS Santa Rosa Office:

    a. **Project Construction Report.** The project applicant will submit a Project Construction Report by January 15 of the year immediately following construction. The project applicant will submit the Project Construction Report to NMFS, Corps, and to the Habitat Agency. The report must include the dates construction began and was completed; a discussion of any unanticipated effects or unanticipated levels of effects on steelhead; a description of any and all measures taken to minimize those unanticipated effects; the number of steelhead killed or injured; and photos taken before, during, and after the activity from the same reference points.

    b. **Fish Relocation Report**. The project applicant will submit a Fish Relocation Report by January 15 of the year immediately following construction. The project applicant will submit the Fish Relocation Report to NMFS, Corps, and to the

Habitat Agency. The report must include the date and time of the relocation effort(s); a description of the location from which fish were removed and the release site, including photographs; a description of the equipment and the methods used to collect, hold, and transport salmonids; the number of fish relocated by species; the number of fish injured or killed by species and a brief narrative of the circumstances surrounding steelhead injuries or mortalities; and a description of any problems which may have arisen during the relocation activities and a statement as to whether or not the activities had any unforeseen effects.

c. **Site Restorati**on. The project applicant will submit a Site Restoration Report by January 15 of the year immediately following completion of the site restoration associated with project-specific impacts. The project applicant will submit the Site Restoration Report to NMFS, Corps, and to the Habitat Agency.

d. **Annual Program Report**. The Habitat Agency will describe efforts to carry out the Santa Clara Valley Habitat Plan RGP in the RGP Annual Report. The annual report will include an assessment of overall Program activity, a map showing the location of each action authorized under the Program, a summary of the extent of take indicators, and any other data or analyses the Habitat Agency deems necessary or helpful to assess the habitat trends as a result of the actions authorized under the Program.

e. **Annual Coordination Meeting**. The Habitat Agency will convene an annual coordination meeting with NMFS by June 1 each year to discuss the annual reports and any actions that can improve conservation or make the Program more efficient or accountable.

We considered, under the ESA, whether or not the proposed action would cause any other activities and determined that it would cause the following activities. The construction of new utility lines (RGP Activity A-13) and construction, expansion, modification, or improvement of linear transportation projects (e.g., bridges, roads, highways, pedestrian bridges, bike paths; RGP Activity A-1) would result in other activities reasonably certain to occur, such as construction of new subdivisions or other urban development. We considered the effects of such activities below in the effects section (Section 2.5) of this opinion.

2. ENDANGERED SPECIES ACT: BIOLOGICAL OPINION AND INCIDENTAL TAKE STATEMENT

The ESA establishes a national program for conserving threatened and endangered species of fish, wildlife, plants, and the habitat upon which they depend. As required by section 7(a)(2) of the ESA, each Federal agency must ensure that its actions are not likely to jeopardize the continued existence of endangered or threatened species, or adversely modify or destroy their designated critical habitat. Per the requirements of the ESA, Federal action agencies consult with NMFS and section 7(b)(3) requires that, at the conclusion of consultation, NMFS provides an opinion stating how the agency's actions would affect listed species and their critical habitats. If

incidental take is reasonably certain to occur, section 7(b)(4) requires NMFS to provide an ITS that specifies the impact of any incidental taking and includes 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 the sDPS of North American green sturgeon or its critical habitat. Our concurrence with the Corps' determination is documented in the "Not Likely to Adversely Affect" Determinations section (Section 2.12) of this opinion.

2.1 Analytical Approach

This 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 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 designations of critical habitat for CCC 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 part 424) 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 opinion, we use the term PBF to mean PCE or essential feature, as appropriate for the specific critical habitat.

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 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.

To conduct the assessment, NMFS examined an extensive amount of information from a variety of sources. Detailed background information on the biology and status of listed species and critical habitat has been published in a number of documents including peer reviewed scientific journals, primary reference materials, and governmental and non-governmental reports. Additional information regarding the effects of the project's actions on the listed species in question, their anticipated response to these actions, and the environmental effects of the actions as a whole was formulated from the aforementioned resources and the BA (ICF 2022) for this project. For information that has been taken directly from published, citable documents, those citations have been referenced in the text and listed at the end of this document.

The issues NMFS is obliged to address in this opinion are wide-ranging, complex, and often not directly referenced in scientific literature. We base many of our conclusions on explicit assumptions informed by the available evidence. By this, we mean to make a reasonable effort to compile the best scientific and commercial empirical evidence related to the analysis and to then apply general and specific information on salmonid biology from the published literature to make inferences and establish our conclusions. In some cases, we have used the results of recent project specific studies or analyses conducted in the action area. In other situations, only more general local data are available on species presence or absence, and habitat condition. Where necessary, we have used this information and combined it with more general information from the scientific literature to infer salmonid response to the proposed action. In several instances, we make reasonable inferences that rely mainly on information in the scientific literature, because local data are not available.

The Corps has the authority to renew the RGP 18 every 5 years indefinitely. This opinion includes an analysis of potential long-term effects to listed species and critical habitat as a result of implementing the proposed action. Therefore, as long as no criteria for reinitiation (as detailed in Section 2.10) are triggered, the analysis in this opinion anticipates subsequent permit renewals by the Corps.

2.2 Rangewide Status of the Species and Critical Habitat

This opinion examines the status of federally-listed species that are likely to be adversely affected by the proposed action. The status is determined by the level of extinction risk faced by CCC and S-CCC steelhead, based on parameters considered in documents such as recovery plans, status reviews, and listing decisions. This informs the description of the likelihood of both survival and recovery of CCC and S-CCC steelhead. The species status section informs the description of the species' current "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.

NMFS assesses four population viability[1] parameters to discern the status of the listed DPS and to assess each species ability to survive and recover. These population viability parameters are: abundance, population growth rate, spatial structure, and diversity (McElhany *et al.* 2000). While there is insufficient data to evaluate these population viability parameters quantitatively, NMFS has used existing information to determine the general condition of the populations in the CCC and S-CCC steelhead DPSs and the factors responsible for the current status of these listed species.

We use these population viability parameters as surrogates for "reproduction, numbers, and distribution" in the regulatory definition of "jeopardize the continued existence of" (50 CFR 402.02). For example, abundance, population growth rate, and distribution are surrogates for numbers, reproduction, and distribution, respectively. The fourth parameter, diversity, is related to all three regulatory criteria. Numbers, reproduction, and distribution are all affected when genetic or life history variability is lost or constrained, resulting in reduced population resilience to environmental variation at local or landscape-level scales.

This opinion analyzes the effects of the proposed action on the following listed species' DPS and designated critical habitat:

Central California Coast steelhead
Threatened (71 FR 834, January 5, 2006)
Critical Habitat Designation (70 FR 52488, September 2, 2005);

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

While historical and present data on abundance are limited, CCC and S-CCC steelhead numbers are substantially reduced from historical levels. Survey efforts mentioned in the following sections have been inconsistent and conducted sporadically in limited areas. Though these efforts are useful for confirming the continued presence of steelhead in these watersheds, the data are insufficient to determine population status or trends since the previous viability assessment. Therefore, estimates for individual populations within the CCC and S-CCC steelhead DPS have not been produced.

2.2.1 CCC Steelhead Status

The CCC steelhead DPS includes all naturally spawned steelhead from the Russian River in Sonoma County to Aptos Creek in Santa Cruz County as well as the drainages of San Francisco, Suisun, and San Pablo Bays eastward to Chipps Island at the confluence of the Sacramento and

[1] NMFS defines a viable salmonid population as "an independent population of any Pacific salmonid (genus *Oncorhynchus*) that has a negligible risk of extinction due to threats from demographic variation, local environmental variation, and genetic diversity changes over a 100- year time frame" (McElhany *et al*. 2000).

San Joaquin Rivers. Historically, approximately 70 populations[2] of steelhead existed in the CCC steelhead DPS (Spence *et al.* 2008, Spence *et al.* 2012). About 37 of these were considered independent, or potentially independent (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).

2.2.1.1 *North Coastal and Interior Strata*

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). Though still below historic levels, the trend of adult returns to the Warm Springs and Coyote Valley fish facilities on the Russian River has improved since the 1980s and '90s. Redd surveys intended to produce basin-wide estimates of steelhead in the Russian River started in 2018. From 2018-2020, estimates averaged 1,503 redds (range 873–2031). Hatchery returns from the Russian River suggest the vast majority of returning fish are of hatchery origin. Thus, potential introgression between hatchery and wild fish is a significant concern. A Hatchery and Genetic Management Plan for the Russian River Steelhead Program is currently in development that seeks to incorporate natural-origin fish into the hatchery broodstock and reduce the percentage of hatchery-origin fish on natural spawning grounds.

Spawner surveys have been conducted in the Lagunitas Creek watershed since 2002 where redd counts have averaged approximately 147 (range 23–321), well below the recovery target of 1,900 adults. Redd surveys for two dependent populations are regularly conducted by the National Park Service where redd counts have averaged 9 (range 0–47) over 22 years of record for Redwood Creek and 11 (range 0–33) over 18 years for Pine Gulch.

2.2.1.2 *Coastal San Francisco Bay Stratum*

Population-level estimates of adult abundance are not available for any of the six independent or two dependent populations within this stratum identified as essential or supporting in the Federal recovery plan (NMFS 2016). In the Guadalupe River, juvenile surveys have been conducted since 2015, which have documented the occurrence of juvenile *O. mykiss* in the mainstem and several tributaries. Since 2018, a Vaki Riverwatcher System camera has been seasonally operated every year at the Alamitos fish ladder on the Guadalupe River to detect migrating salmonids. During the period between February and May, several large *O. mykiss* were detected in 2018, no adults were detected during the 2018-2019 season, three were observed in 2019-2020 and one was detected in 2020-2021 (SCVWD 2019, 2020, 2021).

Spawner surveys have been conducted in San Mateo Creek downstream of Lower Crystal Springs Reservoir each year since 2015, with the exception of 2017 when streamflows were too high to conduct surveys. Redd counts have ranged from 6 to 31; however, no live fish or

[2] Population as defined by Bjorkstedt *et al.* 2005 and McElhaney *et al.* 2000 as, in brief summary, a group of fish of the same species that spawns in a particular locality at a particular season and does not interbreed substantially with fish from any other group. Such fish groups may include more than one stream.

carcasses have been observed that would confirm the presence of anadromous *O. mykiss*. Outmigrant traps operated during the same periods have documented fish classified as "smolts" and "partial smolts"; thus, it appears that the expression of anadromy persists.

Juvenile surveys have also been conducted in Stevens Creek from 2013 to 2020 by Smith (2020), and by the Santa Clara Valley Water District (SCVWD) from 2018 through 2021 (SCVWD 2022). These surveys have documented the continued presence of juvenile *O. mykiss* in the creek. No spawning surveys have been conducted during the winter/spring in Stevens Creek since 2013; thus, there is no recent direct evidence of anadromous adults returning to this watershed.

2.2.1.3 *Interior San Francisco Bay Stratum*

Population-level estimates of adult abundance are also lacking for all nine independent populations and three dependent populations of steelhead in the Interior San Francisco Bay Stratum. Spawner surveys primarily targeting Chinook salmon (but occasionally steelhead) have been conducted in recent years in selected portions of the Napa River watershed and its tributaries. These efforts have produced occasional observations of steelhead redds, live fish, or carcasses. A rotary screw trap operated near the upper limit of tidal influence has resulted in capture of 31 to 242 steelhead smolts annually since 2009. Likewise, limited spawner surveys in selected tributaries of the Petaluma River produced observations of small numbers of live steelhead, carcasses, and redds in Adobe and Lichau Creeks during 2015, 2016, and 2019.

In Pinole Creek, new fish passage structures were installed in fall of 2016 at Interstate 80, approximately 1.5 mile upstream of the creek's mouth, to improve access to the upper watershed by steelhead and other anadromous fishes. Spawning surveys conducted between 2017 and 2020 resulted in redd counts ranging from 7 to 24. Although no adult steelhead or carcasses were observed and the majority of redds were small in size and thus presumed to have been made by resident *O. mykiss*, from 1 to 5 redds were classified each year as likely having been produced by anadromous fish based on redd characteristics. Summer snorkel surveys conducted in Suisun Creek documented occurrence of *O. mykiss* in 2017; however, when revisited in 2018, most of the sites were dry or devoid of fish. In the Alameda Creek, resident *O. mykiss* continue to persist in the upper watershed. However, a 12-foot concrete drop structure known as the BART weir located approximately 10.5 miles upstream of the creek mouth has blocked passage by anadromous fish since its construction in the 1970s. Adult steelhead continue to be observed periodically at the base of the weir, and fish have occasionally been moved upstream of the barrier. A new fish ladder at the BART weir was completed in April 2022, and will allow access to more than 20 miles of spawning and rearing habitat in upper Alameda Creek.

In Coyote Creek, surveys have been conducted at sites up to 5.5 miles downstream of Anderson Dam in summer or fall each year since 2014. These surveys documented low numbers of young-of-the-year and juvenile *O. mykiss*. Smith (2021) reported no *O. mykiss* captures in his sampling from 2015 through 2018. The SCVWD reported low numbers of *O. mykiss* during surveys and fish relocation events from 2018 through 2021 (SCVWD 2019a, 2020a, 2021a) A Vaki camera was also installed in Coyote Creek at the Coyote Percolation Dam fish ladder in 2019 to monitor adult salmonids, but no adult steelhead were detected in 2019, 2020, or 2021 (SCVWD 2020b;

2021b; 2021c). Collectively, surveys in the Interior San Francisco Bay Stratum have been useful in both confirming the continued presence of *O. mykiss* and supporting management actions in the Pinole, Suisun, Alameda, and Coyote creek watersheds.

2.2.1.4 *Santa Cruz Mountain Stratum*

Evaluating abundance or changes in status of both independent and dependent populations within the Santa Cruz Mountain diversity stratum remains extremely challenging due to the uncertainty associated with methods for assigning redds to species. The Scott Creek lifecycle monitoring station provides the only longer-term (> 10 years) data for this stratum. Over the 16 years of record, an average of 205 steelhead (range 59–547) have returned to this watershed, which is approximately 29 percent of the recovery target (NMFS 2016). Adult steelhead estimates for Pescadero Creek ranged from 132-1407 fish from 2012-2015 and dropped to 17-51 fish from 2019-2021. In the larger San Lorenzo River, adult estimates produced for 2012 to 2015 range from 188–777and from 2019-2021 redd counts have ranged from 18–51.

More limited data are also available for several other smaller independent populations within this stratum. For San Gregorio Creek, population estimates for 2014 and 2015 were 144 and 159, respectively, though redd counts from the last 3 years have been 8 or less. Population estimates in Waddell Creek for 2012 to 2014 ranged from 34 to 89. During the 2017 and 2018 seasons, redd counts were 0 and 1, respectively. For Soquel Creek, surveys over r seasons have produced only a single redd observation. For Aptos Creek, surveys over 3 years have produced redd counts ranging from 5–22. A total escapement estimate of 70 was produced for 2013 with the highest redd count. Pilarcitos Creek was monitored in two years (2012 and 2013); 7 redds were observed in 2012 but none were seen in 2013.

Data are also available for three dependent populations in this stratum. Gazos Creek has been surveyed over 7 years. Between 2012 and 2015, population estimates ranged from 5 to 104 fish. Population estimates are not available for the last three seasons, but redd counts have ranged from 2 to 8. San Vicente Creek has likewise been monitored over 7 years. Population estimates over the first 4 years of surveys ranged from 0 to 120. Population estimates are not available for the last 3 years, but redd counts have varied from 0 to 14. San Pedro Creek was surveyed in the first 2 years of the program; no redds were observed in 2012 and 12 were counted in 2013. Surveys in this watershed have not been conducted since.

2.2.1.5 *Viability Assessment*

The scarcity of information on steelhead abundance in the CCC steelhead DPS continues to make it difficult to assess whether conditions have changed appreciably since the previous assessment (Spence 2016). Population-level estimates of abundance do not exist for any populations in the Interior and Coastal San Francisco Bay strata, thus, their viability remains highly uncertain. It remains likely that many Interior and Coastal San Francisco Bay populations where historical habitat is now inaccessible due to dams and other passage barriers are at high risk of extinction, as noted in prior viability assessments (Spence *et al*. 2008; Williams *et al*. 2011, 2016). In summary, while data availability for this DPS remains generally poor, the new

information for CCC steelhead available since the previous viability assessment indicates that overall extinction risk is moderate and has not changed appreciably.

2.2.1.6 *Recovery Plan*

A final recovery plan for CCC steelhead was completed by NMFS in October 2016 (NMFS 2016). The plan describes key threats, actions needed to achieve recovery, and measurable criteria by which NMFS will determine when recovery has been reached. All threats identified at the time of listing continue to impair CCC steelhead and their habitats, and several threats (urbanization, habitat blockages, water diversions, water management, instream habitat problems, and certain agriculture [illegal marijuana cultivation operations]), pose particularly severe threats to the DPS. Recovery plan actions are primarily designed to restore ecological processes that support healthy steelhead populations, and address the various activities that harm these processes and threaten the species' survival. The recovery plan calls for a range of actions including the restoration of floodplains and channel structure, restoring riparian conditions, improving streamflows, restoring fish passage, protecting and restoring estuarine habitat, among other actions.

2.2.2 S-CCC Steelhead Status

Recent analyses conducted by NMFS (Williams *et al*. 2016) indicate the S-CCC steelhead DPS consists of 12 discrete sub-populations which represent localized groups of interbreeding, anadromous individuals, inhabiting coastal streams from the Pajaro River at Monterey Bay south to, Arroyo Grande in San Luis Obispo Bay in Santa Barbara County. Freshwater-resident (non-anadromous) *O. mykiss*, commonly known as rainbow trout with which they interbreed (Pearse *et al*. 2019), also occur in most of these coastal streams and appear to be members of the same Evolutionarily Significant Unit (ESU) as the originally listed steelhead (Clemento *et al.* 2009). In most populations, adult rainbow trout outnumber adult steelhead by large margins and are not considered part of the ESA-protected DPS (71 FR 834).

The DPS was divided by Boughton *et al.* (2007) into four Biogeographic Population Groups (BPGs):

- The Interior Coast Range BPG consisting of populations in the Pajaro and Salinas rivers (comprised of three subpopulations);
- The Carmel BPG consisting solely of the Carmel River population;
- The Big Sur Coast BPG consisting of 11 coastal populations between the Carmel River and the Monterey/San Luis Obispo County Line; and
- The San Luis Obispo Terrace BPG consisting of 15 coastal populations in San Luis Obispo County.

Populations of S-CCC steelhead throughout the DPS have exhibited a long-term negative trend since the mid-1960s. In the mid-1960s, total spawning populations were estimated at 17,750 individuals (Good *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. Current S-CCC steelhead run-sizes in the five largest systems

in the DPS (Pajaro River, Salinas River, Carmel River, Little Sur River, and Big Sur River) are likely greatly reduced from 4,750 adults in 1965 (CDFW 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.

2.2.2.1 *Interior Coast Range*

This group consists of the Pajaro River population and three populations in the Salinas River basin: the Gabilan Creek, Arroyo Seco, and southern Salinas populations. The combined run of the three populations in the Salinas has been monitored intermittently since 2011; unfortunately, no data have been reported since 2017 (CDFW 2020) and the time series is too short to estimate a trend. Run sizes here have been extremely small, always less than 50 fish per year and sometimes zero. Fish densities during the low-flow season were collected at 6 to 10 sites per year in lower Pajaro tributaries by Beck *et al*. (2019). The average density dipped below 0.3 fish/m^2 for 5 years during drought, but had recovered above this threshold as of 2019; the average density for the most recent 4 years was still below the threshold at 0.232 fish/m^2. In 2019, Upper Pajaro tributaries were monitored by Casagrande (2020), where densities showed a statistically significant downward trend.

2.2.2.2 *Carmel River*

The relatively large run of wild steelhead in the Carmel River historically reached the thousands, but had declined to zero during the California drought of 1986–1992 due to extensive river dewatering and a lack of sandbar opening at the mouth of the river. During this period, the anadromous component was sustained by a captive saltwater rearing program (Thomas 1996).

The abundance of anadromous adults has been monitored for several decades in the Carmel River at fish-passage facilities at the former San Clemente Dam (through 2015) and the existing Los Padres Dam. These county stations only capture fish returning to the upper third of the watershed and therefore are not counts of all adult returns to the watershed. During the 2012-2016 drought, the number of anadromous adults counted at Los Padres again declined to zero for three consecutive years (2014-2016), but has slowly improved since, despite the return of exceptional drought conditions in 2020, 2021, and 2022. The mean count at Los Padres Dam over the past 4 years (n=74) is slightly below the 1988-2022 running average of 84 fish.

Juvenile steelhead densities on the mainstem Carmel have also been monitored for over 20 years at 8-12 index sites distributed between Los Padres Dam and the lower valley. Overall, since 1990, the abundance of juvenile steelhead captured in the mainstem also shows a downward trend, with only 2 of the last 10 years (2010-2019) having average densities greater than the long-term mean (0.7 fish per foot).

2.2.2.3 Big Sur Coast

Abundance of anadromous adults has been reported intermittently for the Big Sur River since 2012 (CDFW 2020), but the series is too short to estimate a trend. The average run size of the most recent 4 years of data was 42 fish, although these data were not considered to be full population estimates by CDFW (2020). The criterion for representation and redundancy specifies

four core monitoring populations in Big Sur Coast BPG, suggesting that three additional populations should be established and monitored for adult abundance.

Fish density has been reported for the steelhead population in Big Creek over the past 15 years by T. Williams and D. Rundio (pers comm). Densities here have been relatively stable, staying above 0.3 fish/m^2 except for 3 years at the end of the drought. Even so, this pattern created a statistically significant downward trend, averaging 4 percent per year. The average density for the most recent 4 years captured the end-of-drought nadir at 0.258 fish/m^2.

2.2.2.4 San Luis Obispo Terrace

No data series have been reported by CDFW (2020) for this BPG, which has a viability criterion of five core monitoring populations with viable numbers of adult steelhead.

2.2.2.5 Viability Assessment

Life-history diversity is a critical component to the resilience of salmon populations (Schindler *et al.* 2010). Many steelhead populations along the West Coast of the U.S. co-occur with non-anadromous (resident) rainbow trout, and new research has improved our understanding of the genetic architecture of the populations exhibiting both resident and anadromous forms (Pearse *et al.* 2014, Pearse *et al.* 2019). There may be situations where reproductive contributions from non-anadromous *O. mykiss* may mitigate short-term extinction risk for some steelhead DPSs (Good *et al*. 2005; 70 FR 67130).

The new information on genetic architecture of the steelhead life history indicates that the risk of its loss is not as great as was assumed in the original viability criteria; at the same time, it demonstrates the need for populations with at least periods when the frequency of anadromous individuals is high. The recent drought has made such individuals quite rare, and the only indication that their frequency might have been high in recent decades is the relatively large number of anadromous steelhead observed in Carmel River in the late 1990s—early 2000s. Data on current adult abundances and low-flow fish densities indicate that the recent and ongoing drought had very large negative impacts on the DPS. Unfortunately, the risk of permanently losing the anadromous phenotype over the longer term is still high and possibly increasing.

The viability criterion for abundance for the Southern California Recovery Domain was augmented by an additional criterion for anadromous fraction, defined as the proportion of reproducing adults that exhibit the anadromous life history (Boughton *et al*. 2022). In addition to new genetic work exploring anadromy in *O. mykiss*, other genetic research such as genome-wide association studies have shown that run timing and associated traits are strongly connected to variation in a small portion of a single chromosome (Prince *et al*. 2017; Thompson *et al.* 2019; Thompson *et al*. 2020). Populations with early run timing that are otherwise clearly differentiated across the genome appear to be closely related. It is unclear the extent to which these single loci control other life-history traits characteristics or how this genetic information should be used to conserve specific life histories (Waples and Lindley 2018). These new genomic results warrant future consideration and may have conservation implications.

Additional synthesis work is needed to develop new risk-based viability criteria to replace the precautionary criteria originally developed by Boughton *et al*. (2007).

Although steelhead are present in most streams in the S-CCC DPS, their populations are small, fragmented, unstable, and vulnerable 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). NMFS (2016) chose to maintain the threatened status of the S-CCC steelhead DPS (76 FR 76386, 81 FR 33468).

2.2.2.6 Recovery Plan

A final recovery plan for S-CCC steelhead was completed by NMFS in December 2013 (NMFS 2013). The plan describes key threats, actions needed to achieve recovery, and measurable criteria by which NMFS will determine when recovery has been reached. Key threats include: water development, flood control programs, forestry practices, agricultural activities, mining, and urbanization that have degraded, simplified, and fragmented aquatic and riparian habitats. Actions are primarily designed to restore ecological processes that support healthy steelhead populations, and address the various activities that harm these processes and threaten the species' survival. The recovery plan calls for a range of actions including the restoration of floodplains and channel structure, restoring riparian conditions, improving streamflow, restoring fish passage, protecting and restoring estuarine habitat, among other actions.

2.2.3 Status of Critical Habitat

In designating critical habitat, NMFS considers the following requirements of the species: 1) space for individual and population growth and for normal behavior; 2) food, water, air, light, minerals, or other nutritional or physiological requirements; 3) cover or shelter; 4) sites for spawning, reproduction, and rearing offspring ; and 5) habitats that are protected from disturbance or are representative of the historic geographical and ecological distributions of the species (50 CFR 424.12(b)). In addition to these factors, NMFS also focuses on PBFs (formerly termed PCEs and/or essential habitat types) within the designated area that are essential to the conservation or protection (81 FR 7214).

PBFs for CCC and S-CCC steelhead and critical habitat 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, andundercut banks;
- freshwater migration corridors free of obstruction and excessive predation with water

quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival.

PBFs for CCC and S-CCC steelhead critical habitat within estuarine areas include: areas free of obstruction and excess predation with: water quality, water quantity, and salinity conditions supporting juvenile and adult physiological transitions between fresh- and saltwater; natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels; and juvenile and adult forage, including aquatic invertebrates and fishes, supporting growth and maturation.

The coastal drainages used by the CCC and S-CCC steelhead DPS provide relatively higher amounts of the freshwater rearing PBFs, maintain connectivity, and result in a wider distribution of the species in these drainages than in inland drainages. Inland drainages provide important freshwater migration corridors, freshwater spawning, and freshwater rearing PBFs unique within the inland ecotype. However, most areas of critical habitat in both coastal and inland drainages have been degraded compared to conditions that once supported thriving populations of steelhead.

The condition of CCC and S-CCC steelhead critical habitat, specifically its ability to provide for conservation, has been degraded from conditions known to support viable salmonid populations. NMFS has determined that currently depressed population conditions are, in part, the result of the following human-induced factors affecting critical habitat: logging, agriculture, mining, urbanization, stream channelization and bank stabilization, dams, wetland loss, and water withdrawals (including unscreened diversions for irrigation). Habitat 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/quantity, lost riparian vegetation, and increased sediment delivery into streams from upland erosion (Busby *et al*. 1996; 70 FR 52488). Widespread water diversions in rivers and streams, as well as the pumping of groundwater hydraulically connected to streamflow, has dramatically altered the natural hydrologic cycle in many of the streams within the CCC and S-CCC steelhead DPSs, which can delay or preclude migration and dewater aquatic habitat.

Based on NMFS familiarity with the landscapes in which these critical habitats occur, these impacts continue to persist today. Widespread water diversions in rivers and streams, as well as the pumping of groundwater hydraulically connected to streamflow, has dramatically altered the natural hydrologic cycle in many of the streams within the CCC and S-CCC steelhead DPSs which can delay or preclude migration and dewater aquatic habitat. Stream channelization, commonly caused by streambank hardening and stabilization, represents a very high threat to instream and floodplain habitat throughout much of the designated critical habitat for these species, as detailed within CCC steelhead, and S-CCC steelhead recovery plans (NMFS 2016, and 2013, respectively). Streambank stabilization confines stream channels and precludes natural channel movement, resulting in increased streambed incision, reduced habitat volume and complexity.

2.2.4 Additional Threats to Listed Species and Critical Habitat

2.2.4.1 Global Climate Change

Another factor affecting the range wide status of CCC steelhead, S-CCC steelhead, and aquatic habitat at large is climate change. Recent work by the NMFS Science Centers ranked the relative vulnerability of west-coast salmon and steelhead to climate change. In California, listed coho and Chinook salmon are generally at greater risk (high to very high risk) than listed steelhead (moderate to high risk) (Crozier *et al* 2019).

Impacts from global climate change are already occurring in California. For example, average annual air temperatures, heat extremes, and sea level increased in California over the last century (Kadir *et al.* 2013). Snowmelt from the Sierra Nevada has declined (Kadir *et al.* 2013). Although CCC steelhead and S-CCC steelhead are not dependent on snowmelt driven streams, they have likely already experienced some detrimental impacts from climate change through lower and more variable stream flows, warmer stream temperatures, and changes in ocean conditions. California experienced well below average precipitation during the 2012-2016 drought, as well as record high surface air temperatures in 2014 and 2015, and record low snowpack in 2015 (Williams *et al.* 2016). Paleoclimate reconstructions suggest the 2012-2016 drought was the most extreme in the past 500 to 1000 years (Williams *et al*. 2016, Williams *et al.* 2020, Williams *et al.* 2022). Anomalously high surface temperatures substantially amplified annual water deficits during 2012-2016. California entered another period of drought in 2020. These drought periods are now likely part of a larger drought event (Williams *et al.* 2022). This recent long-term drought, as well as the increased incidence and magnitude of wildfires in California, have likely been exacerbated by climate change (Williams *et al*. 2020, Williams *et al*. 2022, Diffenbaugh *et al*. 2015, Williams *et al*. 2019).

The threat to CCC steelhead and S-CCC steelhead from global climate change is expected to 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 and the magnitude and frequency of dry years may increase (Lindley *et al*. 2007; Schneider 2007; Moser *et al*. 2012). Similarly, wildfires are expected to increase in frequency and magnitude (Westerling *et al*. 2011; Moser *et al.* 2012). Increases in wide year-to-year variation in precipitation amounts (droughts and floods) are projected to occur (Swain *et al.* 2018). Estuarine productivity is likely to change based on changes in freshwater flows, nutrient cycling, and sediment amounts (Scavia *et al*. 2002; Ruggiero *et al*. 2010).

In marine environments, ecosystems and habitats important to juvenile and adult salmonids are likely to experience changes in temperatures, circulation, water chemistry, and food supplies (Brewer and Barry 2008; Feely 2004; Osgood 2008; Turley 2008; Abdul-Aziz *et al*. 2011; Doney *et al*. 2012). Some of these changes, including an increased incidence of marine heat waves, are likely already occurring, and are expected to increase (Frolicher *et al*. 2018). In fall

2014, and again in 2019, a marine heatwave, known as "The Blob"[3], formed throughout the northeast Pacific Ocean, which greatly affected water temperature and upwelling from the Bering Sea off Alaska, south to the coastline of Mexico. The marine waters in this region of the ocean are utilized by salmonids for foraging as they mature (Beamish 2018). Although the implications of these events on salmonid populations are not fully understood, they are having considerable adverse consequences to the productivity of these ecosystems and presumably contributing to poor marine survival of salmonids.

2.2.4.2 Water Quality

Recently published work has identified stormwater from roadways and streets as causing mortality of adult coho salmon in the wild (Scholz *et al*. 2011) and laboratory settings (McIntyre *et al*. 2018). Subsequent laboratory studies showed this morality also occurred in juvenile coho salmon (Chow *et al*. 2019) as well as juvenile steelhead and Chinook salmon (Brinkmann *et al.* 2022). These recent publications have identified a degradation product of tires (6PPD-quinone) as the causal factor in this mortality (Tian *et al*. 2022, Brinkmann *et al*. 2022, Tian *et al.* 2020; Peter *et al*. 2018). The parent compound (6PPD) is widely used by multiple tire manufacturers and the tire shreds/dust that produce the degradation product have been found to be ubiquitous where both rural and urban roadways drain into waterways (Feist *et al.* 2018, Sutton *et al.* 2019).

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 for RGP 18 includes: Coyote, Guadalupe, and San Tomas sub-watersheds that are part of the larger San Francisco watershed and drain into the southern terminus of San Francisco Bay; the Pajaro sub-watershed that is part of the Central Coast watershed and drains into Monterey Bay; and all of the Uvas, Llagas, and Pacheco sub-watersheds (Figure 2, Table 3). The entirety of the RGP 18 action area is within Santa Clara County with the exception of the wetted half of the Pajaro River on the boundary with San Benito County.

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).

[3] https://www.fisheries.noaa.gov/feature-story/new-marine-heatwave-emerges-west-coast-resembles-blob

Santa Clara County is one of the most populous counties in the state, with approximately 90 percent of the population residing in the heavily urbanized North Valley region. The South Valley includes the cities of Gilroy and Morgan Hill but otherwise remains largely rural. Low-density residential areas are scattered along the length of the valley and extend into the foothills of the Diablo and Santa Cruz Mountains. Other land uses within the permit area include agriculture, ranchland, and public parks. Table 3 lists all of salmonid streams in the action area.

The Coyote Creek watershed is the largest in Santa Clara County, covering 206,000 acres and constituting 40 percent of the permit area. The watershed is located entirely within the permit area, excepting the baylands. From the headwaters in the Diablo Range to Anderson Dam, Coyote Creek and its tributaries flow through steep canyons and narrow valleys. Below Anderson Dam, Coyote Creek flows along the relatively flat Santa Clara Valley floor through agricultural lands and heavily urbanized areas. Major tributaries to Coyote Creek below Anderson Dam are Fisher Creek, Upper Silver Creek, and Upper Penitencia Creek (and its tributary Arroyo Aguague). Anderson and Coyote reservoirs regulate flows in Coyote Creek and Cherry Flat reservoir partially regulates flows on Upper Penitencia Creek. All other Coyote Creek tributaries are dependent on groundwater, springs, and runoff to maintain flows. ESA-listed fish species under NMFS jurisdiction found in the action area within the Coyote Creek watershed are the CCC steelhead DPS.

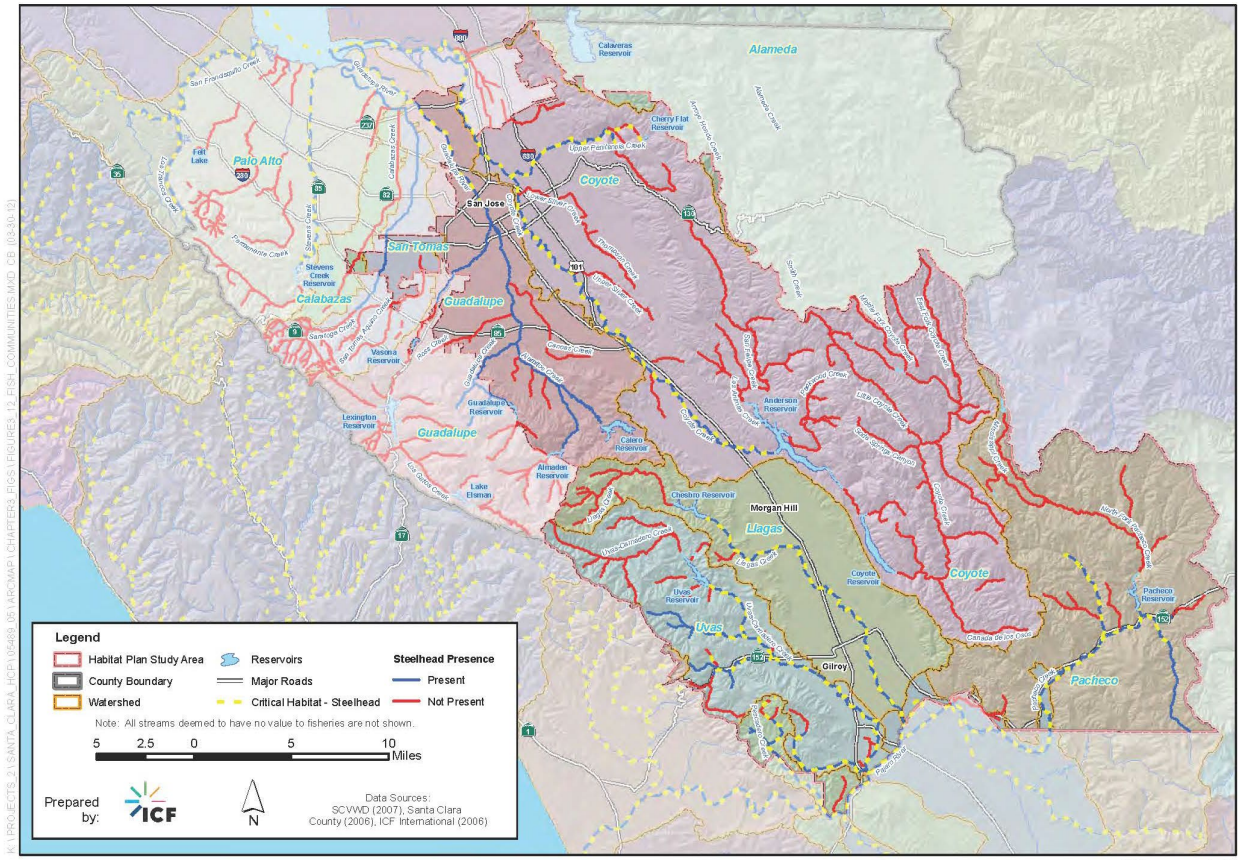

Figure 2. Designated critical habitat and steelhead presence found in watersheds within the Action Area (Source: ICF 2020).

Table 3. Anadromous salmonid streams within the Santa Clara Valley Habitat RGP Action Area.

Watershed	Steelhead DPS	Tributaries (and sub tributaries)
Coyote Creek	CCC	
		Upper Penitencia Creek
		(Arroyo Aguague)
Guadalupe River	CCC	
		Alamitos Creek
		Calero Creek
		Guadalupe Creek
		Los Gatos Creek
Pajaro River	S-CCC	
		Uvas Creek
		(Bodfish Creek)
		(Little Arthur Creek)
		(Tar Creek)
		Llagas Creek
		Pacheco Creek
		(South Fork Pacheco Creek)
		(Cedar Creek)
		Pescadero Creek

The Guadalupe River watershed is approximately 109,000 acres and 59,000 (54 percent) fall within the permit area. The headwaters in the Santa Cruz Mountains and the Baylands fall outside of the permit area boundary. The portions of the Guadalupe River and its tributaries included in the permit area primarily flow through the heavily urbanized areas of San Jose and surrounding cities. Major tributaries to the Guadalupe River include Alamitos, Calero, Guadalupe, and Los Gatos creeks. There are five reservoirs in the Guadalupe watershed. The Almaden, Calero, and Guadalupe reservoirs capture winter runoff and manage releases in summer to maintain perennial flows in the Guadalupe River. Releases from Lexington and Vasona reservoirs are used for groundwater recharge and maintaining perennial flows in Los Gatos Creek. Of these, only Lexington reservoir is not included within the permit area. ESA-listed fish species under NMFS jurisdiction found in the action area within the Guadalupe watershed are the CCC steelhead DPS.

The entirety of the upper Pajaro River watershed lying within Santa Clara County is included in the permit area and covers approximately 230,000 acres. This includes approximately 11.7 miles of the Pajaro River, all of the Llagas and Uvas sub-watersheds, and portions of the Pacheco Creek (and its tributaries, South Fork Pacheco and Cedar Creeks), and Pescadero Creek watersheds. Land use in the South Valley is primarily rural but portions of Llagas and Uvas Creeks (and its tributaries, Bodfish, Little Arthur, and Tar Creeks), flow through urbanized areas in Gilroy, Morgan Hill, and surrounding agricultural lands. There are three reservoirs in the Pajaro watershed included in the permit area. The Uvas and Chesbro reservoirs are operated by the SCVWD on Uvas and Llagas Creeks, respectively. Pacheco Reservoir is privately owned and operated by the Pacheco Pass Water District on North Fork Pacheco Creek. ESA-listed fish

species under NMFS jurisdiction found in the action area within the Pajaro watershed are S-CCC steelhead DPS.

2.4.1 Status of CCC and S-CCC Steelhead in the Action Area

2.4.1.1 *CCC Steelhead*

The action area includes portions of two CCC steelhead diversity strata, the Coastal and Interior San Francisco Bay strata. In the Coastal San Francisco Bay Diversity Stratum, the Guadalupe River is a functionally independent population (FIP) deemed essential for recovery. In the Interior San Francisco Bay Stratum, Coyote Creek is an FIP. FIPs are larger populations that are likely to persist over a 100-year time scale without migrants from neighboring populations. All other streams within the action area are considered dependent populations likely to go extinct within a 100-year period and reliant on immigration from FIPs. Populations within the action area are likely at high risk of extinction due to the majority of spawning and rearing habitat being blocked by impassable barriers and stream reaches below barriers largely constrained and flowing through urbanized areas.

Lack of data is a persistent limitation to estimating abundances of CCC steelhead populations in streams within the action area. Data presented in Table 4 below from the mainstem of Coyote Creek (and its tributary, Upper Penitencia), and the mainstem of the Guadalupe River represents the only streams/watersheds within the CCC DPS with population data in the action area. While steelhead have been captured in other streams and tributaries throughout the action area, population estimates are lacking and low numbers during sampling events suggests densities are very low. Therefore, we are using the available fish data as representative of fish numbers throughout the action area, as habitat conditions are similar.

Drought conditions from 2014 to early 2016 and the subsequent lack of connectivity significantly reduced opportunities for smolt outmigration as well as adult migration and spawning in Coyote Creek in those years (Smith 2021). Although young-of-year (YOY) and juvenile *O. mykiss* were captured at relatively high densities in Upper Penitencia Creek (a Coyote Creek tributary) during 2017, they could not be confirmed as steelhead and may have been resident rainbow trout that migrated downstream from Arroyo Aguague (Smith 2021a). Due to the degraded instream habitat conditions throughout much of the action area and the impacts of extended drought from 2014 to early 2016 (and another from 2020-present), steelhead densities are likely low in most streams and tributaries (Table 4).

The densities of CCC steelhead that may be encountered within the action area are dependent on location and timing. The highest densities reported from these steelhead surveys were in Upper Penitencia Creek, suggesting steelhead densities in these streams may reach as high as 77.1 fish per 100 feet of stream during favorable environmental conditions. However, this estimate was restricted to one site, downstream of the Arroyo Aguague confluence, in 2017. Density estimates from other years and sites in Upper Penitencia Creek are significantly lower with general trends near zero from 2007-2016, ticking slightly upward from 2017-2019, then crashing again in 2020-2021. Densities reported from other streams within the action area were more variable and substantially lower. For instance, reported observations in lower Coyote Creek suggest steelhead

Table 4. Densities of juvenile *O. mykiss* found within the CCC steelhead DPS during electrofishing surveys from 1997-2021 in the mainstem of Coyote Creek, Upper Penitencia Creek, and Guadalupe Creek.

Creek	Year	Site(s)	*O. mykiss* Density	Reference
Coyote	1999	14 in lower reach	0 to 0.4 per 100 ft.	Leidy *et al.* 2005
	2014	3	1.1 to 8.2 juveniles per 100 ft.	Smith 2021
	2015-2018	4	0	Smith 2021
	2019	5	0.2 to 0.6 fish per 100 ft.	Smith 2021
	2020	NA	0.3 fish per 100 ft.	Smith 2021
	2021	4	0.6 to 3.1 per 100 ft.	SCVWD 2021a
Upper Penitencia	1997	Between Dorel Road and Alum Rock Park	*O. mykiss* young-of-year and smolts observed	Leidy *et al*. 2005
	1997	Dorel Road site	*O. mykiss* juveniles observed	Leidy *et al*. 2005
	1997	Alum Rock Park	*O. mykiss* juveniles observed	Leidy *et al.* 2005
	2007 - 2019	Up to 13 (varied depending on year)	0 to 77.1 fish per 100 ft.	Smith 2021a
	2019	3	0 to 3.5 fish per 100 ft.	Smith 2021a
	2020	4	1.5 fish per 100 ft.	SCVWD 2022a
	2021	4	0	SCVWD 2022a
Guadalupe	1994	Below reservoir	17 to 50 fish per 100 ft.	Leidy *et al* 2005
	2000	Below dam	23 juveniles per 100 ft.	NMFS 2016 citing Li 2001
	2004-2009	NA	23 juveniles per 100 ft.	Nishijima 2006; Nishijima *et al*. 2009
	2014	6	1 to 8 fish per 100 ft.	Hobbs 2015
	2020	19	0 to 5.5 fish per 100 ft.	SCVWD 2021d

densities may be as low as 0 fish per 100 feet of stream, whiles survey data from the mainstem Guadalupe River reported steelhead densities ranging from 1 to 23 fish per 100 feet of stream.

2.4.1.2 *S-CCC Steelhead*

Urbanization in the Pajaro watershed is less severe than in the northern portion of Santa Clara County. However, the human population is increasing rapidly and much of the land is privately-owned. Uvas and Llagas Creeks, Pajaro River tributaries, flow through residential and agricultural land where water diversions, flood control structures, and runoff lead to impaired water quality and fish passage.

Data presented in Table 5 below from the mainstem of Llagas Creek, Uvas Creek (and its tributary, Bodfish Creek), and the mainstem of Pacheco Creek represent the only streams/watersheds within the S-CCC DPS with population data in the action area. While steelhead may have been captured in other streams and tributaries throughout the action area, population estimates are lacking and low numbers during sampling events suggests densities are

very low. Therefore, we are using the available fish data as representative of fish numbers throughout the action area, as habitat conditions are similar.

Sampling for the distribution and abundance of juvenile steelhead in the Uvas Creek watershed has been conducted annually since 2005 (Casagrande 2022). This has included sampling of multiple sites within the wetted extent of Uvas Creek mainstem and up to four sites in the Bodfish Creek tributary in late summer or fall. Over this period, juvenile *O. mykiss* densities have ranged between 0.4 and 20.7 fish per 100 feet in Uvas Creek, and between 0 and 35.6 fish per 100 feet in Bodfish Creek (Casagrande 2022; Table 5).

Monitoring of juvenile steelhead distribution and abundance in Llagas Creek has not been as consistent as Uvas Creek. The extent and duration of surface flow connectivity between Llagas Creek and the Pajaro River is much more limited than that of Uvas Creek, and as such, fish migration windows are more limited. For example, water releases from Chesbro Dam on Llagas Creek were not possible during the winters of 2013-2014 and 2014-2015 due to drought conditions. In general, the presence of *O. mykiss* in Llagas Creek downstream of Chesbro Reservoir is inconsistent, and when present, juvenile abundances are consistently low (Casagrande 2022).

As with Uvas and Llagas creeks, the extent, magnitude and duration of rearing habitat in Pacheco Creek are dependent largely on water releases from Pacheco Reservoir. Past water management regimes instituted by the Pacheco Pass Water District, and more recently restrictions by the Division of Safety of Dams, have caused the accessible reaches of Pacheco Creek to dry for extended periods. However, during the wet winter of 2016-17, access to Pacheco Creek by adult steelhead was greatly improved and higher dry season baseflows maintained some rearing habitat and a low abundance of juvenile *O. mykiss* at one of two sites sampled downstream of the dam (Table 5).

Table 5. Densities of *O. mykiss* found within the S-CCC steelhead DPS during electrofishing surveys from 2005-2021 in Llagas, Uvas, Bodfish (tributary to Uvas), and Pacheco Creeks.

Creek	Year	Site(s)	*O. mykiss* Density	Reference
Llagas	2005-2007 & 2010-2012	2 to 4	1.8 to 4.7 juveniles per 100 ft.	Casagrande 2011; 2012; 2013
	2017	1	0	Casagrande 2018
Uvas	2005-2021	3 to 8	0.4 to 20.7 juveniles per 100 ft.	Casagrande 2022
Bodfish	2005-2021	1 to 3	0 to 35.6 juveniles per 100 ft.	Casagrande 2022
Pacheco	2010	3	0	Casagrande 2011
	2017	2	0 to 4 juveniles per 100 ft.	Casagrande 2018

2.4.2 Status of Critical Habitat in the Action Area

Designated critical habitat for CCC steelhead within the action area includes portions of the Guadalupe and Coyote watersheds below passage barriers. In the Guadalupe watershed, critical

habitat is limited to the tidally-influenced reach of the mainstem Guadalupe River. In Coyote watershed critical habitat within the action area includes those portions of Coyote and Penitencia Creeks below passage barriers (Anderson and Cherry Flat Dams, respectively) as well as 1.3 miles of Arroyo Aguague upstream from the confluence with Penitencia Creek. The action area also includes the northernmost portion of the S-CCC steelhead BPG falling within Santa Clara County and includes 11.7 miles of designated critical habitat within the mainstem Pajaro River as well as the Uvas, Llagas, and Pacheco sub-watersheds. In Uvas and Llagas Creeks, critical habitat includes the entirety of reaches below Uvas and Chesbro Dams, respectively. In the Pacheco sub-watershed, critical habitat includes Pacheco Creek from permit area entry to 0.5 miles upstream of the confluence with the South Fork Pacheco; North Fork Pacheco Creek from the confluence with Pacheco Creek to below the Pacheco Reservoir; South Fork Pacheco Creek from the confluence with Pacheco Creek to approximately 1.8 miles upstream; Cedar Creek from its confluence with Pacheco Creek to approximately five miles upstream; and all accessible reaches of Pescadero, Tar, Bodfish, and Little Arthur creeks.

Habitat conditions throughout the action area are degraded for adult steelhead migration, spawning, and juvenile rearing. Dams on Coyote Creek, Guadalupe Creek, and their major tributaries block access to historic upstream spawning and rearing habitat and minor passage barriers are prevalent throughout the system. These barriers block migration, alter stream hydrology, and limit gravel transport, large wood recruitment, and invertebrate drift from upstream reaches. The downstream reaches that are accessible to steelhead are largely channelized and flow through urbanized areas. In the Guadalupe watershed, approximately 91 of 120 river miles (76 percent) are classified as modified or modified with ecological value (SCVWD 2013). Similarly, 38 percent of channels in the Coyote watershed and 25 percent in the Pajaro watershed are modified or modified with ecological value (SCVWD 2013). Habitat complexity, riparian vegetation, and canopy coverage are very limited in these reaches and urban runoff alters flow patterns and impairs water quality. Altogether this results in a lack of cover and flow refugia for rearing juveniles and likely reduces survival.

In Guadalupe watershed, perennial flows are maintained via water releases from Guadalupe, Almaden, Lexington, and Calero reservoirs during summer months. Despite regulated flows, impaired water quality from urban and agricultural runoff and historic mercury mining likely impairs steelhead survival in lower river reaches. In the Coyote watershed, perennial flows are maintained via water releases from Anderson Reservoir and water imported from San Luis Reservoir via the Central Valley Project's San Felipe Division. The current management regime results in high summer flows and low winter flows relative to the historic natural hydrograph. High summer flows through channelized downstream reaches likely exceed the temperature tolerance of juvenile rearing salmonids and high flows limit foraging opportunities by increasing the duration of flows at which these juveniles must seek velocity cover.

Additionally, warm-water inputs from instream groundwater recharge facilities, off-channel pond complexes, and discharge from Sacramento-San Joaquin Delta water importation lead to high stream temperatures and consequently, low juvenile survival, reduced smolt condition, and altered outmigration timing. These higher water temperatures negatively influence salmonid egg development, juvenile appetite and growth, alter migration cues, and can cause death when the temperatures are high enough.

Detailed data on habitat conditions is lacking for some Pajaro sub-watersheds. Within the Pajaro watershed, flow is regulated by water releases from the Uvas, Chesbro, and Pacheco Dams. Water releases have altered the timing, duration, and magnitude of flows and have limited invertebrate drift, gravel, and wood recruitment from upstream reaches. Habitat quality is generally higher in Uvas Creek with increasing distance downstream of Uvas Dam as turbidity, substrate quality, and invertebrate production improve. The Pajaro watershed has similar stresses and altered hydrology as the Coyote and Guadalupe watersheds discussed above. We can therefore infer that the Pajaro watershed is also degraded for adult steelhead migration, spawning, and juvenile rearing, with some relative differences among sub-watersheds as noted.

2.4.3 Climate Change in the Action Area

As described above in the Status of the Species and Critical Habitat section of this opinion (Section 2.2.4.1), climate change poses a threat to salmonid and sturgeon populations in central California. In the San Francisco Bay region, warm temperatures generally occur in July and August, but with climate change these events will likely begin in June and could continue through September (Cayan *et al*. 2012). Climate simulation models indicate the San Francisco region will maintain its Mediterranean climate regime for the 21st century; however, these models predict a high degree of variability in annual precipitation through at least 2050, leaving the region susceptible to drought (Cayan *et al*. 2012). These models of future precipitation suggest that, during the second half of the 21st century in this region, most years will be drier than the historical annual average (1950-1999). As noted above in Section 2.2.4.1, California is currently experincing drought conditions which have likely been exacerbated by climate change (Williams *et al*. 2020, Williams *et al*. 2022, Diffenbaugh *et al*. 2015, Williams *et al*. 2019).

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

Pursuant to Section 7 of the ESA, NMFS has completed 147 individual interagency consultations over the past 20 years that have affected the action area. The majority of these consultations (105 projects or 72 percent) were informal and resulted in NMFS' concurrence that the proposed project was not likely to adversely affect ESA-listed species or their designated critical habitat. Formal consultations (31 projects or 21 percent), where the proposed actions were likely to adversely affect ESA-listed fish species or their designated critical habitat, resulted in non-jeopardy, non-adverse modification opinions containing RPMs to minimize the impacts of incidental take of listed species. Formal and informal consultations covered a range of project types across the action area and are summarized in Table 6 below. The miscellaneous category includes projects that did not otherwise fit into a project category including, but not limited to, FEMA recurring actions, EPA water quality objectives, and riparian mitigation projects.

In addition to the consultations summarized above, NMFS also conducted programmatic consultations (10 programs or 7 percent) that cover activities in all or portions of the action area. There have been eight programmatic opinions, where the proposed suite of activities was likely to adversely affect ESA-listed fish species or critical habitat. These include the Caltrans Routine Maintenance, NOAA Restoration Center Fisheries Habitat Restoration, and Santa Clara Valley Stream Maintenance Programmatics. Two informal programmatic consultations resulted in

NMFS' concurrence that the proposed program was not likely to adversely affect ESA-listed fish species or critical habitat. These include the CDFW Fishing in the City Program and Santa Clara Valley Pipeline Maintenance Program.

NMFS Section 10(a)(1)(A) research and enhancement permits and section 4(d) limits or exceptions have occurred within the action area. United States Geological Survey was permitted to conduct fish surveys in Guadalupe River and Coyote Creek. The SCVWD holds a Section 10(a)(1)(A) research permit for steelhead collections in Stevens Creek, Guadalupe River, Coyote Creek, Uvas Creek, Llagas Creek, and the Pajaro River watersheds. Additional Section 10 permits for scientific research have likely been approved within the action area. Salmonid monitoring approved under these programs generally includes carcass surveys, smolt outmigration trapping, redd surveys, and juvenile steelhead electrofishing surveys. These activities are closely monitored and require measures to minimize take during research activities. NMFS determines these research projects are unlikely to affect future adult returns.

Table 6. Summary of previous informal and formal Section 7 consultations in the action area.

Consultation Type	Project Category	Completed Consultations
Informal	Bridge repair, removal, and widening	16
	Bank stabilization	13
	Water infrastructure maintenance, repair, and construction	12
	Road widening, maintenance, and safety improvements	11
	Recreational facility construction and maintenance	9
	Residential and commercial construction	9
	Rail and light rail development and repair	7
	Outfall construction, repair, and replacement	6
	Habitat restoration and enhancement	4
	Geotechnical exploration	4
	Flood control	3
	Sediment removal	2
	Invasive species control	2
	Miscellaneous	7
Formal	Bridge construction, repair, and replacement	8
	Flood control	6
	Habitat restoration and enhancement	4
	Bank stabilization	3
	Scientific research permits	2
	Water infrastructure maintenance and repair	2
	Rail development	1
	Road improvements	1
	Commercial development	1
	Miscellaneous	3
Programmatic	Stream Maintenance, Restoration, Fishing, Pipeline Maintenance, Miscellaneous	10
Total		**147**

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 (see 50 CFR 402.02). 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 the factors set forth in 50 CFR 402.17(a) and (b).

In this opinion, our approach to determine the effects of the action was based on the best available information, including a review of the ecological literature and other relevant materials. We used this information to gauge the likely effects of the proposed suite of projects using an exposure and response framework that focuses on the stressors (physical, chemical, or biological), caused by the proposed action (including stressors occurring later in time), to which CCC and S-CCC steelhead are likely to be exposed. Next, we evaluate the likely response of the above listed fish to these stressors in terms of changes to survival, growth, and reproduction, and changes to the ability of PBFs to support the value of critical habitat in the action area. Where data to quantitatively determine the effects of the proposed action on listed fish and their critical habitat were limited or not available, our assessment of effects focused mostly on qualitative identification of likely stressors and responses.

The total number of projects and special limits on activities are described in Section 1.3 of this opinion and listed in Table 7 below. These represent the maximum amount of such activities that may be authorized by RGP 18 and could occur within the action area. Based on the number and extent of projects conducted under RGP 18 since the permit was first issued in 2016, very few of these activities are expected to occur within or nearby streams containing CCC or S-CCC steelhead, or their designated critical habitat. From 2016 through 2022, only one project authorized under RGP 18 was conducted in or near a steelhead stream.

Although it is unlikely a large number of projects will occur in or near steelhead streams, for purposes of analyzing the potential effects of RGP 18, NMFS assumes that up to the maximum extent of the activities could occur within or near streams or waterbodies containing listed steelhead, their critical habitat, or both. While this will likely overestimate beneficial impacts, it will also likely overestimate adverse effects, because not all of these activities will occur in or near streams containing listed steelhead or critical habitat.

Table 7. Program and project limits for each of the 13 RGP activities.

RGP Activity	Project Type	Program Limit (Every 5 years)	Project Limit
A-1	Linear Transportation Projects	17.5 ac	0.5 ac; 300 linear ft
A-2	Culvert Repair, Replacement, Removal and Installation	11 ac	0.5 ac; 300 linear ft
A-3	Outfall Repair, Replacement, Removal and Installation	7.5 ac	0.25 ac; 100 linear ft
A-4	Sediment Removal	10 ac	0.25 ac; 300 linear ft; 500 cu yd
A-5	Removal of Vegetation and Storm Debris Involving Soil Disturbance	See AMM A-109 – 10 LWD removal projects	See AMM A-109
A-6	Temporary Construction Access and Dewatering	25 projects	0.1 ac; 400 linear ft; at least 2 mi between dewatering projects in salmon-bearing streams
A-7	Recreational Facility Construction, Reconstruction, and Maintenance	6.25 ac	0.25 ac; 200 linear ft
A-8	Restoration, Establishment, and Enhancement Activities Involving Soil Disturbance, Including Removal and Modification of Fish Passage Impediments	None	None
A-9	Installation of Fish Screens	2.5 ac	0.1 ac
A-10	Bank Stabilization	2.5 ac; 0.125 ac hardscape limits	0.1 ac; 300 linear ft; separated by at least 1,500 ft between bank stabilization projects
A-11	Minor Maintenance of Levees, Canals, and Ditches	4 ac	0.2 ac
A-12	Surveying Activities, Including Installation and Maintenance of Scientific Measurement Devices	0.8 ac	0.08 ac
A-13	Utility Repair, Removal, Replacement, and Installation	3 ac	0.2 ac

Implementation of the 13 categories of RGP-related activities detailed in the proposed project description (Section 1.3) that will build, repair, and maintain new and existing infrastructure in Santa Clara County, may adversely affect CCC and S-CCC steelhead and critical habitat throughout the action area. These effects usually result from dewatering of streams and relocation of fish, disruption of fluvial processes, vegetation removal, heavy equipment operation, exposure to toxic materials, and site restoration. The categories of actions proposed all have predictable effects regardless of where in the action area they are implemented. Therefore, NMFS expects CCC and S-CCC steelhead and their habitat may be exposed to the following stressors as a result of the proposed action:

- Dewatering, fish collection, and relocation;
- Construction noise and underwater sound;
- Impaired water quality;
- Loss of benthic habitat;
- Reduced riparian vegetation;
- Changes in stream form and function.

As noted above in section 1.3, we considered, under the ESA, whether or not the proposed action would cause any other activities and determined that it would cause the following activities. The construction of new utility lines (RGP Activity A-13) and construction, expansion, modification, improvement, or removal of linear transportation projects (e.g., bridges, roads, highways, pedestrian bridges, bike paths; RGP Activity A-1) would result in other activities reasonably certain to occur, such as construction of new subdivisions or other urban development. Such development would have stormwater runoff into streams used by listed steelhead or incur increased groundwater use which may decrease surface water available in salmonid streams.

According to the U.S. 2020 Census data, Santa Clara County has experienced a growth rate of approximately 0.8 percent, over 15 thousand individuals, annually since 2011. The SCVWD's 2021 Groundwater Management Plan includes an assessment of projected future water supplies and demands in Santa Clara County over the next 25 years (Gurdak and Cook, 2021). The countywide future water use is projected to increase slightly over time with population growth, but will be well within the range of historic use. Due to expected population increases and job growth, countywide demands are projected to increase from 306,000 acre-feet per year (AFY) in 2020 to approximately 345,000 AFY in 2045. Although projected 2045 demand is higher than present demand, this number is still down from a peak in the 1990s and 2000s because of significant conservation efforts from the SCVWD and the State. Groundwater demand is projected to drop between 2025 and 2030.

Water conservation and protecting groundwater resources is an important part of the SCVWD's supply planning as demonstrated by the following Board policies: 1) Water Supply Objective 2.1.1: Manage groundwater to ensure sustainable supplies and avoid land subsidence, and 2) Water Supply Objective 2.1.2: Aggressively protect groundwater from the threat of contamination. The Habitat Plan incorporates robust BMPs that will further avoid and minimize impacts to groundwater. The SCVWD is also considering investing in projects to help mitigate potential decrease of future supply due to climate change and new regulations. Although, population and urban growth will continue in Santa Clara County, growth rates are not predicted to be extraordinary. We therefore expect these growth rates combined with strong water conservation practices will assist in protecting groundwater resources such that the additional groundwater use expected will not result in more than minimal additional impacts to listed salmonids and their habitat in the action area.

2.5.1 Fish Collection, Relocation, and Dewatering

Temporarily dewatering stream reaches and capturing and relocating fish may be necessary during the implementation of some RGP activities described in Section 1.3.1. Whether or not an individual project requires dewatering (and therefore fish collection and relocation) depends on the location, timing, and type of proposed project. In instances where dewatering is necessary, streamflow will be diverted around the project site and fish will be captured and relocated to a stream reach outside of the work area.

Fish collection and relocation activities pose a risk of injury or mortality to rearing juvenile salmonids. Any fish collecting gear, whether passive (Hubert 1996) or active (Hayes *et al.* 1996)

has some associated risk to fish, including stress, disease transmission, injury, or death. The effects of seining and dip-netting on juvenile fish include stress, scale loss, physical damage, suffocation, and desiccation. Electrofishing can kill juvenile fish, and researchers have found serious sub-lethal effects including spinal injuries (Nielsen 1998, Nordwall 1999).

The primary contributing factors to stress and death from handling are differences in water temperatures (between the river and wherever the fish are held), dissolved oxygen conditions, the amount of time that fish are held out of the water, and physical trauma. Stress on salmonids increases rapidly from handling if the water temperature exceeds 18ºC (64ºF) or dissolved oxygen is below saturation. Fish that are transferred to holding tanks can experience trauma if care is not taken in the transfer process, and fish can experience stress and injury from overcrowding in holding facilities, if the tanks are not emptied on a regular basis. Although sites selected for relocating fish will likely have similar water temperature as the capture site and should have ample habitat, in some instances relocated fish may endure short-term stress from crowding at the relocation sites. Relocated fish may also have to compete with other native and non-native fishes for available resources such as food and habitat. Some of the fish at the relocation sites may move and reside in areas that have more suitable habitat and lower fish densities. As each fish moves, competition is expected to remain localized to a small area or quickly diminish as fish disperse. Capturing and handling all fish causes them stress, though they typically recover fairly rapidly from the process and therefore the overall effects of the procedure are generally short-lived.

Streamflow diversion and dewatering could harm individual rearing juvenile salmonids by concentrating or stranding them in residual wetted areas before they are relocated. Juvenile fish that avoid capture in the project work area will likely die during dewatering activities due to desiccation or thermal stress. These impacts are typically short duration, lasting a few hours at a time during active construction. Water withdrawal without an adequate fish screen can entrain juvenile fish, which typically injures or kills them.

Stress to juvenile steelhead caused by dewatering and handling is not likely to be sufficient to reduce their individual fitness or performance. Restricting the work window to June 15 through October 15 will largely limit the effects to stream rearing juveniles. Sites selected for relocation should have similar water temperatures as the capture sites, and should have adequate habitat to allow for survival of transported fish. NMFS cannot accurately estimate the number of fish that may be affected by competition, but does not expect this short-term stress to reduce the individual performance of juvenile steelhead, or cascade through watershed populations of these species based on the small areas to be affected and the relatively small number of steelhead to be relocated. The AMMs proposed for fish capture and release, use of pump-intake screens during the de-watering phase, and fish passage around the isolation area are based on standard NMFS guidance to reduce the adverse effects of these activities (NMFS 2011). Key conservation measures in the guidance such as avoiding work during times of high stream temperatures significantly reduces mortality that can occur during work area isolation. Use of properly sized screens during water withdrawal will reduce or nearly eliminate injury or death of fish caused by entrainment. A complete list of AMMs can be found in Appendix A.

Given the variable densities of steelhead throughout the permit area, the number of steelhead encountered and estimates of mortality will vary with project location, timing, and magnitude. Fish relocation activities will occur during the summer low-flow period after emigrating smolts have left the proposed project sites and before adult fish travel upstream in the winter. Therefore, steelhead that may be captured will be juveniles, generally young-of-the-year and one-year age classes. Since fish relocation activities will be conducted by qualified fisheries biologists following NMFS electrofishing guidelines (NMFS 2000), injury and mortality of juvenile salmonids during capture and relocation will be minimized. The guidelines provided by NMFS and applicable AMMs are expected to be effective at removing steelhead from work sites and therefore we anticipate that that less than one percent of steelhead in an area will remain in a project site following dewatering. Any fish that remain would likely die during dewatering. Data on fish relocation efforts between 2002 and 2009 show mortality rates from fish capture and relocation are approximately two percent for steelhead (Collins 2004; CDFW 2005, 2006, 2007, 2008, 2009, 2010). Therefore, unintentional mortality of juvenile steelhead expected from dewatering, capture, and handling procedures is not likely to exceed three percent.

2.5.2 Construction Noise and Underwater Sound

Some activities that may be authorized under the RGP have the potential to disturb fish, and may injure them within the action area through noise from construction equipment and elevated levels of underwater sound. Noise and movement associated with construction personnel and equipment can evoke an avoidance response in fish. These avoidance responses can drive fish into lower quality habitat where food resources may be limited or predation rates are higher (Knudsen *et al.* 1997). Prolonged periods of time spent in lower quality habitats can lead to reduced growth rates, fitness, and survival. The extent of disturbance or injury depends on the location, timing, and magnitude of the project as well as the construction methods utilized. The construction, expansion, modification, improvement, or removal of linear transportation projects (e.g., bridges, roads, highways, pedestrian bridges, bike paths) may require the installation of temporary or permanent piles in the stream channel. Pile driving with an impact hammer can produce high levels of underwater sound capable of injuring or killing fish (Hastings and Popper 2005; Nedwell *et al*. 2006). Injuries associated with exposure to high levels of underwater sound are collectively known as barotraumas and include the hemorrhaging of internal organs, including swim bladders and kidneys in fish. Dual metric criteria for evaluating potential injury to fish from pile driving was established by the Fisheries Hydroacoustic Working Group (FHWG 2008) and includes a threshold for peak pressure (206 dB) and cumulative sound exposure level (cSEL) (187 dB for fishes 2 grams or larger and 183 dB for fishes smaller than 2 grams). Injury or mortality may occur if either threshold is exceeded. There is uncertainty as to the behavioral response of fish to underwater sound produced when driving piles in or near water. However, NMFS believes a 150-dB root mean square pressure (RMS) threshold for behavioral responses, including startle and avoidance responses, changes in swimming behavior, and foraging disruptions for salmonids is appropriate.

The RGP's proposed AMMs for construction and maintenance activities occurring near streams will substantially reduce potential impacts to CCC and S-CCC steelhead. Conducting work when streams are dry would eliminate the potential for disturbance or injury to listed fish species from

construction disturbance and elevated levels of underwater sound during pile driving. If project sites on steelhead streams contain flowing water during the summer and fall months, restricting the in-water work window to June 15 through October 15 would limit impacts to juvenile life stages. The relocation of juvenile fish from work areas and installation of cofferdams are expected to avoid any exposure and adverse effects of elevated underwater sound during construction including pile driving. A complete list of AMMs can be found in Appendix A.

2.5.3 Impaired Water Quality

Construction in and near streams has the potential to cause turbidity and sedimentation, as well as the release of contaminants into aquatic habitat. Turbidity is the degree to which water loses its transparency due to the presence of suspended sediment. Some RGP 18 proposed activities have the potential to increase suspended sediment concentrations and turbidity in streams. It is anticipated that juvenile steelhead within the action area may be exposed to small, short-term, pulses of turbidity. These pulses may occur either: 1) when previously armored sediment in a dry channel is mobilized as the action area re-waters the following fall; or 2) immediately during construction activities that require dewatering.

Deposition of fine sediments can reduce incubation success (Bell 1991), interfere with primary and secondary productivity (Spence *et al.* 1996), and degrade cover for juvenile salmonids (Bjornn and Reiser 1991). Chronic, moderate turbidity can harm newly-emerged salmonid fry, juveniles, and even adults by causing physiological stress that reduces feeding and growth and increases basal metabolic requirements (Bjornn and Reiser1991, Servizi and Martens 1991, Spence *et al.* 1996). Sedimentation leads to increased substrate embeddedness and a reduction in the depth, volume, and frequency of pools. The overall effect of high levels of sediment input is a substantial reduction in the quality and extent of spawning gravels and deep-water refugia for adults and reduced survival of eggs and alevin (Meehan and Bjornn 1991). Sediment deposition can alter macroinvertebrate community composition and reduce the density, biomass, and diversity of aquatic invertebrates available to foraging juveniles. As visual predators, turbid conditions can reduce the foraging efficiency of salmonids thereby reducing growth rates if conditions continue for long periods (Shaw and Richardson 2001).

Water quality monitoring performed in Humboldt County at eleven newly replaced stream culverts provides information that is useful in assessing the relative magnitude of construction effects on in-stream water quality. During the first winter following construction activities, turbidity levels downstream of the eleven culverts increased an average of 19 percent when compared to measurements directly above the culvert (Humboldt County 2002, 2003 and 2004). Although the culvert monitoring results show decreasing sediment effects as projects age from year 1 to year 3, a more important consideration is that most measurements fell within levels that were likely to only cause slight behavioral changes [e.g., increased gill flaring (Berg and Northcote 1985), elevated cough frequency (Servizi and Marten 1992), and avoidance behavior (Sigler *et al*. 1984)]. A turbidity level greater than 5 nephelometric turbidity units (NTU) is considered visible and levels above 25 NTU have been shown to cause reductions in salmonid growth (Sigler *et al*. 1984). Turbidity levels necessary to impair feeding are likely in the 100-150 NTU range (Harvey and White 2008; Gregory and Northcote 2003). Only one of the eleven sites

in Humboldt County recorded levels exceeding 100 NTU (NF Anker Creek, year 1), whereas the majority (81 percent) of downstream readings was less than 20 NTU.

Downstream sediment effects from the proposed RGP activities are expected to extend downstream no further than a few hundred feet below project sites. Given the similar scope and disturbance effects of projects that may be authorized under RGP 18, NMFS anticipates turbidity effects will fall below thresholds that result in the injury or mortality of listed salmonids. Instead, the most likely result of turbidity levels will be minor behavioral responses by affected fish that are unlikely to appreciably reduce their fitness. RGP activities are proposed to occur during work windows that coincide with the lowest flows of the year. Conducting work during these times results in less mobilization of fine sediments, therefore NMFS expects that any exposure to temporary turbidity pulses will not result in a reduction in survival rates.

Construction operations in, over, and near surface waters have the potential to release debris, hydrocarbons, concrete, wood preservatives, fuels, and similar contaminants into streams. Spills, discharges, and leaks of these materials can enter streams directly or via runoff. If introduced into streams, these materials could impair water quality by altering the pH, reducing oxygen concentrations as the debris decompose, or by introducing toxic chemicals such as hydrocarbons or metals into aquatic habitat. Oils and similar substances from construction equipment can contain a wide variety of polynuclear hydrocarbons (PAHs) and metals. PAHs can be acutely toxic to salmonid fish and other aquatic organisms at high levels of exposure and can cause sublethal adverse effects to aquatic organisms at lower concentrations (Heintz *et al*. 1999; Incardona *et al*. 2005; Incardona *et al*. 2004; Incardona *et al*. 2006).

All freshwater life stages of steelhead within the action area may also be exposed to degraded water quality due to stormwater runoff from bridges, approach roadways, and impervious surfaces in urban areas. For this proposed action, we have also included consideration of stormwater runoff from other activities reasonably certain to occur, such as construction of new subdivisions or other urban development. Stormwater runoff to streams is a likely consequence of a project when activities include: 1) new impervious surfaces; 2) repairs or replacement of an existing impervious surface; 3) increases in existing impervious surface area; and 4) new or replacement discharge/outfall structures. As mentioned in Section 2.2.3, recent publications have identified a degradation product of tires (6PPD-quinone) as the causal factor in salmonid mortality at concentrations of less than a part per billion (Tian *et al*. 2022, Brinkmann *et al*. 2022, Tian *et al*. 2020; Peter *et al*. 2018).

Projects will apply AMMs to address spills appropriately and prevent the introduction of contaminants into Santa Clara County waters. Limiting the work window to the dry season from June 15 to October 15 will limit hazardous material exposure to juvenile steelhead and eliminate potential for contaminants to adversely affect more sensitive life stages. Proper storage, treatment, and disposal of construction materials and discharge management is expected to substantially reduce or eliminate contaminants entering streams from runoff. Due to these measures, conveyance of toxic chemicals into waters from projects implemented under the RGP will be minimized.

The Habitat Plan requires development projects implement measures designed to protect waterways and associated riparian vegetation in the action area from degradation due to urban runoff. Through development of stormwater management plans and complementary guidance manuals (Santa Clara Valley Urban Runoff Pollution Prevention Program 2006; City of Gilroy 2004; City of Morgan Hill 2004, 2008; Santa Clara Valley Water Resources Protection Collaborative 2006; Santa Clara Valley Water District 2008), The Habitat Agency has identified a set of programmatic avoidance and minimization measures, performance standards, and control measures to minimize increases of peak discharge of stormwater and to reduce pollutant levels in runoff entering waterways to protect water quality. The requirements include general, project design, construction, and post-construction avoidance and minimization measures. Appendix B of the BA includes avoidance and minimization measures for urban development that will reduce the volume and level of contaminants in stormwater discharge to waterways.

We cannot estimate the precise number of individual CCC and S-CCC steelhead that will experience adverse effects from exposure to construction materials, contaminants, or stormwater. We cannot predict the number or duration of stormwater runoff events, nor the number of individual fish that will be exposed during those events. Furthermore, not all exposed individuals will experience adverse effects. However, available information indicates that impaired water quality that would likely occur as a result of RGP activities will be limited to a few small, localized areas. Steelhead densities within watersheds in the action area are low. Design guidelines in the Habitat Plan require construction in urban and rural areas to manage runoff so that existing runoff conditions (i.e., rate of runoff) are maintained and to reduce pollutants entering local streams. Although it is not possible to estimate precisely how many, we expect that therefore only a very small proportion of listed steelhead (adults, smolts, eggs, alevins, juveniles) will experience harm (injury or mortality due to poor water quality) in these dispersed locations or across the broader action area due to urban development.

2.5.4 Loss of Benthic Habitat

Construction activities in the action area will result in both temporary and permanent effects to benthic habitat. Temporary losses and alteration will result from dewatering activities. Permanent losses of benthic habitat may result from bank stabilization projects, bridge, culvert, and utility projects that include construction of permanent in-channel structures.

Dewatering operations may affect steelhead by temporarily preventing juvenile steelhead from accessing the work area for forage. Benthic (bottom dwelling) aquatic macroinvertebrates are an important food source for rearing salmonids; they may be killed, or their abundance reduced when creek habitat is dewatered (Cushman 1985). However, effects to aquatic macroinvertebrates resulting from streamflow diversions and dewatering will be temporary because construction activities will be relatively short-lived. Rapid recolonization is expected following re-watering and typically occurs within one to two months (Cushman 1985, Thomas 1985, Harvey 1986). For this reason, we expect the function of benthic habitat will return to pre-project levels before adults and smolts use the action area for migration. The effect of macroinvertebrate loss on juvenile salmonids is likely to be negligible because food from upstream sources (via drift) would be available downstream of the dewatered areas via streamflow diverted around the project work sites. Thus, NMFS expects fish will be able to find

food and cover outside of project work sites as needed to maintain their fitness during construction activities.

Bank stabilization conducted under RGP 18 may result in permanent alteration of benthic and riparian habitats. Urban development along steelhead streams in the action area has constrained the lateral movement of channels and lead to incision, which ultimately results in erosion and bank instability that threatens structures along the top of bank. Projects utilizing riprap to stabilize banks and channelize streams create deep, homogenous channels with limited macroinvertebrate production and poor habitat quality for rearing and spawning salmonids (Sudduth and Meyer 2006; Hellmair *et al.* 2018). Within these reaches, juvenile salmonid habitat use is low and potential for predation by invasive smallmouth bass (*Micropterus dolomieu*) is high relative to other habitat types (Hellmair *et al*. 2018). Projects using bioengineered elements, such as root wads, large wood, boulders, and submerged vegetation, can increase the diversity and abundance of benthic macroinvertebrates available for forage as well as increase habitat heterogeneity for rearing salmonids (Sudduth and Meyer 2006; Hellmair *et al.* 2018). Although habitat use by rearing salmonids is consistently higher in unmodified streams, habitat use in modified reaches with bioengineered elements is consistently higher than in homogenous reaches of rock rip rap (Hellmair *et al*. 2018).

For RGP 18, bank stabilization projects will be limited to sites where existing structures and infrastructure are threatened, and may not exceed 2.5 acres over a 5-year period. Additionally, use of hardscape will be limited to 5 percent of the acreage limits for bank stabilization and bioengineered elements will be incorporated into project design. NMFS therefore expects the alteration of benthic habitat will be limited to the minimum amount necessary to protect infrastructure while helping to maintain and in some cases improving macroinvertebrate forage for rearing salmonids.

Projects that involve the construction of permanent in-channel structures such as bank stabilization, bridge installation, repair, or widening, will result in permanent loss or alteration of benthic habitat. This will result in the permanent reduction in benthic habitat available for macroinvertebrate production and salmonid foraging. It is not possible to estimate permanent losses or alteration to benthic habitat resulting from bridge installation, repair, and widening projects since the number of projects and site-specific plans are unknown. However, each transportation project, including bridges, would not affect an area larger than 0.5 acres and cannot exceed 300 linear feet of channel. The loss of benthic habitat associated with bridge-related projects is typically small, representing a fraction of project acreage. Given the annual and RGP term limits (0.5 acres, 300 linear feet) for bridge installation, repair, and widening projects, the extent of permanent losses to benthic habitat is expected to be small in the steelhead streams of the action area.

Temporary losses from dewatering activities for all RGP 18 activities, including bridge and transportation projects, will be limited to a maximum of 2,000 linear feet annually and 10,000 linear feet over the 5-year term of the RGP, per project limitations, with some exceptions for restoration projects. Once construction is complete, streamflow will be returned to the dewatered area and habitat functions will return, modified by any in-channel structures resulting from the construction work.

2.5.5 Reduced Riparian Vegetation and Removal of Instream Debris

RGP 18 activities may require removal of riparian vegetation to access work sites and stage equipment, or to maintain flood control channels Riparian vegetation helps maintain stream habitat conditions steelhead require. Riparian zones and aquatic vegetation serve important functions in stream ecosystems, such as providing shade (Poole and Berman 2001), sediment storage and filtering (Cooper *et al*. 1987, Mitsch and Gosselink 2000), nutrient inputs (Murphy and Meehan 1991), water quality improvements (Mitsch and Gosselink 2000), channel and streambank stability (Platts 1991), habitat heterogeneity (Bryant 1983, Lisle 1986, Shirvell 1990), and refugia (Bustard and Narver 1975, Wesche *et al.* 1987, Murphy and Meehan 1991). Riparian vegetation disturbance and removal can degrade these ecosystem functions and impair stream habitat. Riparian canopy is considered a primary driver of stream temperature (Poole and Berman 2001). Removal of riparian vegetation increases stream exposure to solar radiation, leading to increases in stream temperature.

Under this program, LWD, instream vegetation, or trash may be removed from flood control channels in order to restore hydraulic capacity. While the habitat benefits of LWD will be sought and retained as feasible, these benefits are evaluated in balance of the potential flooding or erosion effects, or threats to downstream infrastructure in flood control channels within the action area. LWD provides many beneficial habitat functions in streams. The reduced amount of LWD and instream and riparian vegetation leads to reduced amount of cover used by salmonids (Bisson *et al*. 1988; Bjornn and Reiser 1991) and increases potential for scour of stream bedload. According to Bisson and Bilby (1987), one of the most important functions of LWD in forming salmon habitat is the creation of rearing pools. The loss of complexity at these sites is likely to reduce cover from predators and velocity refuges from winter flows, and, over time, is expected to adversely affect winter and summer rearing habitat for steelhead.

At individual project sites, the effects of riparian disturbance and removal of LWD will likely be minor; however, the aggregate impacts on ecosystem function of multiple projects over 5 years and beyond is of greater concern. Applying AMMs to all stages of project planning is critically important to reducing these impacts. Limiting the construction site footprint, riparian disturbance, and vegetation and LWD removal to the minimum necessary to complete the work and retaining vegetation and LWD to the extent feasible will minimize both short- and long-term effects. In all streams with listed anadromous fish, woody material (including live leaning trees, dead trees, tree trunks, large limbs, and stumps) will be retained unless it is threatening a structure, or is causing excessive bank failure and increasing sediment loading to the stream. Reseeding and revegetating disturbed areas following construction outside of flood control channels will reduce impacts to largely short-term periods. Disturbed areas are expected to regain lost shading and ecosystem function within a few years following construction. Some projects, such as bank stabilization, bridge installation, widening, and repair, and flood control channel maintenance, may result in permanent losses of riparian habitat.

The extent of harm to listed adult and juvenile steelhead due to the removal of riparian vegetation or instream LWD cannot be estimated without site-specific projects plans, however, we do not expect a large number of projects to be implemented each year and permanent impacts

typically represent a small fraction of the area impacted for a given project. If removal is required, no more than two LWD removal projects may be conducted each year. The total number of projects and specific limits on activities are described in Section 1.3 of this opinion and listed in Table 7. These represent the maximum amount of such activities that may be authorized by RGP 18 and could occur within the action area. Based on the number and extent of projects conducted under RGP 18 since the permit was first issued in 2016, very few of these activities are expected to occur in the future within or nearby streams containing CCC or S-CCC steelhead, or their designated critical habitat. From 2016 through 2022, only one project authorized under RGP 18 was conducted in or near a steelhead stream. Therefore, NMFS anticipates a similar overall amount of instream vegetation removal in streams containing steelhead or their designated critical habitat. Therefore, only a very small number of rearing juvenile or adult steelhead are likely to be harmed by these activities.

2.5.6 Changes in Stream Form and Function

Sediment removal and bank stabilization activities authorized by RGP 18 will contribute to the long-term preclusion of natural fluvial and geomorphic processes. For example, minor maintenance of levees keeps levees functional and extends their life into the future. In most low gradient streams, the channel will naturally "meander", eroding laterally to dissipate its hydraulic energy while creating a sinuous longitudinal course. Stream meandering efficiently regulates the erosive forces by lengthening the channel and reducing stream gradient, thus controlling the ability of the stream to entrain and transport available sediment. Meandering streams also create and maintain both the hydraulic and physical components of instream habitat used by fish and other aquatic species. For instance, specific to salmon and steelhead, a meandering, unconstrained stream channel sorts and deposits gravel and other substrate necessary for optimal food production and spawning success, maintains a healthy and diverse riparian corridor that supplies LWD to the channel, and inundates adjacent floodplain habitat during appropriate winter/spring flows (Spence *et al.* 1996).

Sediment, including gravel and cobble, plays a critical role in the physical and biological health of an anadromous salmonid stream. Sediment size is important in determining channel form and changes in sediment size distribution may induce channel changes (Kondolf 1997). Coarse sediment (*i.e.,* gravel and cobble) has a tremendous ecological importance as habitat for benthic macroinvertebrates and as spawning habitat for salmonids. Gravel and cobble create interstitial spaces in the streambed which serve as cover and velocity refugia for small fish. Low sediment storage within incised channels may increase stream temperatures, if the subsurface flow path beneath the streambed is too short. The loss of sediment can reduce or eliminate hyporheic exchange, and the mixing between groundwater and surface water may be too short to significantly affect temperature (Beechie *et al.* 2012). In these and additional ways, sediment influences the physical habitat features and fish productivity of a stream.

Transport of sediment through a watershed and along the length of a stream is continuous, but within the action area dams have disrupted the longitudinal continuity of the river systems' bedload movement. Upstream of the dams, coarse bedload materials are conveyed to and deposited in reservoirs while all, or part, of the suspended load is also deposited in the reservoir.

Water released from the dam possess more energy to move sediment, but has a reduced sediment load available to transport. This flow is sometimes referred to as sediment-starved (hungry water) and prone to erode the channel bed and banks, produce channel incision (downcutting), and loss of spawning gravels for salmonids (Kondolf 1997).

The anticipated effects of gravel removal projects conducted under RGP 18 are expected to vary due to the location within the watershed, site-specific habitat conditions, type of substrate expected to be removed, and quantity of sediment to be removed. Sediment removal to improve flow conveyance at bridges, culverts and at other manmade structures is expected to be the most common activity authorized by RGP 18 and habitat conditions at these sites is typically degraded due to existing infrastructure. Benthic invertebrates, which are prey for salmonids, will be temporarily lost by removal of their substrate, but rapid re-colonization is expected from undisturbed areas adjacent to work sites. There is very little quality spawning habitat within the action area, but there is the potential for small amounts of spawning gravel to be removed during sediment removal activities. Each sediment removal project cannot exceed 500 cubic yards of material and 300 linear feet of channel (0.25 acres). Thus, it is expected that sediment removal activities will be relatively small in scale and effects localized. Sediment in stream channels is dynamic and the loss of coarse material at most sites will likely be replaced with new material within one to two years. Based on the small scale and temporary nature of these effects, we do not anticipate disruption of food resources or removal of spawning gravels that would harm juvenile or adult steelhead. Other food resources will be nearby or available via drift from upstream. Most spawning takes place outside of the action area. Steelhead are anticipated to seek these better spawning areas without reductions in spawning.

Projects involving bank stabilization will result in permanent alteration of channel morphology and hydrology. Bank stabilization impacts the physical habitat in two general ways: 1) by changing a dynamic, unrestrained stream that constantly evolves via hydrologic and geomorphic processes into a fixed, simplified channel; and 2) by altering the physical land/water interface (i.e. streambank) that provides shelter, food, and other ecosystem benefits to aquatic species, including juvenile salmonids.

Bridges and culverts constrict the channel and increase flow velocity, causing scour and bank degradation downstream. Constricting a natural channel puts a stream into a state of disequilibrium; scour and bank degradation will increase downstream until the system reaches a new state of equilibrium (Henderson 1986; Simon and Johnson 1999). Where channel width is reduced, water velocity will increase and cause corresponding increases in shear stress and degradation along stream banks (Simon and Johnson 1999). Over time, this mechanism widens the stream channel to accommodate the new flow regime, if left unchecked. More typically, this process is halted by stabilizing stream banks with rock or organic materials, thereby preventing bank degradation.

RGP 18 proposes to incorporate bio-engineering features that utilize natural material (e.g., use of engineered back filled soils, erosion control fabric, and live native plantings) to craft a streambank that will resist lateral erosion while providing complex rearing, feeding and sheltering habitat. Also, bank stabilization projects carried out under the proposed action will be limited to 0.1 acres in area and not exceed 300 linear feet of channel for individual projects.

Cumulatively, bank stabilization projects would not exceed 2.5 acres over 10 years. RGP 18 would only authorize bank stabilization at sites that protect critical infrastructure or property, or streambanks that have previously been stabilized, suggesting that work sites will largely occur in urban areas where streambank habitat is currently degraded following decades of urban encroachment and stream channelization. Replacing this poor habitat with bio-engineered stabilization and riparian planting may improve existing habitat at project sites, improving salmonid growth and survival.

While the bio-engineered bank stabilization projects carried out under the proposed action will minimize the extent of habitat degraded, the perpetual nature of most bank stabilization structures will likely manifest as a continued depression in juvenile steelhead carrying capacity at the reach level. We expect juvenile fish will be able to successfully rear in these areas after construction of bio-engineered bank structures, albeit at depressed levels of abundance. NMFS expects there will be the ongoing impact on habitat function and carrying capacity caused by extending channelization into the foreseeable future, and some loss of juvenile steelhead will result from the continued depression of juvenile carrying capacity at the site level. However, the amount of loss is anticipated to be very low due to the RGP's specific limits and primarily occur in existing urbanized reaches within the action area.

The proposed limitations and AMMs included in RGP 18 are intended to limit the above impacts to the extent possible. New bridges on alluvial channel would be wide enough to span the active channel width and include a stream meander belt. Thus, these new bridges will be designed to minimize scour and provide for some lateral movement of the channel. Similarly, culvert projects will be designed to follow the natural stream grade, eliminate plunge pools, and will be sized for the 100-year storm event. Bank stabilization projects will incorporate bioengineered elements in an effort to dissipate flow and create complex habitat. Hard materials used in bank stabilization projects will be limited to 5 percent of the bank stabilization RGP term limit (or, 0.125 acres). Additional AMMs require consideration of project impacts upstream and downstream of the project site in an effort to eliminate the potential for these impacts to spread and further modify critical habitat. A complete list of AMMs can be found in Appendix A of this opinion.

2.5.7 Fish Passage and Habitat Restoration Actions

As mentioned in Section 1.3, the conservation strategy within the Habitat Plan provides mitigation for direct, indirect, temporary, and permanent impacts on other non-listed species and a suite of natural communities, including wetlands and other waters. This conservation strategy contributes to species recovery through: 1) land acquisition; 2) restoration; and 3) management, monitoring, and adaptive management. Land acquisition and restoration and creation requirements from the Habitat Plan and the RGP, as related to streams and riparian vegetation, are summarized in Table 2 of this opinion.

Actions under *RGP A-8 Restoration, Establishment, and Enhancement Activities Involving Soil Disturbance, Including Removal and Modification of Fish Passage Impediments,* include several beneficial activities including: the removal of accumulated sediments that may inhibit fish passage; the removal of small water control structures, dikes, and berms, the enhancement,

restoration, or establishment of riffle and pool stream structure; the placement of in-stream habitat structures; restoring stream and wetland hydrology; removing invasive vegetation, and reestablishing riparian and submerge aquatic vegetation with native plant species. Stream restoration activities include: geomorphic enhancement (i.e., physical re-configuration of channels); installation of structures to enhance channel and habitat complexity, based on CDFW and NMFS guidelines for salmonid habitat enhancement; riparian planting; removal of invasive vegetation; creating and expanding existing floodplain habitats and side channel habitats; and gravel augmentation to enhance spawning habitat.

Habitat improvement projects implemented consistently with the proposed action are expected to have long-term beneficial effects to CCC and S-CCC steelhead and critical habitat, thereby improving chances of species' recovery. Installation of stream restoration, establishment, or enhancement features improve the quantity and quality of available spawning and rearing habitat for listed fish species. Barrier removal or modification improves conditions that support upstream and downstream passage of listed fish species and reestablishes or improves access to upstream spawning and rearing habitat. Planting of native riparian, aquatic, and wetland vegetation reestablish or improve in-stream habitat values through stabilization of stream banks and upland areas, increased cover, and increased stream shading. These beneficial effects may improve both juvenile and adult steelhead abundance, productivity, and spatial structure. Habitat improvement projects carried out in critical habitat will improve the conservation value of the PBFs at the project site scale.

Fish passage impairments are prevalent throughout steelhead streams in Santa Clara County. Over 100 sites have been identified as total or partial barriers to fish passage and many more sites require assessment (PSMFC 2018). Total barriers include structures that prevent the movement of migrating adults and/or emigrating smolts and include weirs, drop structures, dams, and elevated culverts. Partial barriers include structures that impede movement under certain flow conditions and include elevated culverts, weirs, water diversions, low-flow vehicle crossings, poorly designed and poorly maintained fish ladders, and grade control structures. Projects authorized by RGP 18 must include fish passage improvements if the project site has existing passage impediments. No projects will be authorized that maintain or create new fish passage impediments within steelhead streams in the action area. Accordingly, RGP 18 projects have the potential to improve fish passage and habitat access for adult, smolt, and juvenile CCC and S-CCC steelhead in the action area.

2.5.7.1 Beneficial Effects due to the Implementation of Compensatory Mitigation

The purpose of the Habitat Plan is to protect and enhance ecological diversity and function in the greater portion of Santa Clara County, while allowing appropriate and compatible growth and development in accordance with applicable laws. The Habitat Plan provides a framework for promoting the protection and recovery of natural resources, including endangered species, while streamlining the permitting process for planned development, infrastructure, and maintenance activities. These activities (i.e., covered activities) include urban and rural growth and a variety of road, water, and other needed infrastructure construction and maintenance activities. The Habitat Plan also describes the responsibilities associated with operating and maintaining the

new habitat reserves that will be created to mitigate anticipated impacts resulting from growth and development activities.

The approach to stream and riparian woodland land cover protection and enhancement combines elements of land acquisition, restoration, and water management. The land acquisition strategy focuses on stream protection primarily in areas where large stands of riparian woodland are present, such as along Pacheco Creek, San Felipe Creek, and upper Uvas Creek. This focus has the dual benefit of protecting streams and riparian woodland habitats. Stream and riparian protection will also occur through the development review process when projects are proposed adjacent to streams. Through the stream and riparian setbacks condition (Condition 11), applicants will be required to set aside stream frontage to protect stream and riparian functions. In some cases, high-value stream setback areas will be incorporated into a Reserve System to increase opportunities for riparian and stream restoration, and provide greater consistency in management and monitoring of these areas. This Reserve System will protect substantial areas of high-quality habitat for listed species and will provide extensive new opportunities for habitat enhancement, restoration, and creation. To ensure a minimum level of protection of wetlands and other aquatic land cover types and ensure contribution to recovery for listed species, at least 250 acres of riparian forest and scrub, 40 acres of central California sycamore alluvial woodland, 10 acres of coast and valley freshwater marsh (perennial wetland), 5 acres of seasonal wetland, 50 acres of ponds, and 100 miles of streams will be acquired and put in conservation into perpetuity. Though this Reserve System and compensatory mitigation program was set up as part of the Habitat Plan which covers listed species regulated by the US Fish and Wildlife Service, the preservation of 100 miles of streams will also directly benefit listed salmonids under NMFS' jurisdiction. This benefit isn't precisely quantifiable at this point in time since exact locations of the acquisitions are unknown and not all stream miles may include those harboring salmonids or containing critical habitat.

2.6 Cumulative Effects

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

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 the environmental baseline (Section 2.4).

Potential non-Federal actions affecting the action area in the future could include State angling regulation changes, voluntary or State sponsored upslope habitat restoration activities, discharge of stormwater and agricultural runoff, and continued development, including building of private roads, wells, and land use change. Urban development, including rural residential and

agricultural development is likely to continue throughout Santa Clara County. NMFS assumes the rate of such development would be similar to that observed in the last decade. New regulations and increased awareness of the effects of urban and agricultural development associated with adoption of the Santa Clara Valley Habitat Conservation Plan are expected to reduce the magnitude of effects on streams and water quality with steelhead and their critical habitat in the future.

2.7 Integration and Synthesis

The Integration and Synthesis section is the final step in our assessment of the risk posed to species and critical habitat as a result of implementing the proposed action. In this section, we add the effects of the action (Section 2.5) to the environmental baseline (Section 2.4) and the cumulative effects (Section 2.6), taking into account the status of the species and critical habitat (Section 2.2), to formulate the agency's 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 action area covers portions of the Coastal and Interior San Francisco Bay CCC steelhead diversity strata. Within these strata, and the action area, the Guadalupe River and Coyote Creek are considered functionally independent populations deemed essential to recovery of CCC steelhead (NMFS 2016). The action area also includes a portion of the Pajaro River watershed, which is part of the Interior Coast Range S-CCC steelhead BPG. This is the largest BPG in the S-CCC DPS. The Pajaro River population of S-CCC steelhead is considered a Core 1 population, meaning it is considered essential to the recovery of the S-CCC steelhead DPS (NMFS 2013).

Steelhead populations within these rivers are severely depressed compared to historic conditions. Abundance data within the CCC and S-CCC steelhead DPSs are historically scarce but existing data shows small populations subsist within the action area. This depressed condition is due to dams, water diversions, mining operations, groundwater extraction, urban and agricultural runoff, urban and agricultural development, and invasive species. Drought conditions from 2012 to present likely exacerbated these impacts by increasing water temperatures and stream-drying, limiting habitat connectivity. This likely decreased juvenile steelhead survival and more recent survey data suggests populations within the action area are at an all-time low. Despite the impaired habitat conditions, suitable spawning habitat still exists in the upstream portions of tributaries to both the Guadalupe and Coyote watersheds and streams lower in the watershed maintain their function as migratory corridors. Additionally, operation of the dam at Pacheco Reservoir has historically resulted in extensive drying of Pacheco Creek thereby precluding juvenile rearing. However, recent shifts in water management now provide perennial flows in Pacheco Creek provide increased habitat connectivity and rearing juvenile S-CCC steelhead appear to be reestablishing populations in limited stream reaches below the dam.

Covered activities may result in the following adverse effects to CCC and S-CCC steelhead and/or their habitat: (a) injury and mortality, fish collection, relocation, and dewatering; (b) permanent loss of benthic habitat; (c) pollution from hazardous materials and contaminants; (d) removal of riparian vegetation or LWD; and (e) altered channel morphology and hydrology. We

expect the impacts due to groundwater depletion, stormwater runoff, and urbanization to be minimized and ameliorated with the implementation of AMMs. Altered channel morphology and hydrology caused by RGP activities such as bridges, culverts, and bank stabilization will continue to simplify habitat conditions which in turn will result in small losses of individuals over time due to fitness consequences and degrade PBFs of critical habitat. NMFS expects that low numbers of juvenile CCC or S-CCC steelhead may be present at some project locations during project construction and few, if any, may be injured or killed by dewatering, capture, and relocation. Anticipated mortality from dewatering, capture, and relocation is expected to be less than 3 percent of the fish in the areas to be dewatered.

Given the impaired habitat and low steelhead abundances in the action area, any steelhead present at project work sites would likely constitute a small proportion of the steelhead in the three major watersheds where the action area is located (Guadalupe, Coyote, and Pajaro). Habitat, especially spawning and rearing habitat, is in much better condition in these watersheds outside of the action area. It is unlikely that the small losses of steelhead resulting from covered activities would impact future adult returns. Temporary impacts, such as reductions in riparian habitat, increases in suspended sediment concentrations, and loss of benthic habitat will not be of sufficient spatial or temporal magnitude to cause harm to steelhead or habitat. AMMs and project limits on size, proximity, and project design will reduce the magnitude of impacts to steelhead and habitat. NMFS will provide technical assistance during project planning and design to further reduce the potential for adverse impacts to steelhead and their habitat. With implementation of the proposed AMMs and the very small number of projects anticipated to be implemented under this RGP within the action area, NMFS does not expect activities authorized by RGP 18 to affect the persistence or recovery of the CCC or S-CCC steelhead DPSs.

The action area contains critical habitat for CCC and S-CCC steelhead. In our adverse modification analysis, we consider the condition of critical habitat, the potential effects of the program on critical habitat, and whether those effects are expected to directly or indirectly diminish the value of critical habitat for the conservation of CCC and S-CCC steelhead. These elements (condition of critical habitat across the DPSs, in the action area, and in the watersheds; and the effects of the project on critical habitat) are considered further below.

Across the DPSs, CCC and S-CCC steelhead critical habitat has been degraded by habitat alteration and development. While conditions vary across the DPSs, critical habitat is generally impaired by channel modification, habitat alteration and fragmentation, dams and water diversions, groundwater extraction, and estuarine habitat loss. These factors also affect CCC and S-CCC steelhead critical habitat within Santa Clara County watersheds, which have all been impaired by urban and agricultural runoff, development, water diversions and dams, and mining operations. Both watershed-wide factors and action area-specific factors affect critical habitat in the action areas leading to reduced habitat complexity, poor water quality, impaired fish passage, and unsuitable spawning and rearing habitat.

Effects to CCC and S-CCC steelhead critical habitat from the covered activities are expected to include temporary impacts during project construction and permanent effects from new in-channel structures. The temporary impacts are expected to be associated with disturbances to the river bed, banks, riparian corridor, and surface flow. As discussed above, these temporary

impacts are likely to adversely affect PBFs of CCC or S-CCC steelhead critical habitat for a short term, but the small, localized areas impacted are expected to recover quickly once the project area is rewatered and revegetated. Additionally, limits on the timing, proximity, and magnitude of projects will prevent the temporary effects from multiple projects from having additive impacts on CCC or S-CCC steelhead critical habitat. Permanent effects resulting from new in-channel structures and stream bank stabilization are likely to adversely affect macroinvertebrate production and juvenile rearing capacity of streams. Applying AMMs and project limits will minimize these adverse effects by minimizing project footprints, requiring consideration of upstream and downstream impacts, and incorporating salmonid-friendly design elements. After considering the adverse effects on, their temporary nature or limited extent, as well as the habitat enhancement features that must be incorporated into many project types, NMFS concludes that the value of critical habitat as a whole for species conservation will not be appreciably reduced.

Potential beneficial effects resulting from covered activities include improved fish passage conditions and restored habitat. AMMs require any existing fish passage impediments at a project location to be remedied in order to be eligible for coverage under RGP 18. Thus, if such projects occur under the RGP, the number of seasonal and permanent barriers to fish movement within the action area will be reduced. This has the potential to increase access to upstream spawning habitat for adult CCC and S-CCC steelhead as well as increase connectivity and access to higher quality rearing habitat for juvenile steelhead. Habitat improvement projects that occur and are implemented consistently with the proposed action are expected to have long-term beneficial effects to CCC and S-CCC steelhead and their habitat, thereby improving chances of species' recovery.

Ongoing anthropogenic impairments common throughout Santa Clara County (i.e. water diversions, dams, urban and agricultural runoff) are also likely to persist within this and longer timeframes. As noted above, new regulations and increased awareness of the effects of urban and agricultural development on streams and water quality associated with the implementation of the Santa Clara Valley Habitat Conservation Plan are expected to reduce the magnitude of these effects on steelhead and their critical habitat in the future.

Climate change is likely already affecting species and critical habitat in the action area in the near term. As noted above, climate change has likely exacerbated drought conditions in California. Conditions for steelhead and their habitat are likely to worsen due to climate change over the coming decades. For example, extreme storms, higher average summer air temperatures, and lower total precipitation levels may increase in magnitude, potentially resulting in warmer stream temperatures and reduced streamflow in summer months. NMFS expects the beneficial effects of improved fish passage and restored fish habitat will help to increase the resilience of steelhead and their critical habitat to these changes in the action area, helping to improve their chances of recovery in the face of climate change.

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 cumulative effects, it is NMFS' biological opinion that the proposed action is not likely to jeopardize the continued existence of threatened CCC 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.

2.9.1 Amount or Extent of Take

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

A low-level of incidental take of juvenile CCC and S-CCC steelhead in the form of injury or mortality is reasonably certain to occur during dewatering and fish relocation events associated with implementation of RGP activities:

> Unintentional mortality of listed steelhead during capture, handling, and relocation is not likely to exceed three percent of the total CCC and S-CCC steelhead handled. The amount of incidental take during dewatering and fish relocation will be considered exceeded if more than three percent of the total fish handled are injured or killed during any dewatering and fish relocation event.

A low-level of incidental take in the form of harm to all freshwater life stages of CCC and S-CCC steelhead from habitat-related impacts (permanent loss of benthic habitat; pollution from hazardous materials and contaminants; removal of riparian vegetation or LWD; and altered channel morphology and hydrology) is reasonably certain to occur as a result of implementation of RGP 18 activities. NMFS expects this incidental take to be mostly localized and limited to the footprint of project sites. The precise number and life stages of steelhead that are expected to be incidentally taken resulting from these habitat-related impacts cannot be accurately quantified because: 1) some life stages of steelhead are relatively small (especially as eggs, alevins, and juveniles); 2) these species live in aquatic environments where visibility is often low, hiding cover is often available, and predators feed; 3) exactly how many adults that will migrate through the action area and will experience harm is unknown; and 4) we cannot precisely predict where

and when habitat impacts may affect these species later in their life cycles. NMFS will therefore use the following incidental take surrogates pursuant to 50 CFR 402.14(i)(1)(i):

> The extent of incidental take will be considered exceeded if RGP 18 activities go above any of the project-type specific limits presented in Table 7 of this opinion. Project Limits apply to individual projects conducted under the RGP and Program Limits apply to all RGP activities for each 5-year term of the Corps permit.

2.9.2 Effect of the Take

In this opinion, NMFS determined that the amount or extent of anticipated take, coupled with other effects of the proposed action, is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat.

2.9.3 Reasonable and Prudent Measures

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

The following reasonable and prudent measures are necessary and appropriate to minimize take of CCC and S-CCC steelhead:

1. Undertake measures to ensure that injury and mortality to steelhead resulting from fish collection, relocation, and dewatering activities is low.
2. Undertake measures to minimize harm to steelhead from project construction and degradation of aquatic habitat.
3. Ensure proposed fish passage and stream habitat restoration actions are designed to avoid and minimize adverse effects.

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.

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

a) The Habitat Agency or project applicant will retain qualified biologists with expertise in the area of anadromous salmonid biology, including handling, collecting, and relocating salmonids; salmonid/habitat relationships; and biological monitoring of salmonids for overseeing work performed in the steelhead streams listed in Table 3. The Habitat Agency or project applicant will ensure that all biologists working on projects are

qualified to conduct fish collections in a manner which minimizes all potential risks to steelhead. Electrofishing, if used, will be performed by a qualified biologist and conducted according to the NMFS Guidelines for Electrofishing Waters Containing Salmonids Listed Under the Endangered Species Act, June 2000. See: http://www.nwr.noaa.gov/ESA-Salmon-Regulations-Permits/4d-Rules/upload/electro2000.pdf.

b) The biologists will monitor the construction sites during placement and removal of cofferdams and channel diversions to ensure that any adverse effects to salmonids are minimized. The biologists will be on site during all dewatering events to capture, handle, and safely relocate steelhead to an appropriate location.

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

d) If any salmonids are found dead or injured, the biological monitor will contact the NMFS North Central Coast Office in Santa Rosa, California at (707) 575-6050. The purpose of the contact is to review the activities resulting in take, determine if additional protective measures are required, and to ensure appropriate collection and transfer of salmonid mortalities and tissue samples. All salmonid mortalities will be retained. Tissue samples are to be acquired from each salmonid mortality per the methods identified in the NMFS Southwest Fisheries Science Center Genetic Repository protocols (contact the above NMFS office at the phone number provided) and sent to: NOAA Coastal California Genetic Repository, Southwest Fisheries Science Center, 110 McAllister Way, Santa Cruz, California 95060.

e) Any injuries or mortality that exceeds three percent shall be reported to the NMFS Santa Rosa Office by email within 48 hours and construction activities shall cease until a NMFS biologist is on site to oversee the remainder of any fish relocation activities.

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

a) The Habitat Agency or project applicant will allow any NMFS employee(s) or any other person designated by NMFS, to accompany field personnel to visit the project sites during activities described in this opinion.

b) Trimming and removal of riparian vegetation will be limited to the minimum necessary to complete the work.

c) Fill material for cofferdams will be fully confined with the use of plastic sheeting, sandbags, or with other non-porous containment methods, such that sediment does not come into contact with streamflow or in direct contact with the natural streambed. All loose material for cofferdams or access ramps will be completely removed from the channel by October 15.

d) Any pumps used to divert live streamflow, outside the dewatered work areas, will be screened and maintained throughout the construction period to comply NOAA Fisheries' *Juvenile Fish Screen Criteria for Pump Intakes* (1996) See https://media.fisheries.noaa.gov/dam-migration/fish_screen_criteria_for_pumped_water_intakes.pdf.

e) Treated wood may not be used in any temporary platforms or scaffolds in the creek channel. Lumber used for temporary construction operations must be unfinished and untreated wood. All materials used for temporary platforms or scaffolds must be completely removed from the channel by October 15

f) In area where concrete is used, a dry work area must be maintained to prevent conveyance of runoff from curing concrete to the surface waters of the adjacent stream at all times. Water that inadvertently contacts uncured concrete must not be discharged into surface waters.

g) Construction equipment used within the creek channels will be checked each day prior to work within the creek channel (top of bank to top of bank) and, if necessary, action will be taken to prevent fluid leaks. If leaks occur during work in the channel (top of bank to top of bank), the Habitat Agency or project applicant will contain the spill and remove the affected soils.

h) Once construction is completed, all project-introduced material (pipe, gravel, cofferdam, etc.) must be removed, leaving the river as it was before construction. Excess materials will be disposed of at an appropriate disposal site.

i) To minimize the exposure of listed anadromous salmonids to 6-PPD quinone and other contaminants, new roadway and other infrastructure projects adjacent to streams with listed anadromous salmonids must include measures to treat stormwater runoff from impervious surfaces. Measures shall be designed and implemented to avoid or minimize direct discharge of road-generated runoff to streams by diverting surface flow through vegetated areas (*i.e.*, bioswales), or similar features prior to discharge into waterways with listed fish.

The following terms and conditions implement reasonable and prudent measure 3:

a) The Corps, Habitat Agency, or project applicant shall submit draft design plans for projects that include stream habitat restoration actions and fish passage improvements (i.e., fish barrier removals, fish screens, fish passage structures, stream channel modifications, instream fish habitat features, and other actions designed to restore or

improve stream habitat) to NMFS for review and approval at least 120 days prior to construction. This applies to projects located in the steelhead streams listed in Table 3 of the above opinion.

b) Design plans for fish passage improvements and stream habitat restoration must be submitted to NMFS North Central Coast Office, Attention: Central Coast Branch Chief, 777 Sonoma Avenue, Room 325, Santa Rosa, California 95404-6528.

c) The Habitat Agency and/or project applicants are encouraged to coordinate with NMFS as early as possible in the planning stage of stream habitat restoration actions and fish passage improvement projects so that NMFS can provide technical assistance.

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).

1. To maximize the efficacy of the restoration efforts and to aid in recovery of CCC and S-CCC steelhead, the Habitat Agency should work collaboratively with the NMFS, CDFW, the County of Santa Clara, and private landowners to identify and prioritize specific areas to implement actions to improved instream habitat conditions for steelhead. We encourage the Corps, Habitat Agency and project applicants to pursue recovery actions for CCC and S-CCC steelhead (habitat complexity, riparian, sediment, water quality, viability, channel modification, etc.) identified in NMFS Recovery Plans (NMFS 2013, NMFS 2016) in watersheds throughout the action area.

2.11 Reinitiation of Consultation

This concludes formal consultation for the Santa Clara Valley Habitat Plan RGP.

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

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 (50 CFR 402.02). In our analysis, which describes the effects of the proposed action, we considered 50 CFR 402.17(a) and (b). When evaluating whether the proposed action is not likely to adversely affect listed species or critical habitat, NMFS considers whether the effects are expected to be completely beneficial, insignificant, or discountable. Completely beneficial effects are contemporaneous positive effects without any adverse effects to the species or critical habitat. Insignificant effects relate to the size of the impact and should never reach the scale where take occurs. Effects are considered discountable if they are extremely unlikely to occur.

The Corps has determined that the proposed action is not likely to adversely affect the following species and critical habitat:

North American green sturgeon Southern DPS *(Acipenser medirostris)*
Threatened (71 FR 17757; April 7, 2006)
Critical Habitat (74 FR 52299; October 9, 2009).

The life history of green sturgeon in California is summarized in Adams *et al.* (2002) and NMFS (2018). The Southern DPS (sDPS) of North American green sturgeon are anadromous, making migrations as adults to the Sacramento River in the spring (Moyle *et al*. 1995). As juvenile green sturgeon age, they migrate downstream and live in the lower delta and bays, spending from 3 to 4 years there before entering the ocean. Individuals are present in San Francisco Bay and the estuary provides rearing habitat for juveniles and foraging habitat for non-spawning adults and subadults. The southern portion of the action area (Pajaro Watershed) does not support habitat for green sturgeon.

Within the action area, the tidally-influenced reaches (sloughs) adjacent to San Francisco Bay (Guadalupe River and Coyote Creek) provide rearing habitat for juvenile, subadult, and adult green sturgeon. Critical habitat for sDPS green sturgeon includes all tidally influenced areas of San Francisco Bay and extends up to the elevation of mean higher high water. However, activities conducted under RGP 18 will only occur in waterways that are upstream of estuarine areas that support sDPS green sturgeon and no work will be authorized in the tidal portions of these waterways. Effects of RGP 18 activities conducted in freshwater reaches of streams in the action area are not expected to extend downstream to tidally-influenced areas due to the relatively small areas affected by each activity and the AMMs as detailed in Appendix A. Based on the above, effects to sDPS green sturgeon and their designated critical habitat during the implementation of RGP 18 activities are expected to be insignificant or discountable.

Based on this analysis, NMFS concurs with the Corps that the proposed action is not likely to adversely affect sDPS green sturgeon or its designated critical habitats.

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

Section 305(b) of the MSA directs Federal agencies to consult with NMFS on all actions or proposed actions that may adversely affect EFH. 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 descriptions of EFH for Pacific Coast Groundfish (Pacific Fishery Management Council [PFMC] 2020), Coastal Pelagic Species (PFMC 1998), and Pacific Coast Salmon (PFMC 2014) contained in the fishery management plans (FMP) developed by the PFMC and approved by the Secretary of Commerce.

3.1 Essential Fish Habitat Affected by the Project

The Corps has determined that the proposed action may adversely affect EFH. Within the project area, the Guadalupe River and Coyote Creek watersheds are located within areas identified as EFH for various life stages of fish species managed under the Pacific Coast Salmon FMP. San Francisco Bay, downstream of the project area, is also designated as EFH for various life stages of fish species managed under the Coastal Pelagic Species FMP and Pacific Groundfish FMP.

3.2 Adverse Effects on Essential Fish Habitat

NMFS determined the proposed action would adversely affect EFH for various life stages of fish species managed with the Pacific Coast Salmon FMP through (1) increased turbidity in the water column, (2) suspension of sediment-associated contaminants, (3) disturbance of benthic habitat and (4) long term loss of form and function of alluvial processes. EFH may also be temporarily impacted by dewatering of construction areas in streams and elevated underwater sound levels during pile driving. RGP 18 activities associated with fish passage improvements and habitat restoration actions may have beneficial effects on EFH for Pacific Coast Salmon. The short-term and long-term effects of the RGP-18 activities are generally the same as for steelhead critical habitat presented in Section 2.5 of this opinion. EFH for Coastal Pelagics and Pacific Groundfish is designated in San Francisco Bay; however, the RGP will not authorize activities within tidally-influenced areas. Effects of RGP 18 activities conducted upstream in the freshwater reaches of

streams in the action area are not expected to extend downstream to tidally-influenced areas or San Francisco Bay due to the relatively small areas affected by each activity and the AMMs as detailed in Appendix A. Accordingly, no adverse effects to EFH in San Francisco Bay is anticipated for various life stages of fish species managed under the Coastal Pelagics FMP and Pacific Groundfish FMP.

3.3 Essential Fish Habitat Conservation Recommendations

Given the AMMs contained in RGP 18, NMFS has no practical EFH Conservation Recommendations to provide to further avoid or reduce the magnitude of these effects.

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. DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMNATION REVIEW

The Data Quality Act (DQA) specifies three components contributing to the quality of a document. They are utility, integrity, and objectivity. This section of the opinion addresses these DQA components, documents compliance with the DQA, and certifies that this opinion has undergone pre-dissemination review.

4.1 Utility

Utility principally refers to ensuring that the information contained in this consultation is helpful, serviceable, and beneficial to the intended users. The intended user of this opinion is the Corps, the Habitat Agency, and project applicants. Other interested users could include citizens of affected areas, or others interested in the conservation of steelhead. Individual copies of this opinion were provided to the Corps and the Habitat Agency. The document will be available within two 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 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.

5. REFERENCES

Federal Register Notices

70 FR 52488. 2005. Endangered and threatened species; designation of critical habitat for seven evolutionarily significant units of Pacific salmon and steelhead in California. Federal Register. 70:2488-52627.

70 FR 67130. 2005.Endangered and Threatened Species: Request for Comment on Alternative Approach to Delineating 10 Evolutionarily Significant Units of West Coast *Oncorhynchus mykiss*. Federal Register. 70:67130-67134.

71 FR 834. 2006. Endangered and Threatened Species: Final Listing Determinations for 10 Distinct Population Segments of West Coast Steelhead. Federal Register. 71:834-862.

71 FR 17757. 2006. Endangered and Threatened Wildlife and Plants: Threatened Status for Southern Distinct Population Segment of North American Green Sturgeon. Federal Register. 71:17757-17766.

74 FR 52299. 2009. Endangered and threatened wildlife and plants: final rulemaking to designate critical habitat for the threatened southern distinct population segment of North American green sturgeon. Federal Register. 74:52299-52351.

76 FR 76386. 2011. Endangered and Threatened Species; 5-Year Reviews for 4 Distinct Population Segments of Steelhead in California. Federal Register. 76:76386-76386.

81 FR 33468. 2016. Endangered and Threatened Species; 5-Year Reviews for 28 Listed Species of Pacific Salmon, Steelhead, and Eulachon. Federal Register. 81:33468-33469.

81 FR 7214. 2016. Interagency Cooperation - Endangered Species Act of 1973, as Amended; Definition of Destruction or Adverse Modification of Critical Habitat. Federal Register. 81:7214-7226.

84 FR 44976. 2019. Endangered and Threatened Wildlife and Plants; Regulations for Interagency Cooperation. Federal Register. 84:44976-45018.

Literature

Abdul-Aziz, O.I., N.J. Mantua, and K.W. Myers. 2011. Potential climate change impacts on thermal habitats of Pacific salmon (*Oncorhynchus spp*.) in the North Pacific Ocean and adjacent seas. Canadian Journal of Fisheries and Aquatic Sciences 68:1660-1680.

Adams, P. B., C.B. Grimes, J.E. Hightower, S.T. Lindley, and M.L. Moser. 2002. Status review for North American green sturgeon, *Acipenser medirostris*.

Beamish, R.J., editor. 2018. The ocean ecology of Pacific salmon and trout. American Fisheries Society, Bethesda, Maryland.

Beck, M.W., K. Kittleson, and K. O'Connor. 2019. Analysis of the juvenile steelhead and stream habitat database, Santa Cruz County, California. Southern California Coastal Water Research Project, Costa Mesa, California.

Beechie, T., H. Imaki, J. Greene, A. Wade, H. Wu, G. Pess, P. Roni, J. Kimball, J. Stanford, P. Kiffney, and N. Mankua. 2012. Restoring salmon habitat for a climate change. River Research and Applications. Published online in Wiley Online Library (wileyonlinelibrary.com) DOI: 10.1002/rra.2590

Bell, M.C. 1991. Fisheries handbook of engineering requirements and biological criteria. United States Army Corps of Engineers, Portland, OR.

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

Bisson, P.A., R.E. Bilby. 1987. Large woody debris in forested steams in the Pacific Northwest: past, present, and future. Streamside management: forestry and fishery interactions. E. O. Salo and T.W. Cundy. Seattle, WA, University of Washington. Chapter five.

Bisson, P.A., Sullivan,K., Nielsen, J.L. 1988. Channel hydraulics, habitat use, and body form of juvenile coho salmon, steelhead, and cutthroat trout in streams. Transactions of the American Fisheries Society 117. 262-273.

Bjorkstedt, E.P., B.C. Spence, J.C. Garza, D.G. Hankin, D. Fuller, W.E. Jones, J.J. Smith, R. Macedo. 2005. An analysis of historical population structure for evolutionarily significant units of chinook salmon, coho salmon, and steelhead in the North-Central California Coast Recovery Domain. United States Department of Commerce, National Oceanic and Atmospheric Administration Technical Memorandum, NMFS-SWFSC-382.

Bjornn, T.C. and D.W. Reiser. 1991. Habitat requirements of salmonids in W.R. Meehan (ed.), Influence of forest and rangeland management on salmonids fishes and their habitats. Special Publication 19. Bethesda, MD: American Fisheries Society.

Boughton, D.A., P.B. Adams, E. Anderson, C. Fusaro, E. Keller, E. Kelley, L. Lentsch, J. Nielson, K. Perry, H. Regan, J. Smith, C. Swift, L. Thompson, and F. Watson. 2006. Steelhead of the South-Central/Southern California Coast: Population characterization for recovery planning. United States Department of Commerce, National Oceanic and Atmospheric Administration Technical Memorandum NMFS-SWFSC-394.

Boughton, D.A., P.B. Adams, E. Anderson, C. Fusaro, E. Keller, E. Kelley, L. Lentsch, J. Nielson, K. Perry, H. Regan, J. Smith, C. Swift, L. Thompson, and F. Watson. 2007. Viability criteria for steelhead of the South-Central and Southern California coast. United States Department of Commerce, National Oceanic and Atmospheric Administration Technical Memorandum Draft.

Boughton, D.A., J. Nelson, and M.K. Lacy. 2022. Integration of steelhead viability monitoring, recovery plans and fisheries management in the southern coastal area. Fish Bulletin 182. State of California, Department of Fish and Game.

Brewer, P.G., and J. Barry. 2008. Rising Acidity in the Ocean: The Other CO2 Problem. Scientific American October 7, 2008.

Brinkmann, M., D. Montgomery, S. Selinger, J.G.P. Miller, E. Stock, A.J. Alcaraz, J.K. Challis, L. Weber, D. Janz, M. Hecker, and S. Wiseman. 2022. Acute Toxicity of the Tire Rubber-Derived Chemical 6PPD-quinone to Four Fishes of Commercial, Cultural, and Ecological Importance. Environmental Science & Technology Letters 9(4):333-338.

Bryant, M.D. 1983. The role and management of woody debris in west coast salmonid nursery streams. North American Journal of Fisheries Management 3:322-330.

Busby, P.J., T.C. Wainwright, G.J. Bryant, L. Lierheimer, R.S. Waples, F.W. Waknitz, and I.V. Lagomarsino. 1996. Status review of West Coast steelhead from Washington, Idaho, Oregon and California. United States Department of Commerce, National Oceanic and Atmospheric Administration Technical Memorandum NMFS-NWFSC-27.

Bustard, D.R. and D.W. Narver. 1975. Aspects of the winter ecology of juvenile coho salmon (*Oncorhynchus kisutch*) and steelhead trout (*Salmo gairdneri*). Journal of the Fisheries Research Board of Canada 32:667-680.

CDFW (California Department of Fish and Wildlife). 1965. California Fish and Wildlife Plan Vol. 1-3. Inland Fisheries Division, Sacramento, CA.

CDFW (California Department of Fish and Wildlife). 2005. Annual Report to the National Marine Fisheries Service for Fisheries Restoration Grant Program Projects Conducted Under Department of the Army Regional General Permit No. 12 (Corps File No. 27922N) within the U.S. Army Corps of Engineers, San Francisco District January 1, 2004 through December 31, 2004. Fortuna, CA.

CDFW (California Department of Fish and Wildlife). 2006. Annual Report to the National Marine Fisheries Service for Fisheries Restoration Grant Program Projects Conducted Under Department of the Army Regional General Permit No. 12 (Corps File No. 27922N) within the U.S. Army Corps of Engineers, San Francisco District January 1, 2005 through December 31, 2005. Fortuna, CA.

CDFW (California Department of Fish and Wildlife) . 2007. Annual Report to the National Marine Fisheries Service for Fisheries Restoration Grant Program Projects Conducted under the Department of the Army Regional General Permit No. 12 (Corps File No. 27922N) within the U.S. Army Corps of Engineers, San Francisco District January 1, 2006 through December 31, 2006. C.R. 1. Fortuna, CA.

CDFW (California Department of Fish and Wildlife). 2008. Annual Report to the National Marine Fisheries Service for Fisheries Restoration Grant Program Projects Conducted under the Department of the Army Regional General Permit No. 12 (Corps File No. 27922N) within the U.S. Army Corps of Engineers, San Francisco District January 1, 2007 through December 31, 2007. C.R. 1. Fortuna, CA.

CDFW (California Department of Fish and Wildlife). 2009. Annual Report to the National Marine Fisheries Service for Fisheries Restoration Grant Program Projects Conducted Under Department of the Army Regional General Permit No. 12 (Corps File No. 27922N) within the U.S. Army Corps of Engineers, San Francisco District January 1, 2008 through December 31, 2008. Fortuna, CA.

CDFW (California Department of Fish and Wildlife). 2010. Annual Report to the National Marine Fisheries Service for Fisheries Restoration Grant Program Projects Conducted Under Department of the Army Regional General Permit No. 12 (Corps File No. 27922N) within the U.S. Army Corps of Engineers, San Francisco District January 1, 2009 through December 31, 2009. Fortuna, CA.

CDFW (California Department of Fish and Wildlife). 2020. California coastal salmonid population monitoring data and associated metadata (updated 18 May 2020). California Department of Fish and Wildlife, Fisheries Branch. West Sacramento, California.

Cayan, D., M. Tyree, and S. Iacobellis. 2012. Climate Change Scenarios for the San Francisco Region. Prepared for California Energy Commission. Publication number: CEC-500-

2012-042. Scripps Institution of Oceanography, University of California, San Diego.

Casagrande, J. 2011. Uvas Creek steelhead distribution, density, growth, and habitat use, 2010. Prepared for the California Department of Fish and Game. Contract # A08-BD3; Grant Agreement # P0810503. 26 January 2011.

Casagrande, J. 2012. Uvas and Llagas Creek juvenile steelhead distribution and abundance, 2011. Prepared for the California Department of Fish and Game and the National Marine Fisheries Service. 31 January 2012.

Casagrande, J. 2013. Uvas and Llagas Creek juvenile steelhead distribution and abundance fall 2012. Prepared for the California Department of Fish and Wildlife and the National Marine Fisheries Service. 31 January 2013.

Casagrande, J. 2018. Uvas Creek juvenile steelhead distribution and abundance and adult observations, 2017. Annual Report, Santa Rosa, CA. Prepared for the California Department of Fish and Wildlife and the National Marine Fisheries Service. 13 January 2018.

Casagrande, J. 2020. Uvas Creek juvenile steelhead distribution and abundance and adult observations, 2019. U.S. Department of Commerce, National Marine Fisheries Service, Santa Rosa, California.

Casagrande, J. 2022. Uvas Creek juvenile steelhead distribution and abundance and adult observations, 2021. Prepared for the California Department of Fish and Wildlife and the National Marine Fisheries Service. 23 January 2022.

Chow, M., J.I. Lundin, C.J. Mitchell, J.W. Davis, and G. Young. 2019. An urban stormwater runoff mortality syndrome in juvenile coho salmon. Aquatic Toxicology 214. 10 pp.

Clemento, A.J., E.C. Anderson, D. Boughton, D. Girman, and J.C. Garza. 2009. Population genetic structure and ancestry of Oncorhynchus mykiss populations above and below dams in south-central California. Conservation Genetics 10(5):1321–1336.

Collins, B.W. 2004. Section 10 annual report for permit 1067. Fortuna, California Department of Fish and Game, Sacramento, California.

Cooper J.R., J.W. Gilliam, R.B. Daniels, and W.P. Robarge. 1987. Riparian areas as filters for agricultural sediment. Soil Science Society of America Journal 51:416–420.

Crozier L.G., M.M. McClure, T. Beechie, S.J. Bograd, D.A. Boughton, and M. Carr. 2019. Climate vulnerability assessment for Pacific salmon and steelhead in the California Current Large Marine Ecosystem. PLoS ONE 14(7): e0217711. https://doi.org/10.1371/journal.pone.0217711

Cushman, R.M. 1985. Review of ecological effects of rapidly varying flows downstream from

hydroelectric facilities. North American Journal of Fisheries Management 5:330-339.

Diffenbaugh N.S., D.L. Swain, and D. Touma. 2015. Anthropogenic warming has increased drought risk in California. PNAS Early Edition. www.pnas.org/cgi/doi/10.1073/pnas.1422385112.

Doney, S.C, M. Ruckelshaus, J.E. Duffy, J.P. Barry, F. Chan, C.A. English, H.M. Galindo, J. M. Grebmeier, A.B. Hollowed, N. Knowlton, J. Polovina, N.N. Rabalais, W.J. Sydeman, and L.D. Talley. 2012. Climate Change Impacts on Marine Ecosystems. Annual Review of Marine Science 4:11-37.

Feely, R.A., C.L. Sabine, K. Lee, W. Berelson, J. Kleypas, V.J. Fabry, and F.J. Millero. 2004. Impact of anthropogenic CO2 on the CaCO3 system in the oceans. Science 305:362-366.

Feist, B.E., E.R. Buhle, D.H. Baldwin, J.A. Spromberg, S.E. Damm, J.W. Davis, and N.L. Scholz. 2018. Roads to Ruin: Conservation Threats to Sentinel Species across an Urban Gradient. Ecological Applications 27(8):2382-2396.

FHWG (Fisheries Hydroacoustic Working Group). 2008. Agreement in principal for interim criteria for injury to fish from pile driving activities. Memorandum dated June 12, 2008. Available: https://dot.ca.gov/programs/environmental-analysis

Frölicher, T.L., E. M. Fischer, and N. Gruber. 2018. Marine heatwaves under global warming. Nature (Letter). 560:360.

Good, T.P., R.S Waples, and P. Adams. 2005. Updated status of federally listed ESUs of West Coast salmon and steelhead, U.S. Department of Commerce: 598.

Gregory, R.S., and T.G. Northcote. 2003. Surface, planktonic, and benthic foraging by juvenile Chinook salmon (*Oncorhynchus tshawytscha*) in turbid laboratory conditions. Canadian Journal of Fisheries and Aquatic Sciences. 50:233-240.

Gurdak, J., and G. Cook. 2021. Santa Clara Valley Water District 2021 Groundwater Management Plan for the Santa Clara and Llagas Subbasins. November, 2021.

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

Harvey, B.C. and J.L. White. 2008. Use ofbenthic prey by salmonids under turbid conditions in a laboratory stream. Transactions of the American Fisheries Society 137:1756-1763.

Hastings, M.C. and A.N. Popper. 2005. Effects of sound on fish. California Department of Transportation Contract 43A0139 Task Order 1.

Hayes, J.P., M.D. Adam, D. Bateman, E. Dent, W.H. Emmingham, K.G. Mass, and A.E. Skaugset. 1996. Technical commentary: Integrating research and forest management in

riparian areas of the Oregon coast range. Western Journal of Applied Forestry 11:85-89.

Hayhoe, K., D. Cayan, C.B. Field, P.C. Frumhoff, E.P. Maurer, N.L. Miller, S.C. Moser, S. H. Schneider, K.N. Cahill, E.E. Cleland, L. Dale, R. Drapek, R.M. Hanemann, L.S. Kalkstein, J. Lenihan, C.K. Lunch, R.P. Neilson, S.C. Sheridan, and J.H. Verville. 2004. Emissions pathways, climate change, and impacts on California. Proceedings of the National Academy of Sciences of the United States of America 101:12422-12427.

Heintz, R.A., J.W. Short, and S.D. Rice. 1999. Sensitivity of fish embryos to weathered crude oil: Part II. Increased mortality of pink salmon (*Oncorhynchus gorbuscha*) embryos incubating downstream from weathered Exxon Valdez crude oil. Environmental Toxicology and Chemistry 18:494-503.

Hellmair, M., M. Peterson, B. Mulvey, K. Young, J. Montgomery, and A. Fuller. 2018. Physical characteristics influencing nearshore habitat use by juvenile chinook salmon in the Sacramento River, California. North American Journal of Fisheries Management 38:959-970.

Henderson J.E. 1986. Environmental designs for streambank protection projects. Water Resources Bulletin 22:549–558.

Hobbs, J. 2015. Steelhead smolt outmigration and survival study: Year 2 stream surveys. Final Report prepared for Santa Clara Water District, National Marine Fisheries Service, and the South Bay Salt Pond Restoration Program.

Hubert, W.A. 1996. Passive capture techniques. In B. Murphy and D. Willis (eds.) Fisheries Techniques. Bethesda, Maryland, American Fisheries Society.

Humboldt County. 2002. Memo from Ann Glubczynski, County of Humboldt Public Works, to Margaret Tauzer, National Marine Fisheries Society, titled "2002 Monitoring Report – Five Fish Passage Enhancement Projects". June 27, 2002. 1 page.

Humboldt County. 2003. Memo from Ann Glubczynski, County of Humboldt Public Works, to Margaret Tauzer, National Marine Fisheries Society, titled "2003 Monitoring Report - Eleven Culvert Replacements for Fish Passage." June 23, 2003. 2 pages.

Humboldt County. 2004. Memo from Ann Glubczynski, County of Humboldt Public Works, to Margaret Tauzer, National Marine Fisheries Society, titled "2004 Monitoring Report - Eleven Culvert Replacements for Fish Passage." June 10, 2004. 2 pages.

ICF 2012. Final Santa Clara Valley Habitat Plan. Prepared for: the County of Santa Clara, City of San José, City of Morgan Hill, City of Gilroy, Santa Clara Valley Water District, and Santa Clara Valley Transportation Authority. Morgan Hill, California.

ICF. 2022. Programmatic Biological Assessment for the Santa Clara Valley Habitat Plan Regional General Permit. July. San Francisco, California. Prepared for Santa Clara

Valley Habitat Agency, Morgan Hill, California.134 pp.

Incardona, J.P., Collier, T.K., and Scholz, N.L. 2004. Defects in cardiac function precede morphological abnormalities in fish embryos exposed to polycyclic aromatic hydrocarbons. Toxicology and Applied Pharmacology 196:191-205.

Incardona, J.P., Carls, M.G., Teraoka, H., Sloan, C.A., Collier, T.K., and Scholz, N.L. 2005. Aryl hydrocarbon receptor-independent toxicity of weathered crude oil during fish development. Environmental Health Perspectives 113:1755-1762.

Incardona, J.P., Day, H.L., Collier, T.K., and Scholz, N.L. 2006. Developmental toxicity of 4-ring polycyclic aromatic hydrocarbons in zebrafish is differentially dependent on AH receptor isoforms and hepatic cytochrome P4501A metabolism. Toxicology and Applied Pharmacology 217:308-321.

Kadir, T., L. Mazur, C. Milanes, and K. Randles. 2013. Indicators of climate change in California. California Environmental Protection Agency, Office of Environmental Health Hazard Assessment, Sacramento, California.

Knudsen, F.R., C.B. Schreck, S.M. Knapp, P.S. Enger, and O. Sand. 1997. Infrasound produces flight and avoidance responses in Pacific juvenile salmonids. Journal of Fish Biology 51:824-829.

Kondolf, G.M. 1997. Hungry water: effects of dams and gravel mining on river channels. Environmental Management 21(94):533-551.

Leidy, R.A., G.S. Becker, and B.N. Harvey. 2005. Historical distribution and current status of steelhead/rainbow trout (Oncorhynchus mykiss) in streams of the San Francisco Estuary, California. Center for Ecosystem Management and Restoration, Oakland, CA.

Li, S. 2001. Draft electrofishing surveys on Guadalupe, Stevens, Coyote and Penetencia Creeks: Catch results. Aquatic Systems Research, Loomis, CA.

Lindley, S.T., R.S. Schick, E. Mora, P.B. Adams, J.J. Anderson, S. Greene, C. Hanson, B.P. May, D.R. McEwan, R.B. MacFarlane, C. Swanson, and J.G. Williams. 2007. Framework for assessing viability of threatened and endangered Chinook salmon and steelhead in the Sacramento-San Joaquin Basin. San Francisco Estuary and Watershed Science 5.

Lisle, T.E. 1986. Effects of woody debris on anadromous salmonid habitat, Prince of Wales Island, Southeast Alaska. North American Journal of Fisheries Management 6:38-550.

McElhany, P., M.H. Ruckelshaus, M.J. Ford, T.C. Wainwright, and E.P. Bjorkstedt. 2000. Viable salmonid populations and the recovery of evolutionarily significant units. NOAA Technical Memorandum NMFS-NWFSC-42.

McIntyre, J.K., J.I. Lundin, J.R. Cameron, M.I. Chow, J.W. Davis, J.P. Incardona, and N.L. Scholz. 2018. Interspecies Variation in the Susceptibility of adult Pacific salmon to Toxic Urban Stormwater Runoff. Environmental Pollution 238:196-203.

Meehan, W.R. and T.C. Bjorn. 1991. Salmonid distributions and life histories. Pages 47-82 in W.R. Meehan (ed.) Influences of forest and rangeland management on salmonid fishes and their habitats. Special Publication 19, American Fisheries Society, Bethesda MD.

Mitsch, W.J. and J.G. Gosselink. 2000. Wetlands, 3rd ed. John Wiley & Sons, New York.

Moser, S., J. Ekstrom., and G. Franco. 2012. Our changing climate 2012: Vulnerability and adaptation to the increasing risks from climate change in California. A summary report on the third assessment from the California Climate Change Center, Sacramento, California.

Moyle, P.B., R.M. Yoshiyama, J.E. Williams, and E.D. Wikramanayake. 1995. Fish Species of Special Concern in California. California Department of Fish and Game.

Murphy, M.L. and W.R. Meehan. 1991. Stream ecosystems. In W.R. Meehan (ed.) Influences of forest and rangeland management on salmonid fishes and their habitats. American Fisheries Society 19:17-46.

NMFS (National Marine Fisheries Service). 2000. Guidelines for electrofishing waters containing salmonids listed under the Endangered Species Act. National Marine Fisheries Service, Protected Resources Division, Santa Rosa, California.

NMFS (National Marine Fisheries Service) . 2011. Anadromous salmonid passage facility design. NMFS, Northwest Region, Portland, Oregon. http://www.habitat.noaa.gov/pdf/salmon_passage_facility_design.pdf.

NMFS (National Marine Fisheries Service). 2013. South-Central California Coast steelhead recovery plan. West Coast Region, California Coastal Area Office, Long Beach, California.

NMFS (National Marine Fisheries Service). 2014. Biological opinion for the Santa Clara Valley Water District's proposed 2014–2023 stream maintenance activities in Santa Clara County, California.Santa Rosa, CA. SWR-2011-3722.

NMFS (National Marine Fisheries Service). 2016. Final coastal multispecies recovery plan: California Coastal Chinook salmon, Northern California steelhead, Central California Coast steelhead. National Marine Fisheries Service, West Coast Region. California Coastal Office, Santa Rosa, California.

NMFS (National Marine Fisheries Service). 2018. NOAA Fisheries Recovery Plan for the Southern Distinct Population Segment of North American Green Sturgeon (*Acipenser medirostris*).

Nedwell, J.R., A.W.H. Turnpenny, J.M. Lovell, and B. Edwards. 2006. An investigation into the effects of underwater piling noise on salmonids. The Journal of the Acoustical Society of America 120:2550-2554.

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

Nishijima, J. 2006. Guadalupe River Project juvenile sampling. Pages emailed with associated data table to G. Stern. of NMFS.

Nishijima, J., L. Porcella, and D. Salsbery. 2009. Masson Fishway 2007-2008 monitoring report and Alamitos and Masson Fishway 2003-2008 summary report. Santa Clara Valley Water District 14, San Jose, California.

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

Osgood, K.E. (editor). 2008. Climate Impacts on U.S. Living Marine Resources: National Marine Fisheries Service Concerns, Activities and Needs. U.S. Dep. Commerce, NOAA Tech. Memo. NMFSF/ SPO-89, 118 p.

PFMC (Pacific Fishery Management Council). 1998. Description and identification of essential fish habitat for the Coastal Pelagic Species Fishery Management Plan. Appendix D to Amendment 8 to the Coastal Pelagic Species Fishery Management Plan. Pacific Fishery Management Council, Portland, Oregon. December.

PFMC (Pacific Fishery Management Council). 2014. Appendix A to the Pacific Coast Salmon Fishery Management Plan, as modified by Amendment 18. Identification and description of essential fish habitat, adverse impacts, and recommended conservation measures for salmon.

PFMC (Pacific Fishery Management Council). 2020. Pacific Coast Groundfish Fishery Management Plan for the California, Oregon, and Washington Groundfish Fishery. Pacific Fishery Management Council, Portland, Oregon. August.

PSMFC (Pacific States Marine Fisheries Commission) and CDFW Biogeographical Branch. 2018. California Fish Passage Assessment Database. Sacramento, California. Accessed: November 2018.

Pearse, D.E., M.R. Miller, A. Abadia-Cardoso, and J.C. Garza. 2014. Rapid parallel evolution of standing variation in a single, complex, genomic region is associated with life history in steelhead/rainbow trout. Proceedings of the Royal Society B-Biological Sciences. 281(1783):1–9.

Pearse, D.E., N.J. Barson, T. Nome, G.T. Gao, M.A. Campbell, A. Abadia-Cardoso, E.C. Anderson, D.E. Rundio, T.H. Williams, K.A. Naish, T. Moen, S.X. Liu, M. Kent, M.

Moser, D.R. Minkley, E.B. Rondeau, M.S.O. Brieuc, S. Rod Sandve, M.R. Miller, L. Cedillo, K. Baruch, A.G. Hernandez, G. Ben-Zvi, D. Shem-Tov, O. Barad, K. Kuzishchin, J.C. Garza, S.T. Lindley, B. Koop, G.H. Thorgaard, Y. Palti, and S. Lien. 2019. Sex-dependent dominance maintains migration supergene in rainbow trout. Nature Ecology and Evolution 3(12):1731–1742.

Peter, K.T., Z. Tian, C. Wu, P. Lin, S. White, B. Du, J.K. McIntyre, N.L. Scholz, and E.P. Kolodziej. 2018. Using High-resolution Mass Spectrometry to Identify Organic contaminants linked to Urban Stormwater Mortality Syndrome in Coho salmon. Environmental Science and Technology 52:10317-10327.

Platts, W.S. 1991. Livestock grazing. In W.R. Meehan (ed.) Influence of forest and rangeland management on Salmonid fishes and their habitats. American Fisheries Society, Special Publicatio. 19:389-423.

Poole, G.C. and C.H. Berman. 2001. An ecological perspective on in-stream temperature: natural heat dynamics and mechanisms of human-caused thermal degradation. Environmental Management 27:787-802.

Prince, D.J., T.Q. Thompson, O.A. Ali. J.S. Lyman, I.K. Saglam, T.J. Hotaling, A.P. Spindle, and M R. Miller. 2017. Science Advances 3(8):1603198.

Ruggiero, P., C.A. Brown, P.D. Komar, J.C. Allan, D.A. Reusser, H. Lee, S.S. Rumrill, P. Corcoran, H. Baron, H. Moritz, and J. Saarinen. 2010. Impacts of climate change on Oregon's coasts and estuaries. Pages 241-256 in K.D. Dellow and P.W. Mote, editors. Oregon Climate Assessment Report. College of Oceanic and Atmospheric Sciences, Oregon State University, Corvallis, Oregon.

SCVWD (Santa Clara Valley Water District). 2013. 2014-2023 Stream Maintenance Program Manual. 2013 Manual Update. 7 February 2014.

SCVWD (Santa Clara Valley Water District). 2019. Guadalupe River 2018 Adult Salmonid Migration Monitoring Using the Vaki Riverwatcher Passive Monitoring System January 30, 2018 – May 31, 2018. Prepared by Valley Water Environmental Mitigation and Monitoring Unit. January 30, 2019.

SCVWD (Santa Clara Valley Water District). 2019a. Exploratory Juvenile Oncorhynchus mykiss Sampling in Coyote Creek. Prepared by Valley Water Environmental Mitigation and Monitoring Unit. April 11, 2019.

SCVWD (Santa Clara Valley Water District). 2020. Guadalupe River 2018-2019 Adult Salmonid Migration Monitoring Using the Vaki Riverwatcher Passive Monitoring System at the Alamitos Drop Structure. Prepared by Valley Water Environmental Mitigation and Monitoring Unit. January 30, 2020.

SCVWD (Santa Clara Valley Water District). 2020a. Juvenile Onchorhynchus mykiss Rearing

Monitoring in the Coyote Creek Watershed.Prepared by Valley Water Environmental Mitigation and Monitoring Unit. January 30, 2020.

SCVWD (Santa Clara Valley Water District). 2020b. Coyote Creek 2018-2019 Adult Salmonid Migration Monitoring Using The Vaki Riverwatcher Passive Monitoring System at the Coyote Percolations Facility. Prepared by Valley Water Environmental Mitigation and Monitoring Unit. January 30, 2020.

SCVWD (Santa Clara Valley Water District). 2021. Guadalupe River 2019-20 Adult Salmonid Migration Monitoring Using the Vaki Riverwatcher Passive Monitoring System at the Alamitos Drop Structure Prepared by Valley Water Environmental Mitigation and Monitoring Unit. December 2021.

SCVWD (Santa Clara Valley Water District). 2021a. 2021 Junvenile Oncorhynchus mykiss Rearing Monitoring in Coyote Creek. Prepared by Valley Water Environmental Mitigation and Monitoring Unit. January 31, 2021.

SCVWD (Santa Clara Valley Water District). 2021b. Coyote Creek 2019-2020 Adult Salmonid Migration Monitoring Using The Vaki Riverwatcher Passive Monitoring System at the Coyote Percolation Dam Fish Ladder. Prepared by Valley Water Environmental Mitigation and Monitoring Unit. March 2021.

SCVWD (Santa Clara Valley Water District). 2021c. Coyote Creek 2020-2021 Adult Salmonid Migration Monitoring Using The Vaki Riverwatcher Passive Monitoring System at the Coyote Percolation Dam Fish Ladder. Prepared by Valley Water Environmental Mitigation and Monitoring Unit. July 2021.

SCVWD (Santa Clara Valley Water District). 2021d. 2020 Juvenile Onchorynchus mykiss Rearing Monitoring in the Guadelupe River Prepared by Valley Water Environmental Mitigation and Monitoring Unit. December 2021.

SCVWD (Santa Clara Valley Water District). 2022. 2021 Juvenile *Oncoryhnchus mykiss* Rearing Monitoring in Stevens Creek. Prepared by Valley Water Environmental Mitigation and Monitoring Unit. January 2022.

SCVWD (Santa Clara Valley Water District). 2022a. 2021 Junvenile Onchorhynchus mykiss Rearing Monitoring in Upper Penitencia Creek. Prepared by Valley Water Environmental Mitigation and Monitoring Unit. January 2022.

Scavia, D., J.C. Field, D.F Boesch, R.W. Buddmeier, V. Burkett, D.R. Cayan, M. Fogarty, M.A. Harwell, R.W. Howarth, C. Mason, D.J. Reed, T.C. Royer, A.H. Sallenger, and J.G. Titus. 2002. Climate change impacts on U.S. coastal and marine ecosystems. Estuaries 25:149-164.

Schindler, D.E., R. Hilborn, B. Chasco, C.P. Boatright, T.P. Quinn, L.A. Rogers, and M.S. Webster. 2010. Population diversity and the portfolio effect in an exploited species.

Nature 465:609–312.

Schneider, S.H. 2007. The unique risks to California from human-induced climate change. California State Motor Vehicle Pollution Control Standards; Request for Waiver of Federal Preemption, presentation. May 22, 2007.

Scholz, N.L., M.S. Myers, S.G. McCarthy, J.S. Labenia, J.K. McIntyre, G.M. Yitalo, L.D. Rhodes, C.A. Laetz, C.M. Stehr, B.L. French, B. McMillan, D. Wilson, L. Reed, K.D. Lynch, S. Damm, J.W. Davis, and T.K. Collier. 2011. Recurrent Die-Offs of Adult Coho Salmon Returning to Spawn in Puget Sound Lowland Urban Streams. PloS ONE 6(12).

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

Shaw, E.A. and J.S. Richardson. 2001. Direct and indirect effects of sediment pulse duration on stream invertebrate assemblages and rainbow trout (Oncorhynchus mykiss) growth and survival. Canadian Journal of Fisheries and Aquatic Sciences 58:2213-2221.

Shirvell, C. 1990. Role of instream rootwads as juvenile coho salmon (Oncorhynchus kisutch) and steelhead trout (*O. mykiss)* cover habitat under varying streamflows. Canadian Journal of Fisheries and Aquatic Sciences 47:852-861.

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

Simon, A., and P.A. Johnson. 1999. Relative roles of long-term channel adjustments, Processes, and scour on the reliability of bridge foundations. In: E.V. Richardson and P.F. Lagasse (Eds.) Stream stability and scour at highway bridges. American Society of Civil Engineers, pp. 151-165.

Smith, J. 2020. Stevens Creek Environmental Conditions and Fish Resources in 2013-2020. San Jose State University. December 15, 2020.

Smith, J. 2021. Fish Population and Environmental Sampling in 2014-2021 on Coyote Creek. San Jose Sate University. November 22, 2021.

Smith, J.J. 2021a. Upper Penitencia Creek Environmental Conditions and Fish Resources 2007 through 2021. San Jose State University. November 19, 2021.

Spence, B.C., G.A. Lomnicky, R.M. Hughes, and R.P. Novitzki. 1996. An ecosystem approach to salmonid conservation. TR-4501-96-6057. ManTech Environmental Research Services, Inc. Corvallis, Oregon. December. Report. National Marine Fisheries Service, Portland, Oregon.

Spence, B.C., E.P Bjorkstedt, J.C. Garza, J.J. Smith, D.G. Hankin, D. Fuller, W.E. Jones, R. Macedo, T.H. Williams, and E. Mora. 2008. A framework for assessing the viability of threatened and endangered salmon and steelhead in the North-Central California Coast recovery domain. U.S. Department of Commerce. NOAA Technical Memorandum. NOAA-TM-NMFS-SWFSC-423.:173.

Spence, B.C., E.P. Bjorkstedt, S. Paddock, and L. Nanus. 2012. Updates to biological viability criteria for threatened steelhead populations in the North-Central California Coast recovery domain. National Marine Fisheries Service. Southwest Fisheries Science Center, Fisheries Ecology Division, Santa Cruz, California.

Sudduth, E.B. and J.L. Meyer. 2006. Effects of bioengineered streambank stabilization on bank habitat and macroinvertebrates in urban streams. Environmental Management 38:218-226.

Sutton, R., L.D. Sedlak, M. Box, C. Gilbreath, A. Holleman, R. Miller, L. Wong, A. Munno, K. X, Zhu, and C. Rochman. 2019. Understanding Microplastic Levels, Pathways, and Transport in the San Francisco Bay Region, SFEI-ASC Publication #950, October 2019, 402 pages. https://www.sfei.org/sites/default/files/biblio_files/Microplastic%20Levels%20in%20SF%20Bay%20-%20Final%20Report.pdf.

Swain, D.L, B. Langenbrunner, J.D. Neelin, and A. Hall. 2018. Inceasing percipitation volatility in twenty-first-century California. Nature Climate Change 8:427-433. https://www.nature.com/articles/s41558-018-0140-y

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

Thomas, R. L. 1996. Enhancing threatened salmonid populations: A better way. Fisheries 21(5):12–14.

Thompson, A.R. 2019. State of the California current 2018–19: A novel anchovy regime and a new marine heatwave? California Cooperative Oceanic Fisheries Investigations Report. Volume 60.

Thompson, N.F., E.C. Anderson, A.J. Clemento, M.A. Campbell, D.E. Pearse, J.W. Hearsey, A.P. Kinziger, and J.C. Garza. 2020. A complex phenotype in salmon controlled by a simple change in migratory timing. Science 370(6516):609–613.

Tian Z., H. Zhao, K.T. Peter, M. Gonzalez, J. Wetzel, C. Wu, X. Hu, J. Prat, E.Mudrock, R. Hettinger, A. . Cortina, R.G. Biswas, F.V.C Kock, R. Soong, A. Jenne, B. Du, F. Hou, H. He, R. Lundeen, A. Gibreath, R. Sutten, N.L. Scholz, J.W. Davis, M.C. Dodd, A. Simpson, J.K. McIntyre, and E.P. Kolodziej. 2020. A ubiquitous tire rubber-derived chemical induces acute mortality in coho salmon. Science. 10.1126/science.abd6951.

Tian Z., M. Gonzalez, C.A. Rideout, H.N. Zhao, X. Hu, J. Wetzel, E. Mudrock, C.A. James, J.K. McIntyre, and E.P. Kolodziej. 2022. 6PPD-Quinone: Revised Toxicity Assessment and Quantification with a Commercial Standard. Environmental Science & Technology Letters 9(2):140-146.

Turley, C. 2008. Impacts of changing ocean chemistry in a high-CO2 world. Mineralogical Magazine 72(1):359-362.

U.S. 2020 Census Data
https://worldpopulationreview.com/us-counties/ca/santa-clara-county-population
Accessed: February 6, 2023.

Waples, R.S., and S.T. Lindley. 2018. Genomics and conservation units: The genetic basis of adult migration timing in Pacific salmonids. Evolutionary Applications 11(9):1518–1526.

Wesche, T.A., C.M. Goertler, and C.B. Frye. 1987. Contribution of riparian vegetation to trout cover in small streams. North American Journal of Fisheries Management 7:151-153.

Westerling, A.L., B.P. Bryant, H.K. Preisler, T.P. Holmes, H.G. Hidalgo, T. Das, and S.R. Shrestha. 2011. Climate change and growth scenarios for California wildfire. Climate Change 109(1):445-463.

Williams, T.H., S.T. Lindley, B.C. Spence, and D.A. Boughton. 2011. Status review update for Pacific salmon and steelhead listed under the Endangered Species Act: Southwest. 20 May 2011 update to 5 January 2011 report to Southwest Region National Marine Fisheries Service from Southwest Fisheries Science Center, Fisheries Ecology Division. Santa Crux, California.

Williams, T.H., B.C. Spence, D.A. Boughton, R.C. Johnson, L. Crozier, N. Mantua, M. O'Farrell, and S.T. Lindley. 2016. Viability assessment for Pacific salmon and steelhead listed under the Endangered Species Act: Southwest. 2 February 2016 report to West Coast Region National Marine Fisheries Service from Southwest Fisheries Science Center, Fisheries Ecology Division. Santa Cruz, California.

Williams, A.P., J.T. Abatzoglou, A. Gershunov, J. Guzman-Morales, D.A. Bishop, J.K. Balch, and D.P. Lettenmaier. 2019. Observed Impacts of Anthropogenic Climate Change on Wildfire in California. Earth's Future 7:892–910. https://doi.org/10.1029/2019EF001210.

Williams, A.P., E.R. Cook, J.E. Smerdon, B.I. Cook, J. Abatzoglou, K. Bolles, S.H. Baek, A.M. Badger, and B. Livneh. 2020. Large contribution from anthropogenic warming to an emerging North American megadrought. Science 268:314-318.

Williams, A.P., B. I. Cook, and J. E. Smerdon. 2022. Rapid intensification of the emerging southwestern North American megadrought in 2020–2021. Nature Climate Change 12:232–234.

6. APPENDICES

Appendix A
Avoidance and Minimization Measures

General

A-15[a] If native fish or non-covered, native aquatic vertebrates are present when cofferdams, water bypass structures, and silt barriers are to be installed, a native fish and aquatic vertebrate relocation plan shall be implemented when ecologically appropriate as determined by a qualified biologist to ensure that significant numbers of native fish and aquatic vertebrates are not stranded.

Prior to the start of work or during the installation of water diversion structures, native aquatic vertebrates shall be captured in the work area and transferred to another reach as determined by a qualified biologist. Timing of work in streams that supports a significant number of amphibians will be delayed until metamorphosis occurs to minimize impacts to the resource. Capture and relocation of aquatic native vertebrates, with the exception of ESA-listed salmonids, is not required at individual project sites when site conditions preclude reasonably effective operation of capture gear and equipment, or when the safety of biologist conducting the capture may be compromised.

Listed species not covered by the Habitat Plan will not be relocated without the appropriate permits and authorizations from the correct agencies.

Relocation of native fish or aquatic vertebrates may not always be ecologically appropriate. Prior to capturing native fish and/or vertebrates, the qualified biologist will use a number of factors, including site conditions, system carrying capacity for potential relocated fish, and flow regimes (e.g., if flows are managed) to determine whether a relocation effort is ecologically appropriate. If so, the following factors will be considered when selecting release site(s):

1. similar water temperature as capture location;
2. ample habitat availability prior to release of captured individuals;
3. presence of other same species so that relocation of new individuals will not upset the existing prey/predation function;
4. carrying capacity of the relocation location;
5. potential for relocated individual to transport disease;
6. low likelihood of fish reentering work site or becoming impinged on exclusion net or screen; and
7. Presence of aquatic predators.

Proposals to translocate any covered species will be reviewed and approved by the Wildlife Agencies.

A-25 When work is conducted in a salmonid-bearing stream, diversions shall maintain fish passage when the length of time the stream is dewatered exceeds two weeks in length.

Conditions for fish passage shall be met as long as the diversion: 1) maintains contiguous flows through a low flow channel in the channel bed, an artificial open channel, or in a pipe; 2) presents no vertical drops exceeding six (6) inches and follows the natural grade of the site; 3) is conducted such that water at the downstream end does not scour the channel bed or banks; and 4) maintains water depths in the bypass channel/pipe that is at or higher than average depths in the 150 feet of stream upstream of the beginning of the bypass channel. If fish passage requirements cannot be met, then fish passage may not be required. A qualified biologist may make adjustments on a site-specific basis if determined to be beneficial to the fish. An artificial channel used for fish passage shall be made of impervious material to prevent

loss of flows and lined with cobble/gravel. A closed conduit pipe may be used for fish passage. The inlets of diversions/pipes shall be checked daily to prevent accumulation of debris. If block nets are being used to keep leaf litter/debris out of the diversion, they will be checked at least twice per day.

Project Design

A-47 If a culvert is used, up- and downstream ends of the culvert must be appropriately designed so that the stream cannot flow beneath the culvert or create a plunge pool at the downstream end. Preference will be given to designs that allow a natural bottom (arch culvert) and/or those that restore or do not alter natural grade.

A-56 Increased water velocity at bank protection sites may increase erosion downstream. Therefore, bank stabilization site design shall consider hydraulic effects immediately upstream and downstream of the work area. Bank stabilization projects will be designed and implemented to provide similar roughness and characteristics that may affect flows as the surrounding areas just upstream and downstream of the project site. In streams supporting listed salmonids, preference will be given by NMFS to designs that incorporate bio-engineered measures and enhance instream habitat conditions.

Post-Construction

A-109 Large woody debris (LWD) is defined as downed trees, logs, and other large woody material within the stream channel that has a minimum diameter of 12 inches and a minimum length of 6 feet. In all streams with listed anadromous fish, LWD will be retained unless it is threatening a structure, or is causing excessive bank failure and increasing sediment loading to the stream. LWD will be assessed and managed in the following priority: (1) retaining the LWD feature; (2) modifying the LWD feature through repositioning to ameliorate the threat; (3) removing and replacing the LWD feature in another location to ameliorate the threat; or (4) removing the LWD feature from the stream channel. If removal is required, no more than two LWD removal projects may be conducted per year. When feasible, woody material that cannot be reused on site will be retained for future restoration projects.

Revisions to the Habitat Plan RGP Avoidance and Minimization Measures Required when Seeking Take Coverage for Listed Fish

RGP-2	No activity may substantially disrupt the necessary life cycle movement of aquatic species indigenous to the water body, including those species that normally migrate through the area, unless the activity's primary purpose is to impound water. Culverts placed in streams must be installed to maintain low-flow conditions and adequate fish passage. If feasible, they should be designed as open-bottom culverts and be capable of passing the 1 percent flow exceedance, or the 100-year flood event. New and replacement culverts must meet NMFS and CDFW design criteria for salmonid streams.

Listed Fish Avoidance and Minimization Measures

F-0	In-stream work may only occur between June 15 and October 15 unless approval by NMFS.
F-1	If pre-project conditions at a project site include fish passage impediment(s), the project design must include fish passage improvements. Projects that maintain or create fish passage impediments shall not be covered by the Program. Fish passage impediments may be determined through fish passage assessments or deemed an impediment by existing reports or databases (i.e., California Fish Passage Assessment Database).

F-2	New and replacement in-channel structures (e.g., bridge piers, footings, and abutments; culverts; fish screens) must meet NMFS and CDFW design criteria for salmonid streams.
F-3	Effects of temporary lighting during construction on listed species shall be minimized by: • Avoiding maintenance and construction activities at night, to the extent practicable. • Restricting substantial use of temporary lighting to the least sensitive seasonal and meteorological windows. • Shielding and focusing lights on work areas.
F-4	Creek protection barriers, screening, or netting shall be used on bridges over waterways during substantial bridge repavement or maintenance operations to keep any debris or construction materials from falling into streams.
F-5	When conducting in-water pile driving with an impact hammer, employ the following measures: • Perform fish capture and relocation, isolate the work area, and dewater the site before pile driving.
F-6	During in-water construction, areas below the OHWM will be isolated using cofferdams or similar isolation features during the approved in-water work window.
F-7	All fish will be removed from the work area once work area isolation measures are in place. To minimize the risk of harm or mortality, an attempt will first be made to capture fish within the isolation area with seines or dip nets. If fish are unable to be captured with a seine or net, electrofishing equipment will be used. Electrofishing will be conducted consistent with the Guidelines for Electrofishing Water Containing Salmonids Listed Under the Endangered Species Act (National Marine Fisheries Service 2000).
F-8	A qualified fishery biologist will conduct and supervise fish removal and handling activities to minimize effects to fish. Excluded fish will be moved to another part of the water body outside of the work area and released.

F-9	The work isolation area will be dewatered after initial fish removal efforts are completed. Pump intakes will be screened according to NMFS standards to prevent impacts to aquatic organisms that may have been missed during fish removal activities (NMFS 2011). A qualified fishery biologist will monitor the area being dewatered for any stranded fish. Any fish found during dewatering will be captured using dip nets or other similar means and released outside the work area.
F-10	For project actions involving in-water work within 500 feet of tidally influenced waters, potential temporary effects to water quality (e.g., sedimentation, turbidity, temperature, contaminants) shall be evaluated to 500 feet downstream of the action.
F-11	For new bridge construction, the following design standards apply: • For confined channels, the hydraulic section of the bridge will have the capacity to transport sediment and not aggrade or degrade up to at least a flood event occurring on a 20-year recurrence interval (Q20). This may be achieved if the crossing does not affect a stage change of more than 0.5 feet above what would occur in a channel with natural grade and no artificial confinements or controls at Q20. • For alluvial channels, the minimum bridge width will be equal to or greater than the active channel width, defined as the "channel migration zone" (CMZ) width. Delineation of the CMZ width would include the stream meander belt width relative to the lifespan of the structure. For example, a bridge designed for a lifetime of 100 years should not be smaller than the previous 100-year CMZ and the projected future 100-year CMZ width (CMZ100).
F-12	For bank stabilization projects, the following design criteria apply: • The Project must not diminish existing channel conveyance capacity (i.e., no net increase in fill within the active channel); • Regraded slopes must be planted with native vegetation in an upslope progression (e.g., grasses/forbes at the toe of slope, shrubs mid-slope, transitioning to trees at top-of-bank) appropriate for the site-specific conditions; • To minimize soil loss and improve riparian planting success, natural erosion-control fabric (e.g., jute netting) or other natural products (e.g., weed-free hay or natural mulch) may be used; • Large boulders and woody material, both live and dead, may be used for anchoring the slope toe. Live options include, but are not limited to, willow baffles, willow walls, and willow sprigs. To increase habitat complexity at the streambank/slope toe interface, logs with rootwads exposed may be used either by themselves or in conjunction with live plantings. Wood pieces may also be incorporated into the regraded streambank slope to increase habitat complexity at higher flows; • Natural cobble material sized appropriately to the Project site may be used in conjunction with the woody material alluded to above. Natural cobble material may not be mined on-site, but must be imported; and • Planted vanes, barbs, or other flow-deflecting designs may be used at the slope toe, but only if designed by an experienced practitioner and authorized by a licensed engineering professional.