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

September 30, 2019 **Refer to NMFS No:** WCRO-2019-01724

Randy LaVack
Branch Chief, Senior Environmental Planner
California Department of Transportation, District 4
50 Higuera Street
San Luis Obispo, California 93401-5415

Re: Endangered Species Act Section 7(a)(2) Biological Opinion, and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the County of Santa Cruz Emergency Relief Program (ER-32LO)

Dear Mr. LaVack:

Thank you for the California Department of Transportation's (Caltrans)[1] letter of June 24, 2019, requesting initiation of consultation with NOAA's National Marine Fisheries Service (NMFS) pursuant to section 7 of the Endangered Species Act of 1973 (ESA) (16 U.S.C. 1531 et seq.) for the County of Santa Cruz Emergency Relief Program (ER-32LO). Thank you, also, for your request for consultation pursuant to the essential fish habitat (EFH) provisions in Section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA)(16 U.S.C. 1855(b)) for this action.

The enclosed programmatic biological opinion is based on our review of Santa Cruz County's (County) proposed project and describes NMFS' analysis of potential effects on threatened Central California Coast (CCC) steelhead (*Oncorhynchus mykiss*), South-Central California Coast (S-CCC) steelhead, endangered CCC Coho salmon (*O. kisutch*), and designated critical habitat for these species in accordance with section 7 of the ESA. In the enclosed biological opinion, NMFS concludes the project is 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, and endangered CCC Coho salmon may occur. An incidental take statement which applies to this project with non-discretionary terms and conditions is included with the enclosed biological opinion.

NMFS has reviewed the proposed project for potential effects on EFH and determined that the proposed project would adversely affect EFH for Pacific Coast Salmon, which are managed under the Pacific Coast Salmon Fishery Management Plan. While the proposed action contains measures

[1] Pursuant to 23 USC 327, and through a series of Memorandum of Understandings beginning June 7, 2007, the Federal Highway Administration (FHWA) assigned and Caltrans assumed responsibility for compliance with Section 7 of the federal Endangered Species Act (ESA) and the Magnuson-Stevens Fishery Conservation and Management Act (MSA) for federally-funded highway projects in California. Therefore, Caltrans is considered the federal action agency for consultations with NMFS for federally funded projects involving FHWA. Caltrans proposes to administer federal funds for the implementation of the proposed project. Thus, per the aforementioned MOU, Caltrans is considered the federal action agency for this project.

to minimize, mitigate, or otherwise offset the adverse effects to EFH, an additional EFH Conservation Recommendation is included in this opinion. Please be advised that regulations (50 CFR 600.092) to implement the EFH provisions of the MSA require your office to provide a written response to this letter within 30 days of its receipt and prior to the final action. A preliminary response is acceptable if a final response cannot be completed within 30 days. Your final response must include a description of how the EFH Conservation Recommendation will be implemented and any other measures that will be required to avoid, mitigate, or offset adverse impacts of the activity. If your response is inconsistent without EFH Conservation Recommendation, you must provide an explanation for not implementing this recommendation at least 10 days prior to final approval of the action.

Please contact Elena Meza, North Central Coast Office in Santa Rosa, California at (707) 575-6068, or via email at Elena.Meza@noaa.gov if you have any questions concerning this section 7 and EFH consultation, or if you require additional information.

Sincerely,

Alecia Van Atta
Assistant Regional Administrator
California Coastal Office

Enclosure

cc: Tim Bailey, County of Santa Cruz, Timothy.Bailey@santacruzcounty.us
Copy to ARN File #151422WCR2019SR00139

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

County of Santa Cruz Emergency Relief Program

NMFS Consultation Number: WCRO-2019-01724

Action Agency: California Department of Transportation (Caltrans)

Table 1. Affected Species and NMFS' Determinations

ESA-Listed Species	Status	Is Action Likely to Adversely Affect Species?	Is Action Likely To Jeopardize the Species?	Is Action Likely to Adversely Affect Critical Habitat?	Is Action Likely To Destroy or Adversely Modify Critical Habitat?
Central California Coast steelhead (*Oncorhynchus mykiss*)	Threatened	Yes	No	Yes	No
South-Central California Coast steelhead (*O. mykiss*)	Threatened	Yes	No	Yes	No
Central California Coast Coho Salmon (*Oncorhynchus kisutch*)	Endangered	Yes	No	Yes	No

Table 2. 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	Yes

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

Issued By:

Alecia Van Atta
Assistant Regional Administrator
California Coastal Office

Date: September 30, 2019

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1 INTRODUCTION

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

1.1 Background

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

We completed pre-dissemination review of this document using standards for utility, integrity, and objectivity in compliance with applicable guidelines issued under the Data Quality Act (DQA) (section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001, Public Law 106-554). A complete record of this consultation is on file at the NMFS North-Central Coast Office in Santa Rosa, California.

1.2 Consultation History

Early coordination between NMFS and the California Department of Transportation (Caltrans) has been ongoing since March 2019. On June 24, 2019, NMFS received an initiation package from Caltrans requesting formal consultation for a subset of proposed actions that are likely to adversely affect Central California Coast (CCC) steelhead, South-Central California Coast (S-CCC) steelhead, CCC coho salmon, and designated critical habitat, and concurrence that a subset of proposed actions are not likely to adversely affect the aforementioned species. NMFS divided the consultation into two batches—individual project locations that Caltrans determined were not likely to adversely affect listed salmonids and critical habitats, and project locations that Caltrans determined that proposed actions were likely to adversely affect listed salmonids and critical habitats. NMFS consulted separately on projects that were "not likely to adversely affect" listed salmonids and critical habitats, and concurred with Caltrans' determinations on August 7, 2019 (WCRO-2019-01723). This consultation history addresses only the "likely to adversely affect" projects.

Several calls and email exchanges occurred between Caltrans, NMFS, and the County throughout the weeks following NMFS' receipt of the consultation request on June 24, 2019. NMFS reviewed the project package submitted on June 24, 2019 and by email on July 10, 2019, NMFS determined that sufficient information had been provided to initiate consultation. NMFS conveyed this consultation initiation date to Caltrans via email on July 10, 2019.

On July 16, 2019 Caltrans submitted updated information regarding the action area, amounts and placement of rock slope protection, lengths of retaining walls, and dewatering lengths. NMFS, Caltrans, and the County shared information through numerous emails between July 16, 2019 and September 10, 2019. NMFS utilized the information in Caltrans' Biological Assessment and the supplemental information provided by Caltrans and the County; however, in order to keep supplemental information in a single document, Caltrans prepared an addendum to the Biological

Assessment. This addendum was specific to the batch of "likely to adversely affect" projects, and was submitted to NMFS on September 11, 2019.

1.3 Proposed Federal Action

"Action" means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies (50 CFR 402.02). Federal action means any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken by a Federal Agency (50 CFR 600.910).

Caltrans proposes to provide federal funding assistance to the County to repair storm-damaged infrastructure sustained during the winter storm events. The purpose of the proposed action (or "Program) is to repair infrastructure to provide the public with safe roadways for travel. Implementation of the Program will take place over three construction seasons, beginning in 2020. During the winters of 2015-2016 and 2016-2017, local roadways and infrastructure throughout the County experienced a suite of damage including roadway slumps, slip-outs, failure of culverts, retaining walls, stormwater drainage systems, and landslides. The County proposes a variety of bank stabilization treatments to repair local infrastructure for safe travel. The type of bank stabilization treatment proposed by the County at each site depends on existing damage, site conditions, proximity to creeks and/or river banks, and long-term maintenance. Bank stabilization treatment options include softscape, hardscape, and hybrid methods. The repair method for each project may incorporate any combination of these methods. Specific details (e.g., design plans, staging areas, etc.) for some projects covered under this Program are currently unknown; however, the scope of activities necessary to complete each type of bank stabilization treatment are known, and are described below.

Softscape methods utilize vegetative materials and may include filling, regrading, and planting embankments, and incorporating elements of habitat complexity such as large woody debris (LWD) and/or root wads. Embankment fill repair typically includes placement of earthen material that is then compacted to restore the embankment. If suitable, earthen fill material may be excavated on-site; otherwise material will be imported. Slopes created from embankment fill repair may be utilized for habitat restoration or enhancement plantings. This method of repair will typically be utilized at sites located away from creeks and riverbanks to avoid potential erosion at the toe of the slope from water flow. To the maximum extent practicable, LWD will be retained on site either as aquatic habitat enhancements, or incorporated into stream bank stabilization or riparian habitat enhancement. Moreover, to the degree practicable and in order to reduce disturbance and impacts, the County will retain debris and sediment on the repair property, and erosion control and revegetation will be employed. Project specific specifications for LWD and/or root wad incorporation will be included in each project-specific restoration plan and will be submitted to NMFS prior to construction as described below in Section 1.3.2.

Hardscape methods utilize hard materials, such as rock slope protection (RSP), and/or retaining walls, and lack vegetative materials. Depending on the location of the proposed RSP placement, RSP will either be placed over a gravel filter layer or a geotextile filter fabric. RSP placed along embankments away from creeks and river banks will typically be lined with geotextile filter fabric to minimize undermining of native materials. Installation of RSP placed along creeks and

riverbanks will be designed to withstand wash-out during peak flows; and will typically be constructed with large sized rocks at the surface, smaller-sized rocks in an inner layer, and a gravel filter layer placed against the erodible embankment soils. Retaining walls will typically be utilized when the soft- and hardscape methodologies described above are not feasible; due to either insufficient space, steepness of slope, and/or the need for long-term full road closure. Four types of retaining walls are proposed including soil nail, soldier pile, crib, and mechanically stabilized earth retaining walls. All four retaining wall types require some amount of excavation, drilling and placement of structural elements, and backfilling with concrete or shotcrete, free draining material, soil, and/or compacted structural fill.

Hybrid methods include designs that incorporate both hard- and softscape methods. These may include RSP backfilled with soil and planted with vegetation or woody plants, utilization of LWD found on site, and/or retaining walls with adjacent embankments planted with native vegetation or woody debris. Softscape and hybrid methods, also referred to as bioengineering, are preferred, as they provide more habitat value for salmonids, and will be utilized wherever feasible.

Bank stabilization projects may require heavy equipment such as excavators, bulldozers, dump trucks, backhoe loaders, drill rigs, as well as hand-held tools such as shovels, chainsaws or jackhammers. Equipment will generally be operated from the existing road prism, although portions of equipment (e.g., excavator bucket, drill rig) may be required to operate outside of the developed road prism and below the ordinary high water mark (OHWM). In some cases, repairs from the bank or channel may only require hand-held tools.

In addition, the following activities may occur as part of any bank stabilization project: 1) constructing stormwater drainage facilities; 2) dewatering; 3) handling and relocating fish; 4) debris and sediment removal; 5) clearing and grubbing of vegetation; 6) tree Removal; 7) erosion control and revegetation; and 8) reconstruction and repaving roadways.

Stormwater drainage facilities include, but are not limited to, roadside ditches, open channel drains, subsurface gravel and perforated pipe trench drains, drainage inlets, manholes, longitudinal storm drain pipes, cross-culverts, curbs and gutters, overside drains, downdrains, and energy dissipaters. Ancillary activities may include pavement sawcutting, backfilling, and paving.

Debris can comprise brush and vegetation, LWD, broken pavement, or other miscellaneous debris. This work can involve removal of sediment and/or debris from the road, from adjacent shoulders or ditches, from embankments, or from channels. In order to reduce the footprint and impacts to the surrounding environment that is associated sediment and debris removal work, the County will remove debris and/or sediment only as required for proper function of the repair.

Clearing and grubbing involves removing and disposing of all unwanted surface material, such as trees, brush, grass, weeds, downed trees, and other material. Grubbing entails removing unwanted vegetative matter from beneath the ground surface, such as stumps, roots, buried logs, and other debris.

Due to the existing conditions present at the storm damage sites and the proposed construction activities, it may be necessary to remove trees to ensure public safety and construction access. Typical construction equipment may include a chainsaw and crane or bucket trucks and hauling truck. If within identified jurisdictional areas, replanting mitigation maybe necessary.

Storm damage sites will likely require pavement reconstruction at each project location. Existing pavement will be sawcut as defined by the limits of the pavement replacement and removed up to the subgrade depths specified by the engineer. Typical equipment for this activity includes a front loader tractor and compactor. An asphalt milling machine will remove the top layer of existing pavement along conform areas. An asphalt paver will then be used to place asphalt over an aggregate base layer and conform to the existing adjacent pavement to create a smooth transition.

Erosion control will be placed at most of project sites to protect the exposed slopes from degradation and to prevent sediment from discharging from the site. Typical construction activities in erosion control are hydroseed, erosion control blanket, geotextiles and fiber rolls. Re-vegetation is a large component of erosion control as the roots will help hold the topsoil in place and reduce velocity of surface drainage. The County will specify a native seed mix to be used and will typically require the spreading of native duff over project site to encourage native plants to proliferate.

As part of the Program, Caltrans proposes to provide funding for two small dam removal projects that the Resource Conservation District of Santa Cruz County will implement. The two dams, known as the Happy Valley Conference Center Dams (HVCCD) No. 1 and No. 2[2], will be removed from the wetted channel on Branciforte Creek. These dams are identified in the Passage Assessment Database as partial barriers during low flow conditions; dam No. 1 has a stable cascade through the apron that may also create a velocity barrier at very high flows from constriction of the channel (Passage ID: 8114 and 8116, respectively). Both flashboard dams were constructed on bedrock, and all concrete and metallic material associated with each dam[3] will be removed and disposed of off-site. As appropriate, anchored large wood structures will be installed to encourage scour. The banks will be revegetated with native rushes and sedges that will help to secure disturbed soils and lower the potential for sedimentation during future storm events. Removal of the two dams is scheduled for 2021. For more detail on dam removals, please see Appendix E of Caltrans' Biological Assessment (2019).

Caltrans proposes to include avoidance and minimization measures (AMMs) that will be implemented before, during, and after construction to prevent and minimize project-related effects to CCC and S-CCC steelhead, CCC coho, and their critical habitat. These measures include: working within the designated construction work window (June 15 – October 15); ensuring proper handling and relocation of listed species during diverting/dewatering; implementing erosion control best management practices (BMPs); minimizing effects to riparian vegetation; ensuring establishment of revegetation areas; preventing introduction of

[2] Dam No. 1 located at: 37.011244, -122.00016; Dam No. 2 located at: 37.01426, -121.998639

[3] Portions of each dam that are keyed into the bank that have become integral to bank stability will remain in place to protect roadways and residential access.

contaminants into creeks; and ensuring complete removal and proper disposal of all construction waste. A more detailed description of these measures can be found in Caltrans' County of Santa Cruz Emergency Relief Program Biological Assessment (2019). In addition to AMMs, there are limits on the size and number of projects that may be covered under this Program (described in Section 1.3.1 of this opinion).

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

1.3.1 Program and Project Limits

The following section outlines limitations for Program activities developed in collaboration with NMFS, Caltrans, and the County of Santa Cruz. This Program is designed to repair the damaged infrastructure identified in Appendix A of this opinion, and one additional unknown project on each stream listed below in Table 3. Each additional project is bound by the post mile (PM) range that Santa Cruz County provided. Post mile ranges for each road are identified in Section 2.3 of this opinion. The County identified these stretches of road as areas where infrastructure may be damaged during the upcoming 2019-2020 winter storm season. Limitations are outlined below for each project, as well as limitations for the entire Program. Any project that exceeds the specified limitations will not be covered under the Program, and therefore, must undergo separate consultations under section 7 of the ESA.

1.3.1.1 General Program Limitations

Any project in a salmonid-bearing stream (Table 3) that requires water diversions for more than two weeks will maintain fish passage through the work site. If environmental conditions at the project site preclude the installation of fish passage around the work site, then it will not be required. A qualified biologist will be present at the project site to make determinations, monitor fish passage conditions, and make site-specific changes as necessary. If a fish passage impediment is present at the work site, then the project design will remediate fish passage impediments per NMFS' fish passage guidelines (NMFS 2011), and will be reviewed by a NMFS fish passage engineer Any project that maintains, repairs, or installs fish passage impediments will not be eligible for coverage under the Program.

Table 3. Salmonid Bearing Streams within the County of Santa Cruz Emergency Relief Program Area

Branciforte Creek	Reggiardo Creek
Browns Valley Creek	Shingle Mill Gulch
Corralitos Creek	Stream 415 (Trib. to Browns Creek)
Granite Creek	Valencia Creek
Lompico Creek	

Pile driving with an impact hammer in flowing water will not be covered under the Program. Piles will be installed with drill mounted rigs or vibratory hammers, when necessary. If vibratory methods are insufficient, then the work area must first be isolated and dewatered before

completing installation with an impact hammer. Project and Program limits for bank stabilization and dewatering can be found in Sections 1.3.1.2 and 1.3.1.3 below.

1.3.1.2 Bank Stabilization Limitations

Program Limits. In addition to the limits above, the following limits also apply. Bank stabilization projects will be limited to projects where existing structures and infrastructure are threatened and existing bank stabilization projects are in need of repair. Stream reaches with destabilized banks will be assessed and evaluated for soil conditions, channel and bank scour velocities, slope stability, channel form and position, and other active geomorphic conditions. Consideration of the cause of the bank failure (e.g., overland runoff, bank slumping, undersized culvert) is critical to determining the appropriate treatment and approach. Where practicable and appropriate, bank stabilization projects will address the cause of the bank failure. Projects may utilize hard, soft, or hybrid materials as described above in Section 1.3. Bank stabilization projects may use hard materials (hardscape) to repair existing bank stabilization projects comprised of hard materials. These repairs will count towards the total acreage of bank stabilization allowed for the Program (0.2456 acres or 10,698 square feet). Soft and hybrid materials will be used wherever possible and to the extent feasible. Overall, hardscape associated with bank stabilization projects would account for no more than 17.3% percent (0.04256 acres or 1,854 square feet) of the total acreage limits for the Program. Bank stabilization projects will be separated by at least 1,500 feet. This requirement is intended to prevent multiple small projects from being used together to stabilize banks within a longer length of channel than is covered under the Program.

Individual Project Limits. Any bank stabilization treatment under the Program, including any combination of softscape, hardscape, and hybrid methods, will not exceed 160 linear feet. Projects will incorporate the recommended design criteria listed below to the extent feasible for a given project site:

1. regraded slopes will be planted with native plants in an upslope progression, where appropriate and as site conditions allow (e.g., grasses/forbes at the slope toe, shrubs mid-slope and transitioning to trees);
2. to minimize soil loss and improve riparian planting success, natural erosion-control fabric (i.e., jute netting) or other natural products (i.e., weed-free hay, natural mulch, etc.) may be used;
3. large boulders and wood 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, whether 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; and
4. natural cobble material sized appropriately to the project site may be used in conjunction with woody material. Natural cobble material will not be mined on-site, but must be imported.

1.3.1.3 Diversion and Dewatering Limitations

During each construction season, diversion and dewatering will be limited to: 1) a maximum of 200 linear feet of channel per project; 2) a cumulative seasonal maximum of 400 linear feet in each creek; and 3) a maximum of 4 projects per creek. This is intended to avoid the potential for short-term or temporary effects (i.e., habitat loss, turbidity, sedimentation) to have larger, additive impacts on steelhead, salmonids, and critical habitat.

The limitations described above also apply to the two dam removal projects within the wetted channel of Branciforte Creek with one exception: a maximum of 250 linear feet of channel may be diverted and dewatered at each dam removal project location.

1.3.2 Implementation Procedure

The following section outlines the procedure for implementing Program planning, review, and reporting requirements.

1. **Pre-Project Planning.** Caltrans and the County will work with NMFS and CDFW to ensure that when projects are to be incorporated into the Program, specifics of the Program are considered at the onset of each project and incorporated into all phases of project design, and that any constraints, such as the need for fish passage, are resolved early on.
2. **Caltrans Review.** For each project proposed to be covered under the Program, Caltrans will review the project to determine whether it meets the following criteria and is therefore appropriate to be included as a part of the Program:
    a. The proposed project falls within the description of the covered activity (i.e., bank stabilization).
    b. Caltrans will review and approve each project to be included in the Program to ensure that the project:
        i. Occurs within the boundaries of the action area (described in Section 2.3).
        ii. Is designed to meet NMFS fish passage criteria, if applicable.
        iii. Is designed within the Program and project limits specified above in Section 1.3.1.
        iv. Will not include any actions specifically excluded from the Program.
3. **Electronic Notification.** Once Caltrans makes a determination that a project satisfies the above criteria, Caltrans will submit a project package to NMFS for review and acceptance at least 30 days prior to the start of construction. For any project addressing a fish passage impediment, Caltrans will submit a project package to NMFS 90 days prior to construction for review and acceptance by NMFS engineers. The project package should be submitted electronically to the Caltrans Liaison at NMFS' Santa Rosa Office (elena.meza@noaa.gov).
    a. The project package must include the following items:

i. Action Notification Form[4]

ii. Detailed project description

iii. Site-Specific Restoration Planting Plan

iv. Design plans that are at least 60% complete

v. Fish Handling and Relocation Plan.

4. **Reporting.** Caltrans will submit the following reports[4] to the NMFS Santa Rosa Office:

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

   b. **Fish Relocation Report.** The County will submit a Fish Relocation Report by January 15 of the year immediately following construction. The County will submit the Fish Relocation Report to NMFS and to Caltrans. 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 salmonid 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 Restoration Report**. The County will submit a Site Restoration[4] Report by January 15 of the year immediately following completion of the site restoration associated with project-specific impacts. The County will submit the Site Restoration Report to NMFS and to Caltrans.

   d. **Annual Program 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 Caltrans deems necessary or helpful to assess the results of the actions authorized under the Program. Caltrans will provide the Annual Program Report to NMFS by January 15 of the year immediately following construction.

   e. **Annual Coordination Meeting**. Caltrans will convene an annual coordination meeting with NMFS by June 1 each year to discuss annual reports, updates on dam removals, and projects anticipated for completion during the next year.

[4] Fillable templates can be found in Appendix B.

2 ENDANGERED SPECIES ACT: BIOLOGICAL OPINION AND INCIDENTAL TAKE STATEMENT

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

Updates to the regulations governing interagency consultation (50 CFR part 402) will become effective on September 26, 2019 [84 FR 44976]. Because this consultation was pending and will be completed prior to that time, we are applying the previous regulations to the consultation. However, as the preamble to the final rule adopting the new regulations noted, "[t]his final rule does not lower or raise the bar on section 7 consultations, and it does not alter what is required or analyzed during a consultation. Instead, it improves clarity and consistency, streamlines consultations, and codifies existing practice." Thus, the updated regulations would not be expected to alter our analysis.

2.1 Analytical Approach

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

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

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

- Identify the rangewide status of the species and critical habitat expected to be adversely affected by the proposed action.
- Describe the environmental baseline in the action area.

- Analyze the effects of the proposed action on both species and their habitat using an "exposure-response-risk" approach.
- Describe any cumulative effects in the action area.
- Integrate and synthesize the above factors by: (1) Reviewing the status of the species and critical habitat; and (2) adding the effects of the action, the environmental baseline, and cumulative effects to assess the risk that the proposed action poses to species and critical habitat.
- Reach a conclusion about whether species are jeopardized or critical habitat is adversely modified.
- If necessary, suggest a RPA to the proposed action.

NMFS determines the range-wide status of critical habitat by examining the condition of its physical or biological features (also called "primary constituent elements" or PCEs) – which were identified when critical habitat was designated. The new critical habitat regulations (81 FR 7414 codified at 50 CFR 402.02) replace this term with physical or biological features (PBFs). The shift in terminology does not change the approach used in conducting a ''destruction or adverse modification'' analysis, which is the same regardless of whether the original designation identified PCEs, PBFs, or essential features. In this biological opinion, we use the term PBF to mean PCE or essential feature, as appropriate for the specific critical habitat.

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 consequences of the actions as a whole was formulated from the aforementioned resources and the programmatic biological assessment 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.

2.2 Rangewide Status of the Species and Critical Habitat

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

2.2.1 Species Description and Life History

The biological opinion analyses the effects of the federal action on the following Federally-listed species (Distinct Population Segment (DPS) or Evolutionary Significant Unit (ESU)) and designated critical habitat:

Central California Coast (CCC) steelhead DPS (*O. mykiss*)
Threatened (71 FR 834, January 5, 2006)
Critical habitat (70 FR 52488, September 2, 2005);

South-Central California Coast (S-CCC) steelhead DPS (*O. mykiss*)
Threatened (71 FR 834; January 5, 2006)
Critical habitat (70 FR 52488; September 2, 2005);

Central California Coast (CCC) Coho salmon ESU (*O. kisutch*)
Endangered (70 FR 37160, June 28, 2005)
Critical habitat (64 FR 24049; May 5, 1999).

The CCC steelhead DPS includes steelhead in coastal California streams from the Russian River to Aptos Creek, and the drainages of Suisun, San Pablo, and San Francisco Bays (71 FR 5248). The S-CCC steelhead DPS includes all naturally spawned steelhead populations in streams from the Pajaro River watershed (inclusive) to, but not including, the Santa Maria River, (71 FR 5248) in northern Santa Barbara County, California. There are no artificially propagated steelhead stocks within the range of the S-CCC steelhead DPS. The CCC Coho salmon ESU includes Coho from Punta Gorda in northern California south to, and including, Aptos Creek in central California, as well as populations in tributaries to San Francisco Bay, excluding the Sacramento-San Joaquin River system (61 FR 56138).

The action area is within designated critical habitat for CCC and S-CCC steelhead (steelhead), and CCC Coho salmon (coho salmon). CCC steelhead critical habitat is designated from the Russian River to the San Lorenzo River to a lateral extent of ordinary high water (OHW) in freshwater stream reaches, and to extreme high water in estuarine areas.

CCC Coho salmon critical habitat is designated to include all river reaches assessable[5] to listed coho salmon from Punta Gorda in northern California south to the San Lorenzo River in central California, including Arroyo Corte Madera Del Presidio and Corte Madera Creek, tributaries to San Francisco Bay. Critical habitat consists of the water, substrate, and adjacent riparian zone of estuarine and riverine reaches (including off-channel habitats).

2.2.1.1 General Life History of Listed Species

Steelhead are the anadromous form of *O. mykiss*, spawning in freshwater and migrating to marine environments to grow and mature. Steelhead have a complex life history that requires successful transition between life stages across a range of freshwater and marine habitats (i.e.,

[5] Accessible reaches are those within the historical range of the ESU that can still be occupied by any life stage of coho salmon. Inaccessible reaches are those above longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years) and specific dams within the historical range of the ESU identified in 64 FR 24049.

egg-to-fry emergence, juvenile rearing, smolt outmigration, ocean survival, and upstream migration and spawning). Steelhead exhibit a high degree of life history plasticity (Shapovalov and Taft 1954; Thrower et al. 2004; Satterthwaite et al. 2009; Hayes et al. 2012). The occurrence and timing of these transitions are highly variable and generally driven by environmental conditions and resource availability (Satterthwaite et al. 2009; Sogard et al. 2012).

Steelhead are generally divided into two ecotypes based on timing and state of maturity when returning to freshwater: summer-run and winter-run. Summer-run steelhead return to natal streams in spring and early summer while they are still sexually immature and spend several months maturing before spawning in January and February (Nielson and Fountain 2006). Winter-run steelhead enter natal streams as mature adults with well-developed gonads. They typically immigrate between December and April and spawn shortly after reaching spawning grounds (Shapovalov and Taft 1954; Moyle et al. 2008). Winter-run steelhead are the most common ecotype and are the only ecotypes expressed in the CCC and S-CCC steelhead DPSs.

Adult steelhead spawn in gravel substrates with low sedimentation and suitable flow velocities. Females lay eggs in redds, where they are quickly fertilized by males and covered. Egg survival depends on oxygenated water circulating through the gravel, facilitating gas exchange and waste removal. Adults usually select spawning sites in pool-riffle transition areas of streams with gravel cobble substrates between 0.6 to 10.2 centimeters (cm) in diameter and flow velocities between 40-91 cm per second (Smith 1973; Bjornn and Reiser 1991). Eggs incubate in redds for approximately 25 to 35 days depending on water temperature (Shapovalov and Taft 1954). Incubation time depends on water temperature, with warmer temperatures leading to lower incubation periods due to increased metabolic rates. Eggs hatch as alevin and remain buried in redds for an additional two to three weeks until yolk-sac absorption is complete (Shapovalov and Taft 1954). Optimal conditions for embryonic development include water temperatures between 6 and 10°C, dissolved oxygen near saturation, and fine sediments less than 5% of substrate by volume (Bjornn and Reiser 1991; USEPA 2001).

Upon emerging from redds, juvenile steelhead occupy edgewater habitats where flow velocity is lower and cover aids in predator avoidance. Rearing juveniles feed on a variety of aquatic and terrestrial invertebrates. As they grow, juveniles move into deeper pool and riffle habitats where they continue to feed on invertebrates and have been observed feeding on younger juveniles (Chapman and Bjornn 1969; Everest and Chapman 1972). Juveniles can spend up to four years rearing in freshwater before migrating to the ocean as smolts, although they typically only spend one to two years in natal streams (Shapovalov and Taft 1954; Busby et al. 1996; Moyle 2002). Successful rearing depends on stream temperatures, flow velocities, and habitat availability. Preferred water temperature ranges from 12 to 19°C and sustained temperatures above 25°C are generally considered lethal (Smith and Li 1983; Busby et al. 1996; Moyle 2002; McCarthy et al. 2009). In Central California streams, juvenile steelhead are able to survive peak daily stream temperatures above 25°C for short periods when food is abundant (Smith and Li 1983). Response to stream temperatures can vary depending on the conditions to which individuals are acclimated, however, consistent exposure to high stream temperatures results in slower growth due to elevated metabolic rates and lower survival rates overall (Hokanson et al. 1977; Busby et al. 1996; Moyle 2002; McCarthy et al. 2009).

Juveniles undergo behavioral, morphological, and physiological changes in preparation for ocean entry, collectively called smoltification. Juveniles begin smoltification in freshwater and the process continues throughout downstream migration with some smolts using estuaries for further acclimation to saltwater prior to ocean entry (Smith 1990; Hayes et al. 2008). Juveniles typically will not smolt until reaching a minimum size of 160 mm (Burgner et al. 1992). Smoltification is cued by increasing photoperiod. Stream temperatures influence the rate of smoltification, with warmer temperatures leading to more rapid transition. Downstream migration of smolts typically occurs from April to June when temperature and stream flows increase. Preferred temperature for smoltification and outmigration is between 10 and 17°C with temperatures below 15°C considered optimal (Hokanson et al. 1977; Wurtsbaugh and Davis 1977; Zedonis and Newcomb 1997; Moyle 2002; Myrick and Cech 2005). In coastal systems with seasonal lagoons, smolts may take advantage of higher growth potential in productive lagoon habitats before ocean entry (Osterback et al. 2018).

Adult steelhead are known to be highly migratory during ocean residency but little is known of their habitat use and movements. They have been observed moving north and south along the continental shelf, presumably to areas of high productivity to feed (Barnhart 1986). Adults will typically spend one to two years in the ocean, feeding and growing in preparation for spawning (Shapovalov and Taft 1954; Busby et al. 1996). Upstream migration typically begins once winter rains commence and stream flows increase. For coastal systems with seasonal freshwater lagoons, winter storms are required to breech the sandbars and allow access to upstream spawning sites. Within the action area, steelhead migrate through large, permanently open bays; S-CCC and CCC steelhead migrate through San Francisco Bay and Monterey Bay, respectively. Unlike most congenerics, steelhead are iteroparous, meaning they can return to spawn multiple times. Adult steelhead may spawn up to four times in their lifetime, although spawning runs predominantly consist of first-time spawners (~59%) (Shapovalov and Taft 1954). The maximum life span of steelhead is estimated to be nine years (Moyle 2002).

The life history of the coho salmon in California has been well documented (Shapovalov and Taft 1954; Hassler 1987; Weitkamp et al. 1995). In contrast to the life history patterns of other anadromous salmonids, coho salmon in California generally exhibit a relatively simple three year life cycle. Adult salmon typically begin the immigration from the ocean to their natal streams after heavy late-fall or winter rains breach the sand bars at the mouths of coastal streams (Sandercock 1991). Coho salmon are typically associated with small to moderately-sized coastal streams characterized by heavily forested watersheds; perennially-flowing reaches of cool, high quality water; dense riparian canopy; deep pools with abundant overhead cover; instream cover consisting of large, stable woody debris and undercut banks; and gravel or cobble substrates (Sandercock 1991). Immigration continues into March, generally peaking in December and January, with spawning occurring shortly after arrival at the spawning ground (Shapovalov and Taft 1954).

When in freshwater, optimal habitats for successful coho include adequate quantities of: (1) deep complex pools formed by large woody debris; (2) adequate quantities of water; (3) cool water temperatures [when maximum weekly average water temperatures exceed 18°C Coho salmon are absent from otherwise suitable rearing habitat (Welsh et al. 2001); temperatures between 12-14°

C are preferred; and the upper lethal limit is between 25-26°C.]; (4) unimpeded passage to spawning grounds (adults) and back to the ocean (smolts); (5) adequate quantities of clean spawning gravel; and (6) access to floodplains, side channels and low velocity habitat during high flow events. Numerous other requirements exist (*i.e*., adequate quantities of food, dissolved oxygen, low turbidity, *etc*.), but in many respects these other needs are generally met when the six freshwater habitat requirements listed above are at a properly functioning condition.

The eggs generally hatch after four to eight weeks, depending on water temperature. Survival and development rates depend, in part, on fine sediment levels within the redd. Under optimum conditions, mortality during this period can be as low as 10 percent; under adverse conditions of high scouring flows or heavy siltation, mortality may be close to 100 percent (Baker and Reynolds 1986). McMahon (1983) found that egg and fry survival drops sharply when fines make up 15 percent or more of the substrate. The newly-hatched fry remain in the redd from two to seven weeks before emerging from the gravel (Shapovalov and Taft 1954). Upon emergence, fry seek out shallow water, usually along stream margins. As they grow, juvenile coho salmon often occupy habitat at the heads of pools, which generally provide an optimum mix of high food availability and good cover with low swimming cost (Nielsen 1992). In the spring, as yearlings, juvenile coho salmon undergo a physiological process, or smoltification, which prepares them for living in the marine environment. Emigration timing is correlated with precipitation events and peak upwelling currents along the coast. Entry into the ocean at this time facilitates more growth and, therefore, greater marine survival (Holtby et al. 1990).

2.2.2 Status of Listed Species

NMFS assesses four population viability[6] parameters to discern the status of the listed ESUs and DPSs 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 steelhead and S-CCC steelhead DPSs, the CCC coho salmon ESU, and factors responsible for the current status of these listed species.

The population viability parameters are used as surrogates for numbers, reproduction, and distribution, as defined in the regulatory definition of jeopardy (50 CFR 402.20). 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.

2.2.2.1 CCC Steelhead

Historically, approximately 70 populations of steelhead existed in the CCC steelhead DPS (Spence et al. 2008; Spence et al. 2012). Approximately 37 of these populations were

[6] 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).

independent, or potentially independent, meaning they had a high likelihood of surviving for 100 years absent anthropogenic impacts (Bjorkstedt et al. 2005). The remaining populations were dependent upon immigration from nearby CCC steelhead DPS populations to ensure their viability (McElhaney et al. 2000; Bjorkstedt et al. 2005).

Abundance data for CCC steelhead are limited, however, existing information indicates population abundances have been substantially reduced from historical levels. In the mid-1960's, a total of 94,000 adult steelhead were estimated to spawn in CCC steelhead rivers, including 50,000 fish in the Russian River, the largest population in the DPS (Busby et al. 1996). Abundance estimates for smaller coastal streams in the DPS indicate low but stable levels with recent estimates for several streams (Lagunitas, Waddell, Scott, San Vicente, Pudding, and Caspar creeks) at individual run sizes of 500 fish or less (62 FR 43937). Some loss of genetic diversity has been documented and attributed to previous among-basin transfers of stock and local hatchery production in interior populations in the Russian River (Bjorkstedt et al. 2005). In San Francisco Bay streams, reduced population sizes and habitat fragmentation has likely also led to loss of genetic diversity in these populations. For more detailed information on trends in CCC steelhead abundance, see: Busby et al. 1996; Good et al. 2005; Spence et al. 2008; Williams et al. 2011; and Williams et al. 2016.

CCC steelhead have experienced serious declines in abundance and long-term population trends suggest a negative growth rate, indicating the DPS may not be viable in the long-term. DPS populations that historically provided enough steelhead immigrants to support dependent populations may no longer be able to do so, thereby putting dependent populations at increased risk of extirpation. Recent status reviews and return data indicate an ongoing potential for the DPS to become endangered in the future (Good et al. 2005). In 2006, NMFS issued a final determination that the CCC steelhead DPS is a threatened species, as previously listed (71 FR 834). A CCC steelhead viability assessment completed in 2008 concluded that populations in watersheds that drain to San Francisco Bay are highly unlikely to be viable, and that the limited information available did not indicate that any other CCC steelhead populations could be demonstrated to be viable (Spence et al. 2008).

In the Santa Cruz Mountains, the California Coastal Monitoring Program (CMP) has been recently initiated for CCC steelhead.[7] New information from three years of the CMP indicates that population sizes there are perhaps higher than previously thought. However, the long-term downward trend in the Scott Creek population, which has the most robust estimates of abundance, is a source of concern. Although steelhead occur in the Russian River, the ratio of hatchery fish to natural origin fish remains a concern. The viability of San Francisco Bay watershed populations remains highly uncertain. Population-level estimates of adult abundance are not available for any of the seven independent populations inhabiting the watersheds of the coastal strata (Novato Creek, Corte Madera Creek, Guadalupe River, Saratoga Creek, Stevens Creek, San Francisquito Creek, and San Mateo Creek). The scarcity of information on CCC steelhead abundance continues to make it difficult to assess whether conditions have changed

[7] For more information on the California Coastal Monitoring Program, visit: http://www.calfish.org/Home.aspx.

appreciably since the previous status review assessment of Williams et al. (2011). On May 26, 2016, NMFS chose to maintain the threatened status of the CCC steelhead (81 FR 33468).

2.2.2.2 S-CCC Steelhead

There is not sufficient data to quantitatively evaluate population viability, however, NMFS has used existing information to determine the general condition of the S-CCC steelhead DPS and factors responsible for the current status.

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 (Good et al. 2005). 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 (CDFG 1965) to less than 500 returning adult fish in 1996. More recent estimates for total run-size do not exist for the S-CCC steelhead DPS (Good et al. 2005).

Recent analyses conducted by NMFS (Boughton et al. 2006, Boughton et al. 2007, Williams et al. 2011, Williams et al. 2016) indicate the S-CCC steelhead DPS consists of 12 discrete sub-populations which represent localized groups of interbreeding individuals, and none of these sub-populations currently meet the definition of viable. Most of these sub-populations can be characterized by low population abundance, variable or negative population growth rates, and reduced spatial structure and diversity. The sub-populations in the Pajaro River and Salinas River watersheds are in particularly poor condition (relative to watershed size) and exhibit a greater lack of viability than many of the coastal subpopulations.

Although steelhead are present in most streams in the S-CCC DPS (Good et al. 2005), their populations are small, fragmented, unstable, and vulnerable to stochastic events (Boughton et al. 2006). Additionally, 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' 2005 status review concluded S-CCC steelhead remain "likely to become endangered in the foreseeable future" (Good et al. 2005). NMFS confirmed the listing of S-CCC steelhead as threatened under the ESA on January 5, 2006 (71 FR 834). Observations suggest the number of adult returns is fluctuating, sometimes below recent low numbers. The Coastal Monitoring Plan (CMP) was developed to standardize the sampling of salmonids in a way that would inform the Viable Salmonid Population (VSP) framework (Adams et al. 2011). Since the development of the CMP, there has been one effort to conduct population/red surveys in the S-CCC DPS (Carmel River) with mixed results (Williams et al. 2016).

Additional information on this steelhead DPS is available in NMFS' Status Review of West Coast Steelhead from Washington, Idaho, Oregon, and California (Busby et al. 1996), NMFS' final rule for listing steelhead (62 FR 43937), NMFS Southwest Fisheries Science Center

(SWFSC) reports (Boughton et al. 2006; Boughton & Goslin 2006; NMFS 2007),[8] and NMFS' recovery plan (NMFS 2013). New and additional information available since Good et al. (2005) does not appear to suggest a change in extinction risk. The two most recent status updates conclude that steelhead in the S-CCC steelhead DPS remain "likely to become endangered in the foreseeable future" (Williams et al. 2011, Williams et al. 2016), and in 2011 and 2016 NMFS chose to maintain the threatened status of the S-CCC steelhead DPS (76 FR 76386, 81 FR 33468). NMFS' recovery plans for CCC and S-CCC steelhead DPS' (NMFS 2016 and 2013, respectively) identified major threats to population recovery. For the CCC steelhead DPS these include: agriculture, water quantity and quality, urbanization and impaired passage. Similarly, major threats to the S-CCC steelhead DPS include: dams, surface water diversion, and groundwater extraction, urbanization, agriculture, and levees and channelization.

2.2.2.3 CCC Coho Salmon

Historically, the CCC coho salmon ESU was comprised of approximately 76 coho salmon populations. Most of these were dependent populations that needed immigration from other nearby populations to ensure their long-term survival, as described above. Historically, there were 11 functionally independent populations and one potentially independent population of CCC coho salmon (Spence et al. 2008). Most of the populations in the CCC coho salmon ESU are currently doing poorly. Low abundance is common, and some populations have been extirpated, as described below. A comprehensive review of estimates of historic abundance, decline, and present abundance of coho salmon in California is provided by Brown et al. (1994).

They estimated that annual spawning numbers of coho salmon in California ranged between 200,000 and 500,000 fish in the 1940's, which declined to about 100,000 fish by the 1960's, followed by a further decline to about 31,000 fish by 1991. Brown et al. (1994) concluded that the abundance of California coho salmon had declined more than 94 percent since the 1940's, with the greatest decline occurring since the 1960's. More recent abundance estimates vary from approximately 600 to 5,500 adults (Good et al. 2005). Recent NMFS status reviews (NMFS 2001; NMFS 2003; Good et al. 2005; Spence et al. 2008) indicate that the CCC coho salmon are likely continuing to decline in number. Recent status reviews for CCC coho salmon conclude that this ESU is presently in danger of extinction (NMFS 2001, NMFS 2003, Good et al. 2005, and Williams et al. 2011).

Available information suggests that CCC coho salmon abundance is very low, and the ESU is not able to produce enough offspring to maintain itself (population growth rates are negative). CCC coho salmon have experienced acute range restriction and fragmentation (Brown et al. 1994). Many dependent populations that supported the species' overall numbers and geographic distributions have been extirpated. This suggests that populations that historically provided support to dependent populations via immigration have not been able to provide enough immigrants for many dependent populations for several decades. Adams et al. (1999) found that in the mid 1990's coho salmon were present in 51 percent (98 of 191) of the streams where they

[8] The SWFSC has prepared several reports specifically for recovery planning that provide: 1) characterization of the S-CCC steelhead DPS historical population structure; 2) viability criteria for recovery; 3) assessment of threats; and 4) recommendations for recovery of the highest priority populations. See Boughton *et al.* (2006), Boughton & Goslin (2006), NMFS (2007).

were historically present, and documented an additional 23 streams within the CCC coho salmon ESU in which coho salmon were found for which there were no historical records.

Recent genetic research in progress by both the NMFS Southwest Fisheries Science Center and the Bodega Marine Laboratory has documented a reduction in genetic diversity within subpopulations of the CCC coho salmon ESU (Bjorkstedt et al. 2005). The influence of hatchery fish on wild stocks has also contributed to the lack of diversity through outbreeding depression and disease. The near-term (10-20 years) viability of many of the extant independent CCC coho salmon populations (Garcia River, Gualala River, Russian River, and San Lorenzo River) is of serious concern.

On June 28, 2005, NMFS issued a final listing determination for CCC coho salmon, changing their status from threatened to endangered (70 FR 37160). The most recent status review (81 FR 33468) documents conditions for CCC coho salmon have not improved since the last status review in 2011 (Williams et al. 2011). Williams et al. 2011 concluded CCC coho were in danger of extinction. Updated information does not indicate a change in the biological risk category for CCC coho salmon since the time of the last status review (Williams et al. 2016). Based on this information, NMFS chose to maintain the endangered listing of CCC coho salmon (81 FR 33468). NMFS's recovery plan (NMFS 2012) for the CCC coho salmon ESU identified the major threats to population recovery. These major threats include: roads, water diversions and impoundments, and residential development.

2.2.2.4 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, generally 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 Physical or Biological Features (PBF) and/or essential habitat types within the designated area that are essential to the conservation or protection (81 FR 7414). PBFs for CCC and S-CCC steelhead critical habitat and their associated essential features within freshwater include:

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

large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival.

For the CCC steelhead DPS, approximately 1,465 miles of stream habitat, and 386 square miles of estuarine habitat are designated critical habitat (70 FR 54288). Critical habitat for the DPS has been designated in the following CALWATER Hydrologic Units: Russian River, Bodega, Marin, San Mateo, Bay Bridge, Santa Clara, San Pablo, and Big Basin. There were 0.6 stream miles (1.0 km) excluded because they overlap with the Native America tribal lands (Coyote Valley and Redwood Valley Rancherias). No lands controlled by the Department of Defense were excluded.

For the S-CCC steelhead DPS, approximately 1,832 miles of stream habitat, and 442 square miles of estuarine habitat are designated critical habitat (70 FR 52488). Critical habitat for the DPS has been designated in the following CALTWATER Hydrologic Units: Pajaro River, Carmel River, Santa Lucia, Salinas, and Estero Bay. Tributaries in the Neponset, Soledad, and Upper Salinas Valley Hydrologic Sub-areas (HAS) were excluded from critical habitat and Department of Defense lands in Paso Robles, and Chorro HSAs were also excluded.

For CCC coho salmon, the following essential habitat types were identified: 1) juvenile summer and winter rearing areas; 2) juvenile migration corridors; 3) areas for growth and development to adulthood; 4) adult migration corridors; and 5) spawning areas. PBFs for coho salmon include adequate (64 FR 24049): (1) substrate, (2) water quality, (3) water quantity, (4) water temperature, (5) water velocity, (6) cover/shelter, (7) food, (8) riparian vegetation, (9) space, and (10) safe passage conditions (64 FR 24049).

The condition of CCC and S-CCC steelhead, and CCC coho salmon critical habitat, specifically its ability to provide for their conservation, has been degraded from conditions known to support viable salmonid populations. NMFS has determined that currently depressed population conditions are, in part, the result of the following human-induced factors affecting critical habitat[9]: 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 streambank 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 (Weitkamp *et al*. 1995; Busby et al. 1996; 64 FR 24049; 70 FR 37160; 70 FR 52488). Based on NMFS familiarity with the landscapes in which these critical habitats occur, these impacts continue to persist today. Widespread diverting of rivers and streams, as well as the pumping of groundwater hydraulically connected to stream flow, has dramatically altered the natural hydrologic cycle in many of the streams within the CCC and S-CCC steelhead DPSs, and CCC coho ESU which can delay or preclude migration and dewater aquatic habitat. Overall, the current condition of CCC and S-CCC steelhead, and CCC salmon critical habitat is degraded, and does not provide the full extent of conservation value necessary for the recovery of the species.

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

Reggiardo Creek, located within the Laguna Creek watershed, is not designated critical habitat for any species considered within this biological opinion. Thus, no further discussion of Reggiardo Creek, as it concerns critical habitat, will occur in the remainder of this biological opinion.

2.2.3 Additional Threats to CCC and S-CCC steelhead, CCC Coho Salmon, and Critical Habitat

Another factor affecting the rangewide status of CCC and S-CCC steelhead, CCC coho salmon, and their critical habitat at large is climate change. Impacts from global climate change are already occurring in California. For example, average annual air temperatures, heat extremes, and sea level have all increased in California over the last century (Kadir et al. 2013). Snow melt from the Sierra Nevada has declined (Kadir et al. 2013). However, total annual precipitation amounts have shown no discernible change (Kadir et al. 2013). CCC and S-CCC steelhead, CCC coho salmon may have already experienced some detrimental impacts from climate change. NMFS believes the impacts on listed salmonids to date are relatively minor but increasing (see below) because natural, and local, climate factors likely still drive most of the climatic conditions salmonids experience, and many of these factors have much less influence on salmonid abundance and distribution than human disturbance across the landscape. In addition, CCC and S-CCC steelhead, CCC coho salmon are not dependent on snowmelt driven streams and thus not directly affected by declining snow packs.

The threat to CCC and S-CCC steelhead, CCC coho salmon from global climate change will increase in the future. Modeling of climate change impacts in California suggests that average summer air temperatures are expected to continue to increase (Lindley et al. 2007; Moser et al. 2012). Heat waves are expected to occur more often, and heat wave temperatures are likely to be higher (Hayhoe et al. 2004; Moser et al. 2012; Kadir et al. 2013). Total precipitation in California may decline; critically dry years may increase (Lindley et al. 2007; Schneider 2007; Moser et al. 2012). Wildfires are expected to increase in frequency and magnitude (Westerling et al. 2011, Moser et al. 2012). Many of these changes are likely to further degrade salmonid habitat by, for example, reducing stream flows during the summer and raising summer water temperatures. Estuaries may also experience changes detrimental to salmonids. Estuarine productivity is likely to change based on changes in freshwater flows, nutrient cycling, and sediment amounts (Scavia et al. 2002, Ruggiero et al. 2010). In marine environments, ecosystems and habitats important to juvenile and adult salmonids are likely to experience changes in temperatures, circulation, water chemistry, and food supplies (Brewer and Barry 2008; Feely 2004; Osgood 2008; Turley 2008; Abdul-Aziz et al. 2011; Doney et al. 2012). These projections are for the mid to late 21st Century. In shorter time frames, climate conditions not caused by the human addition of carbon dioxide to the atmosphere are more likely to predominate (Cox and Stephenson 2007; Santer et al. 2011).

2.3 Action Area

"Action area" means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). The action area (Figure 1) for

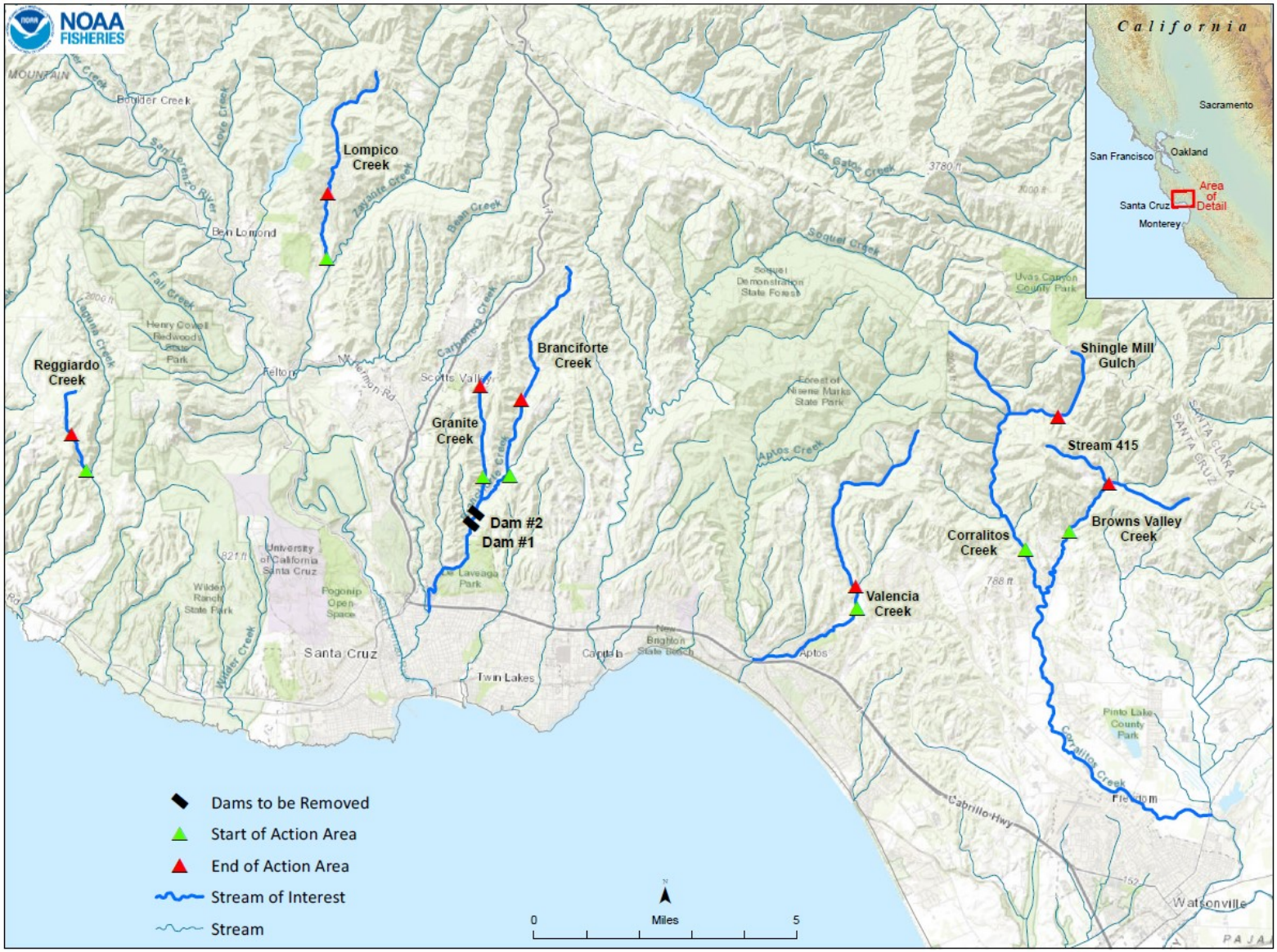
the Program includes nine creeks within four watersheds, located within the County of Santa Cruz, California:

- **Granite Creek** is a perennial tributary that flows to Branciforte Creek. The project sites range from post mile (PM) 0.5 – 2.40 along Granite Creek Road, east of Scotts Valley, on Granite Creek approximately 4.5 miles upstream of the Branciforte Creek confluence with the San Lorenzo River;
- **Branciforte Creek** is a perennial tributary that flows to the San Lorenzo River. The project sites range from PM 0.70 – 2.22 along Branciforte Drive, east of Highway 17. The two dams proposed for removal, and the stream reach between them, also make up a portion of the action area on Branciforte Creek;
- **Lompico Creek** is a perennial tributary that flows to Zayante Creek. The project sites range from PM 0.15 – 1.40 along Lompico Road, east of the Loch Lomond Reservoir, on Lompico Creek approximately three miles upstream from the Zayante Creek confluence with the San Lorenzo River;
- **Shingle Mill Gulch** is a perennial tributary that flows to Corralitos Creek. The project sites range from approximately PM 4.71 – 5.60 along Eureka Canyon Road, in south eastern Santa Cruz County, on Shingle Mill Gulch approximately eleven miles upstream from the Corralitos Creek confluence with Salsipuedes Creek;
- **Stream 415** is a very small intermittent stream that flows to **Browns Valley Creek** approximately fifty-feet downstream from the project site located at PM 2.93 on Browns Valley Road. Browns Valley Creek is a perennial tributary that flows to Corralitos Creek. The project sites range from PM 2.10 – 3.40 along Browns Valley Drive, north of Pinto Lake, on Browns Valley Creek approximately seven miles upstream from the Corralitos Creek confluence with Salsipuedes Creek;
- **Corralitos Creek** is a perennial tributary that flows to Salsipuedes Creek. The project sites range from approximately PM 1.45 – 4.70 along Eureka Canyon Road, on Corralitos Creek approximately 2.5 miles upstream from the Salsipuedes Creek confluence with the Pajaro River;
- **Valencia Creek** is a perennial tributary that flows to Aptos Creek. The project sites range from PM 1.80 – 2.55 along Valencia Road, north of Highway 1;
- **Reggiardo Creek** is a perennial tributary that flows to Laguna Creek. The project sites range from PM 3.55 – 4.35 along Smith Grade Road, northwest of Wilder Ranch State Park.

The action area for the entire Program covers approximately 1.56 acres and includes areas that may be affected by stream diversion, fish capture and relocation, dam removal, and construction activities; including the riverbed, banks, riparian corridor, and adjacent storage areas above top of bank adjacent to the river channel. For the Program as a whole, the action area is described by the stream reaches within the PMs noted above. For any project covered under the Program, the specific action area includes a maximum of 200 linear feet of creek that will be dewatered, and approximately 100 linear feet of stream channel downstream of each dewatered reach where temporary construction effects may occur.

As described above in Section 1.3.1.3, the two dam removal projects within the wetted channel of Branciforte Creek are exempt from this limit, and a maximum of 250 linear feet of channel may be diverted and dewatered at each dam removal project location.

Figure 1. Map of Action Area



2.4 Environmental Baseline

The "environmental baseline" includes the past and present impacts of all Federal, state, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of state or private actions which are contemporaneous with the consultation in process (50 CFR 402.02).

2.4.1 General Watershed Descriptions

Granite, Branciforte, and Lompico creeks ultimately flow to the San Lorenzo River. The San Lorenzo River is a central California coastal river that drains approximately 138 square miles, and is the largest watershed in Santa Cruz County (Griggs and Paris 1982). About 62 percent of the San Lorenzo River watershed is coniferous forest and about 22 percent of the watershed area is either shrub or grasslands; the remaining 16 percent is urban development. The climate is Mediterranean, with over 90 percent of annual precipitation occurring between November and April. Past and present land use within the San Lorenzo River watershed is generally comprised of historical logging, tanneries, and paper mills; later followed by tourism, urbanization, and residential development throughout the 20th Century. Major land uses in the watershed are forest, urban, open land, recreation, agriculture, and water (NMFS 2016). Flow from the San Lorenzo River watershed along with groundwater resources provides up to 80 percent of the water supply for the City of Santa Cruz system and is a key supply for the communities of the San Lorenzo Valley. The lower portion of the watershed is more urbanized (e.g., City of Santa Cruz), while land use in the upper watershed consists predominantly of rural residential, forest, and open land.

Waters from Browns and Corralitos creeks, and Shingle Mill Gulch ultimately flow to the Pajaro River. The Pajaro River drains to the Pacific Ocean near Monterey Bay, and drains an area of approximately 200 square miles within the County of Santa Cruz. The climate is Mediterranean, with over 90 percent of annual precipitation occurring between November and April. Cool, moist coastal fog generally alternates with clear, warm weather during the months of May through September. Flows within the watershed are highly variable and can go quickly from low base flow conditions to high flows and then quickly recede again. Land use is primarily agricultural, with smaller parcels of open space (mainly used for cattle grazing), and commercial and residential areas of Watsonville and other smaller communities.

The Aptos Creek watershed drains an area of approximately 25 square miles in southern Santa Cruz County. Aptos and Valencia creeks are the principal tributaries in the watershed. Land use in this watershed is comprised of forested lands, state parks, and some rural residential areas. More than half of the Aptos Creek portion of the watershed is forested, with the majority of the creek running through the southern portion of the Nisene Marks State Park. Land use within the Valencia Creek portion of the watershed is primarily rural residential and urban development. There are historical and modern day logging sites within the watershed.

The Laguna Creek watershed drains an area of approximately 8 square miles and is comprised of Laguna Creek, Reggiardo Creek, and several unnamed streams. Land use within the Laguna

Creek watershed is primarily rural residential and rangeland with large portions of public lands managed by California State Parks, the California Department of Fish & Wildlife (Bonny Doon Ecological Preserve), Bureau of Land Management, and the City of Santa Cruz.

Aptos Creek, Branciforte Creek, Valencia Creek, and Corralitos Creek are included on the 2012 Clean Water Act section 303(d) list of water quality limited segments (CRWQCB 2012). The pollutants in these streams are varied, including, but not limited to: pathogens, nutrients, fecal coliform, and sedimentation/siltation. The potential sources of these pollutants are also varied; nonpoint, urban runoff, resource extraction (e.g., via in-channel gravel mining), pasture grazing, and road construction are just a few.

As part of the baseline, NMFS also includes the informal consultation described above in Section 1.2 (WCRO-2019-01723) for projects that Caltrans determined were not likely to adversely affect listed salmonids, or critical habitat. Twenty-five projects were considered in this informal consultation at locations throughout the watersheds described above. Caltrans proposed roadway, drainage, and slope repairs outside the ordinary high water mark. NMFS concurred with Caltrans' determination that these projects were not likely to adversely affect listed salmonids or critical habitat on August 7, 2019.

2.4.2 Status of Listed CCC and S-CCC steelhead, and CCC Coho Salmon in the Action Area

Salmonid abundance data are not available for the all nine creeks within the action area of this Program; however, there are results from long-term fisheries surveys conducted within the San Lorenzo, Soquel, Aptos, and Pajaro watersheds (County of Santa Cruz 2018; DWAA 2004, 2006, 2007, 2008, 2009, and 2010). Combined, these surveys provide good information (as described below) for inferring the status of steelhead and coho salmon within the action area and inform the following assessment of the status of CCC and S-CCC steelhead, and CCC coho salmon in the action area.

2.4.2.1 CCC Steelhead in Santa Cruz County and the Action Area

CCC Steelhead are present in most of Santa Cruz County's streams that are accessible from the ocean including Waddell Creek, Scott Creek, San Vicente Creek, Laguna Creek, Majors Creek, Baldwin Creek, Wilder Creek, the San Lorenzo River, Arana Gulch, Rodeo Gulch, and Soquel Creek (Note: Pajaro populations are considered part of the S-CCC DPS described below). Only two estimates of historical (pre-1960s) abundance specific to this DPS are available for Santa Cruz County streams: the first reported an average of about 500 adults in Waddell Creek in the 1930s and early 1940s (Shapovalov and Taft 1954), and the second estimated 20,000 steelhead in the San Lorenzo River before 1965 (Johnson 1964).

The San Lorenzo River is the largest watershed in Santa Cruz County and the largest watershed in the Santa Cruz Mountains Diversity Stratum (NMFS 2016).[10] The San Lorenzo River

[10] The Central California Coast (CCC) steelhead Distinct Population Segment (DPS) consists of five Diversity Strata with 38 independent populations of winter-run steelhead (12 functionally independent and 26 potentially independent) and 22 dependent populations. The delineation of the CCC steelhead DPS Diversity Strata was based on environmental and ecological similarities and life history. Five strata were identified as North Coastal, Interior, Santa Cruz Mountains, Coastal San Francisco Bay, and Interior San Francisco Bay (for more information, see NMFS 2016).

steelhead population is considered a very important population within the DPS, and is a functionally independent population that likely provides frequent dispersal to nearby smaller coastal populations (NMFS 2016). The San Lorenzo River has played a central role in the history of steelhead in Santa Cruz County, and in 1954 was considered the best winter steelhead stream south of San Francisco Bay (Becker et al. 2008). DWAA (2004) notes two "functional regimes" in the San Lorenzo River system, the first being the lower and middle mainstem downstream from the Boulder Creek confluence and the second comprising the upper mainstem and tributaries. According to the DWAA (2004) report, "…results suggest that smolts leaving the system each year are mostly a combination of large YOYs from the middle and lower river, and yearlings from the tributaries and upper mainstem river." The large YOY from the middle and lower mainstem are highly dependent upon good stream flows to provide for fast-water feeding habitat necessary for faster growth.

Recovery criteria for the CCC steelhead San Lorenzo River population is a spawner density target of 3,200 (as described in NMFS 2016). In the lagoon at the mouth of the river, the juvenile steelhead population was estimated at 4,277 in August 2005, and 5,452 in September 2005, a wet year (Beck et al. 2006); although the author noted these estimates were likely overestimated due to long time periods between sample events. In 2013, Hagar Environmental Science estimated the population size of juvenile steelhead in the lagoon was 207 individuals (Hagar Environmental Science 2014). This estimate was more than double the population estimate observed in Spring 2012, but slightly less than half of the estimate from Spring 2011 (~500 individuals) (Hagar Environmental Science 2014). Few steelhead were captured during the spring-fall sampling period in 2014 (37, 10, and 8 steelhead during June, July and September sampling, respectively) (Hagar Environmental Science 2015).

The County of Santa Cruz is a partner of the Juvenile Salmonid and Stream Habitat Monitoring Program (JSSHM) that collects data on juvenile salmonid densities in the San Lorenzo, Soquel, Aptos, and Pajaro watersheds. Many of the long term data collection sites are located near stream reaches within the action area ((DWAA 2015, [Figure A-2, A-6, and A-7]) and provide the best baseline estimates of steelhead densities within the action area. The following survey data provide baseline estimates of juvenile CCC steelhead densities within the action area.

- Electrofishing surveys of upper Branciforte Creek from 2013 – 2018 yielded densities that ranged between 8.60 and 44.0 fish per 100 feet of creek, with an average density of 20 fish per 100 feet (County of Santa Cruz 2018).
- Electrofishing surveys of middle Branciforte Creek from 1998 – 2001, 2005, and 2012 – 2016 yielded densities between 7.90 and 69.60 fish per 100 feet of creek, with an average density of 44.99 fish per 100 feet (County of Santa Cruz 2018).
- Electrofishing surveys of lower Branciforte Creek from 1997 – 2018 yielded densities that ranged between 10.90 and 70 fish per 100 feet of creek, with an average density of 39.93 fish per 100 feet (County of Santa Cruz 2018). Survey efforts from the last sixteen years throughout the lower, middle, and upper[11] reaches of Branciforte Creek indicate a continued presence of juvenile steelhead both up- and downstream of the Branciforte

[11] As identified in DWAA 2015, Figures A-2, A-6, and A-7.

Creek reaches located within the action area despite multiple legacy flashboard dams (County of Santa Cruz 2018), and passage challenges in the lowest one-mile of a flood control channel operated and maintained by the City of Santa Cruz. While long term monitoring at the JSSHM sites indicates some level of successful adult steelhead migration through the flood control channel into the upper Branciforte Creek watershed, the high variability in average fish densities indicates that while the flood control channel is not a full barrier to the upstream passage of adult steelhead it may limit their upstream passage in some years (ESA 2018).

- Electrofishing surveys of Lompico Creek from 2007 – 2016 yielded densities that ranged between 7.10 and 123.30 fish per 100 feet of creek, with an average density of 47.0 fish per 100 feet (County of Santa Cruz 2018). Despite limited access to spawning and rearing habitat within Lompico Creek, survey efforts from the last ten years at one location on Lompico Creek indicate that steelhead are well documented immediately downstream of Lompico Creek reaches located within the action area.
- Electrofishing surveys of Valencia Creek from 2006 – 2018, and 1981 yielded densities that range between 3.0 and 43.0 fish per 100 feet of creek, with an average density of 20.08 fish per 100 feet (County of Santa Cruz 2018). Over the past ten years data collected at a sampling location, just upstream of the Valencia Creek reach within the action area, indicates a well-documented CCC steelhead presence despite habitat limited by low flows in the dry season, and very sandy substrate.

Reggiardo Creek is not documented as a CCC steelhead stream, but O. *mykiss* have been observed in this creek (Chris Berry, City of Santa Cruz, personal communication). And despite a boulder cascade on Laguna Creek that is a significant partial barrier, Jon Jankovitz of California Department of Fish and Wildlife (personal communication) recently observed an adult steelhead upstream of the cascade barrier that could potentially use Reggiardo Creek. Similarly, Granite Creek is not documented as a CCC stream, likely due to its small size and a significant partial, or complete, barrier at a private driveway just upstream from the confluence with Branciforte Creek (personal communication, Kristen Kittleson). Despite these conditions, due to its proximity to Branciforte Creek, steelhead presence is assumed, including in this portion of the action area.

Although recovery criteria are not met for the CCC steelhead population in the San Lorenzo River watershed, as described above, CCC steelhead maintain a regular presence in the watershed. Given the regular presence of steelhead within the broader San Lorenzo River watershed, the documented presence of CCC steelhead in reaches very near, or within, stream reaches in the action area, CCC steelhead are expected to occur in portions of the action area year round.

2.4.2.2 S-CCC Steelhead in Santa Cruz County and the Action Area

Portions of the Pajaro River and one of its major tributaries, Corralitos Creek, are located within Santa Cruz County and are known to support S-CCC steelhead. Relatively detailed information on historical distribution of *O. mykiss* in the Pajaro River is available due to surveys conducted by Snyder (1913), and Smith (1982). Department of Fish and Game records beginning in the 1930s, and Smith's (1982) later work, provide a comprehensive overview of steelhead and rainbow trout use in these streams. In late fall of 1981, the mean density of smolt-sized steelhead

at nine Corralitos Creek sites was 5.3 trout/meter, which was above the county-wide average. The mean density of smolt-sized steelhead at two sites in Brown's Valley Creek (tributary to Corralitos Creek) was 5.4 trout/meter, also, well above the countywide average (Titus et al. 2005). The mainstem of the Pajaro River once contained suitable spawning and rearing habitat for S-CCC steelhead, but it currently functions solely as a migratory corridor because of impacts from flood control projects, agriculture, and water withdrawals for agricultural use. Corralitos Creek is the first major tributary spawning steelhead can access as they migrate into the Pajaro River drainage.

Based on past estimates, recent observations, and the known impairments throughout the watershed, the Pajaro River steelhead population is recognized as having experienced significant declines as compared to its historic condition. Nehlsen *et al*. (1991) estimated Pajaro River adult steelhead escapement at less than 200. However, this estimate was made during the drought years of the late 1980s to early 1990s and was not based on empirical escapement counts. Busby *et al*. (1996) (referencing the findings of Nehlsen *et al*. [1991] and Reavis [1991]) estimated Pajaro River adult steelhead returns at less than 100. More recent estimates from other tributaries in the Pajaro River watershed suggest the total basin population, in some years, may be higher. For example, during the summer of 2008, a total of 62 individual adult steelhead were rescued and relocated from Uvas Creek (interior Pajaro River tributary) and an additional 6 individual adult carcasses were found (Coastal Habitat Education and Environmental Awareness, CHEER, unpublished rescue data summarized by NMFS). While these 68 adults do not constitute a complete annual run for Uvas Creek, as many adults likely emigrated after spawning and some that did not survive in the creek prior to rescue may have been scavenged, it does highlight that current abundance estimates for the Pajaro River watershed as a whole may be higher than previously considered.

Multiple creeks containing portions of the action area are located in the Pajaro River Watershed, which is part of the Interior Coast Range Biogeographic Population Group (BPG). The Interior Coast Range BPG region is the largest of the four BPGs in the S-CCCs Recovery Planning Area and includes the east-facing (interior) slopes of the Central Coast Ranges (Santa Lucia Mountains and Santa Cruz Mountains) and the west-facing slopes of the Inner Coast Range (Diablo, Gabilan, Caliente, and Temblor ranges). This region extends 180 miles across the entire length (north-to-south) of the SCCCS Recovery Planning Area and includes portions of Santa Clara, San Benito, Monterey, and San Luis Obispo Counties. This BPG consists of two major watersheds, the Pajaro River and Salinas River, which flow into the Pacific Ocean at Monterey Bay. The Pajaro River watershed includes the Salsipuedes, Corralitos (which contains the portions of the action area in the Pajaro River watershed), Casserly, San Benito River, Uvas, Pacheco and Llagas sub-watersheds. The Pajaro River steelhead run was identified as a Core 1 population within NMFS' S-CCC DPS recovery plan and is targeted by NMFS for increased conservation and recovery efforts (NMFS 2013).

A major concern in this BPG is that the mainstems of the two primary drainages, the Pajaro and Salinas rivers, are severely impaired by intensive anthropogenic activities related to agriculture, and residential development and associated water development and management. Additionally, historic logging in the upper watershed of the Pajaro River has created ongoing legacy effects as

a result of the removal of old growth forests, and associated roads. Ten anthropogenic activities ranked as the top five sources of stress to S-CCC steelhead viability in this BPG. These sources are not mutually exclusive and can be grouped into the following four general threat categories: 1) barriers to upstream and downstream migration (roads, dams, groundwater extraction, sand and gravel mining); 2) agricultural conversion of floodplain habitats; 3) recreational facilities and activities; and 4) water management activities, including dam operations, diversions, and groundwater extractions (Hunt & Associates 2008a). Despite widespread and varied habitat degradation to the coastal and middle mainstems of all these watersheds, native non-anadromous *O. mykiss* populations still inhabit the relatively high-quality habitats that persist upstream of the dams in this region, and low numbers of anadromous *O. mykiss* attempt to enter and spawn in each of the watersheds of the Interior Coast Range BPG when flow conditions are suitable.

As discussed above in Section 2.4.2.1, long term data collection on juvenile salmonid densities in the San Lorenzo, Soquel, Aptos, and Pajaro watersheds is ongoing as part of the JSSHM Program. Many of the data collection sites are located in, or near, stream reaches within the action area ((DWAA 2015, [Figure A-2, A-6, and A-7]) and provide the best baseline estimates of S-CCC steelhead densities within the action area. The following survey data provide baseline estimates of juvenile S-CCC steelhead densities within the action area.

- Electrofishing fishing surveys of Corralitos Creek from 1981, 1994, and 2006 – 2018 yielded densities that ranged between 8.8 and 87.1 fish per 100 feet of creek, with an average density of 44.89 fish per 100 feet (County of Santa Cruz 2018). Survey efforts from the past fifteen years on Corralitos Creek indicate a continued presence of S-CCC steelhead near the action area, despite habitat limited by roads and residential development.
- Electrofishing surveys of Shingle Mill Gulch from 2006 – 2017 yielded densities that ranged between 12.70 and 31.30 fish per 100 feet of creek, with an average density of 22.09 fish per 100 feet (County of Santa Cruz 2018). Despite the small size and steep nature of Shingle Mill Gulch, ten years of survey data indicate a continue presence of S-CCC steelhead very near the action area.
- Electrofishing surveys of Browns Valley Creek from 1981, 1994, and 2006 – 2017 yielded densities that ranged between 6.70 and 99.50 fish per 100 feet of creek, with an average density of 46.16 fish per 100 feet (County of Santa Cruz 2018). Stream 415 is a very small, unnamed tributary to Browns Valley Creek. S-CCC steelhead distribution in Stream 415 is unknown, but because this tributary is located approximately fifty feet upstream from Browns Valley Creek, a documented S-CCC stream, we assume steelhead may utilize Stream 415.

As described above S-CCC steelhead maintain a regular presence in the Pajaro watershed. Given the regular presence of steelhead within the broader Pajaro watershed, and the documented presence of S-CCC steelhead in reaches very near, or within, stream reaches in the action area, S-CCC steelhead are expected to occur in this portion of the action area year round.

2.4.2.3 CCC Coho Salmon in Santa Cruz County and the Action Area

Historically, coho salmon were believed to inhabit all or most of the accessible coastal streams along San Mateo and Santa Cruz County, possibly as many as 50 coastal drainages. By the

1960's coho salmon were believed present in seven stream systems in Santa Cruz County including Waddell Creek, Scott Creek, San Vicente Creek, San Lorenzo River System, Soquel Creek, Aptos Creek, and the lower Pajaro River System (Bryant 1994). According to Bryant (1994), of the streams and rivers known to historically support coho salmon south of San Francisco Bay (including rivers and streams in San Mateo, Santa Cruz, and Monterey counties) until the mid-1970's, only Scott Creek and Waddell Creek in Santa Cruz County have coho salmon returning (Bryant 1994). Long-term, historical data on the abundance of coho salmon in streams within Santa Cruz County are limited. Records of adult spawners and outmigrating smolts from Waddell Creek between 1933 and 1942 (Shapovalov and Taft 1954) constitute the main historical record of abundance in the county.

Surveys have been conducted regularly in the San Lorenzo River and its tributaries, and in 2005 rearing juvenile coho salmon were observed in the San Lorenzo River for the first time since 1982 (DWAA 2006, 2007, 2008; Hagar Environmental Science [HES] 2005; Jon Jankovitz, personal communication, 2013). These recent observations have reported low densities of fish. During the winters of 2003-2004, 2004-2005, 2005-2006, and 2012-2013, 14, 18, 2, and 1 adult coho salmon were encountered, respectively, at the adult migrant trap operated at the City of Santa Cruz Felton Diversion Dam[12] (DWAA 2008, 2013). In 2005, low numbers of juvenile coho salmon were observed at three locations in Bean Creek, a tributary of Zayante Creek (DWAA 2006 and 2007, and Hagar Environmental Science 2005). DWAA (2006) encountered coho salmon within two Bean Creek survey reaches, finding 19 fish in the 3,007-foot reach, and 178 fish in the 2,460-foot reach (0.6 and 7.2 fish per 100-feet of stream, respectively). Juvenile salmonid survey efforts within the San Lorenzo River watershed subsequent to 2005 did not encounter coho salmon through 2012 (DWAA 2007, 2008, 2009, 2010, 2012). The most recent documented coho salmon observations in the San Lorenzo River watershed occurred in late January/early February 2013 when two to three adult coho salmon (assumed females) were observed in the San Lorenzo River, within Henry Cowell State Park. One fish was observed directly upstream of a spawning redd, but was not observed actively spawning (J. Jankovitz, personal communication, 2013). Coho salmon are still found in Scott and Waddell creeks and were rediscovered in San Vicente Creek in 2002. In 2005, coho were observed for the first time in Laguna Creek (NMFS 2016).

The San Lorenzo River coho salmon population is at an extreme risk of extirpation (NMFS 2012). Given the sporadic occurrence of coho salmon within the broader San Lorenzo River watershed for the past decade, and the discovery of coho in Laguna Creek, NMFS concludes that coho salmon are likely to occur in the action area, but in very low numbers.

2.4.3 Status of CCC and S-CCC steelhead, and CCC Coho Salmon Critical Habitat in the Action Area

Excluding Reggiardo creek, the action area is designated critical habitat for CCC and S-CCC steelhead, and CCC coho salmon, and supports spawning, rearing, and migration of these listed species. Essential features include substrate, water quality, water quantity, water temperature,

[12] The Santa Cruz Felton Diversion Dam is located on the mainstem San Lorenzo River downstream of the Zayante Creek confluence.

water velocity, cover/shelter, food, riparian vegetation, space, and safe passage conditions. The principle factors responsible for current steelhead and salmon habitat conditions in the action area are described below and organized by the major factors responsible for current habitat conditions: water diversions, sedimentation, channelization, and loss of riparian vegetation and wood from streams.

Branciforte Creek within the action area consists of pools and riffles with riparian canopy cover. The canopy consists of Douglas fir, box elder, hazelnut, big leaf maple, and oaks. Surface flows are typically perennial, and are suitable to support adult spawning and juvenile rearing. The creek bed is comprised of cobbles, boulders, fine sediment, and some LWD. Habitat conditions in and near the action area are generally sufficient to support freshwater life stages of steelhead and coho; however, the area is impaired by sub-optimal spawning conditions, low summer streamflow, and shallow pool conditions. DWAA (2017) rates the smolt habitat within the action area as average. As described above in Section 1.3, there are two partial barriers on Branciforte Creek that are proposed for removal as part of this Program.

Limited survey data exists for Granite Creek likely because it is not a documented salmonid stream due to its small size and a significant partial, or complete, barrier at a private driveway just upstream from the confluence with Branciforte Creek. As described above in Section 2.4.2.1, salmonid presence is assumed due to its proximity to Branciforte Creek. Additionally, NMFS also assumes the Branciforte Creek conditions described above are representative of the action area in Granite Creek.

Lompico Creek in the action area consists of pools and riffles with a dense riparian canopy. The woodland riparian canopy consists of redwoods, alders, hazel, and oaks. There is some bedrock in the creek streambed, along with gravels, cobbles, boulders, and old concrete riprap. Surface water flows are typically perennial within the action area and suitable to support adult spawning and juvenile rearing. Regarding fish passage, most of Lompico Creek is accessible to steelhead, although a four-foot high bedrock ledge is reported approximately 900 feet upstream of Lompico Creek's confluence with Zayante Creek (Kittleson Environmental Consulting 2017). A fish ladder is installed at this location that has improved access since the 1980s (Becker et al. 2008), but this site is considered a partial barrier to upstream adult fish passage in the Passage Assessment Database)[13]

There is limited survey data on the stream reach within the Valencia Creek action area, but surveys just downstream do exist (Conrad 2003); NMFS assumes these downstream conditions are similar to that of the action area. Valencia Creek has pools created by bedrock and LWD, and shallow riffles with moderate riparian canopy cover. There is some bedrock within the creek bed, in addition to gravels, cobbles, and boulders; but sediment is mostly sand dominated. Habitat conditions near the action area are sufficient to support freshwater life stages of steelhead and coho; however, the area is impaired by low flow conditions in summer, fine sediment loading, and habitat complexity.

[13] For more information, please visit the Passage Assessment Database, hosted by CDFW.

There is limited survey data on the stream reach within the Reggiardo Creek action area, but surveys from Laguna Creek, just downstream of the action area, do exist; NMFS assumes these downstream conditions are similar to that of the action area. Suitable spawning areas for salmonids were lacking in Laguna Creek, and thought to be a limiting factor to steelhead production. In contrast, rearing habitat for juvenile salmonids, in the form of pools and cover, was abundant and of high quality. Natural bedrock falls, beginning at about 3.2 km above the mouth, were identified as migration barriers to adult steelhead; though adults have been observed by Chris Berry, City of Santa Cruz, above this barrier (personal communication).

As determined during a survey in July 2019 by Kristen Kittleson, Stream 415 in the action area is a very small perennial stream with shallow pools, LWD, cobbles, boulders, relatively sandy substrate, and moderate canopy cover. Despite a few large boulders at the confluence of Stream 415 and Browns Valley Creek, approximately 50 feet downstream, steelhead passage is possible at higher flows; two small fish assumed to be juvenile steelhead, were observed within Stream 415. Browns Valley Creek, Shingle Mill Gulch and Corralitos Creek within the action area consists of pools and riffles, with moderate riparian canopy cover. The creek beds are comprised mostly of cobbles, gravel, and sandy substrate, with moderate densities of LWD within Corralitos Creek. When comparing most recent survey data (2015) to past observations, DWAA determined that some pool filling had occurred within reaches in Corralitos Creek, while pool depth within Browns Valley Creek had increased. While Corralitos Creek downstream of Browns Valley Road, and the action area, typically goes dry by mid-summer, flows typically remain in the upper watershed, including the action area, and ongoing surveys from DWAA (2006, 2007, 2008) indicate that overall habitat conditions within the Browns Valley Creek, Shingle Mill Gulch, and Corralitos Creek action area are sufficient to support various life stages of steelhead.

Water diversions and resulting decreases in stream flow are a limiting factor for fisheries in the action area (NMFS 2012). Depletion and diversion of natural flows have altered natural hydrological cycles, and subsequent flows, in most streams inhabited by CCC and S-CCC steelhead and CCC coho salmon in Santa Cruz County. Reduction of flows negatively affect salmonid habitat by loss of usable habitats due to dewatering and blockage, stranding of fish resulting from rapid flow fluctuations; migration delays, entrainment of juveniles into unscreened or poorly screened diversions, and increased lethal and sublethal effects resulting from increased water temperatures (Bergren and Filardo 1993, Chapman and Bjornn 1968). Reduced flows degrade or diminish fish habitats via increased deposition of fine sediments in spawning gravels, decreased recruitment of new spawning gravels, and encroachment of riparian and non-endemic vegetation into spawning and rearing areas.

Water diversions in the Aptos Creek watershed varies from year to year depending on the amount of rainfall received the previous winter and the season weather patterns; water is supplied to local residents primarily from groundwater. The County of Santa Cruz GIS database indicated there are records of approximately 250 private wells in the Aptos/Valencia watershed. However, no records are available regarding the quantity of water diverted from these wells (SHG 2001). The impact of diversions on spring and summer baseflows (particularly during drought conditions) are unknown but, based upon impacts to baseflow in other watersheds in the

Santa Cruz Mountains Diversity Stratum (e.g., San Gregorio, Pilarcitos, San Lorenzo, Soquel), adverse impacts in the portion of the action area in Valencia Creek are probable.

As described in the CCC steelhead and CCC coho salmon recovery plans, road densities are high throughout the San Lorenzo River and Aptos Creek watersheds (NMFS 2016; NMFS 2012). Road densities are estimated at 5.3 and 3.7 miles of road per square mile of watershed area, and at 6.2 and 4.6 miles per square mile of riparian area, respectively. Roads were determined as a primary sediment source, including private, public, and timber harvest roads (Santa Cruz County 2001). Paved and unpaved roads parallel many of the waterways within the action area likely impinging on channel migration. The periodic grading and leveling of unsurfaced roads continuously expose erodible material both on the road surface and along the road shoulders. This loose, unconsolidated material is frequently mobilized during winter storms when it enters the water column. Many of these roads have areas that fail recurrently at the same unstable locations. These reoccurring bank failures contribute to ongoing instream sedimentation and often are addressed by bank hardening. Stabilization of banks along road corridors, without reestablishment of riparian vegetation, furthered additional bank instability and increased rates of sediment input.

Aquatic habitats in the San Lorenzo River watershed, including the action area, have deteriorated considerably from historical conditions (Santa Cruz Planning Department 1979) due to increased rates of sediment input into the river. The high rates of sediment input have impaired salmonid spawning, feeding, and rearing habitats by burying spawning gravels, disrupting invertebrate (salmonid food) production, and filling in pools needed by salmonids for thermal and predator refuge. Similar pool filling has also occurred within Valencia Creek degrading habitat. Elevated rates of fine sediment input are considered by many fisheries experts to be the primary limiting factor to salmonid production in the San Lorenzo River watershed, including portions of the action area (DWAA 2004).

Similar degradation of habitat has occurred in the Pajaro River, including the portion of the action area in this watershed. Present land use practices continue to degrade water quality of the Pajaro River and many of its tributaries. The mainstem Pajaro River once supported spawning and rearing habitats (Snyder 1913) for S-CCC steelhead. Most spawning and rearing habitats are gone or degraded due to agricultural runoff throughout the watershed, high sedimentation rates in the upper watershed from gravel mining and urbanization, and in-channel erosion within the lower watershed from levee maintenance actions. Sedimentation from these activities has changed the streambed into a primarily sand dominated system no longer capable of supporting essential life functions for S-CCC steelhead.

Other impacts of roads include changes and losses to riparian vegetation and structure that lead to ongoing impacts to water quality. Many of the streams in the County have reduced riparian complexity, and most have gaps in the riparian corridor. Santa Cruz County had been conducting logjam removal at the request of streamside property owners starting in the 1970s[14]. The purpose of cutting up large woody material in the past was to prevent or reduce potential flooding and bank erosion to adjoining property owners. Lasserette (2003) indicates the majority of large

[14] Santa Cruz Board of Directors Flood Control and Water Conservation District Resolution NO. 417-71.

woody debris (LWD) in the County has accumulated in connection with infrastructure such as bridges, culverts, and road crossings because many were designed and constructed without consideration of passing large wood. Few remaining watersheds in the County, including those within the action area, retain the appropriate levels of large wood to sustain various life stages of salmonids (NMFS 2012). Riparian vegetation clearing has not been limited to County operations; private landowners have cleared riparian vegetation with or without County approval.

Modifications to riparian corridors have reduced salmonid carrying capacity. Wood in and over streams creates cover from predators, and large woody debris often results in the localized scour of deep pools that provide salmonids thermal refuge and hiding places from predators (Dolloff 1983). The loss of riparian vegetation removes cover for fish over streams, and reduces the amount of wood that enters stream channels from tree death, wind-throw, and bank erosion. The result is a reduction in a stream's carrying capacity for juvenile fish, particularly coho salmon (Glova 1978). In the CCC coho salmon ESU, watersheds that have increased agricultural and/or urban development also have depressed populations of coho salmon (NMFS 2010 and 2012) in large part due to the removal or reduction of large wood elements in stream channels and floodplains.

The long-term effects of climate change have been presented above, and include temperature and precipitation changes that may affect steelhead, coho salmon, and critical habitat by changing water quality, streamflow levels, and salmonid migration in the action area. The threat to salmonids in in the action area from climate change is likely going to mirror what is expected for the rest of Central California. NMFS expects that average summer air temperatures in the action area would continue to increase, heat waves would become more extreme, and droughts and wildfire would occur more often (Lindley et al. 2007; Moser et al. 2012, Hayhoe et al. 2004, Moser et al. 2012; Kadir et al. 2013, Schneider 2007, Westerling et al. 2011). Many of these changes are likely to further degrade CCC and S-CCC steelhead and CCC coho salmon critical habitat throughout the action area by, for example, reducing streamflow during the summer and raising summer water temperatures.

2.4.4 Previous Section 7 Consultations and Section 10(a)(1)(A) Permits in the Action Area

Pursuant to Section 7 of the ESA, NMFS has completed many interagency consultations that have affected the action area. Over the past two decades, NMFS has conducted seventeen individual Section 7 consultations throughout the action area. Thirteen, including the one described above at the beginning of the Environmental Baseline, were informal consultations and resulted in NMFS' concurrence that the proposed project was not likely to adversely affect ESA-listed species or their designated critical habitat. Five were formal consultations where proposed actions were likely to adversely affect ESA-listed fish species or their designated critical habitat, and resulted in biological opinions containing reasonable and prudent measures to minimize the impacts of incidental take of listed species. Formal and information consultations covered a range of project types across the action area and are summarized in Table 4 below.

Stream restoration actions under programmatic consultations may take place in Santa Cruz County, including the reaches located within the action area. These programmatic consultations include the NOAA Restoration Center's restoration program, the Regional General Permit

programmatic consultation with the California Department of Fish and Wildlife (CDFW), and the programmatic consultation with the Corps for the Santa Cruz County Partners in Restoration program. These consultations anticipate a limited amount of take for juvenile salmonids during instream work conducted in the summer months. NMFS determined these restoration actions are likely to improve habitat conditions for listed species and that the limited amount of take anticipated is unlikely to affect future adult returns.

In addition to the above, NMFS also conducted a programmatic consultation, the Large Woody Material Management Program in Santa Cruz County, where the proposed suite of activities was likely to adversely affect ESA-listed fish species or critical habitat, which resulted in a programmatic biological opinion.

NMFS' Section 10(a)(1)(A) research and enhancement permits and section 4(d) limits or exceptions could potentially occur in any of the watersheds covered under this Program, including the reaches within the action area. Salmonid monitoring approved under these programs includes carcass surveys, smolt outmigration trapping, and juvenile density surveys. In general, these activities are closely monitored and require measures to minimize take during the research activities. NMFS determined these research projects are unlikely to affect future adult returns.

Table 4. Summary of Previous Formal and Informal Section 7 consultation in the Action Area

Consultation Type	Project Category	Completed Consultations
Informal	Culvert Repair and Replacement	3
	Road Repair	7
	Road Turnaround	2
	Dam Intake Repair	1
	Erosion	1
Formal	Culvert Repair	1
	Road Repair	2
	Drought Contingency Plan	1
	Fish Ladder	1

2.5 Effects of the Action

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

In this biological opinion, our approach to determine the effects of the action was based on institutional knowledge and 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), directly or indirectly caused by the proposed action, to which CCC and S-CCC steelhead, CCC coho salmon 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. PBFs

include sites essential to support one or more life stages of the species. These sites for migration, spawning, and rearing, in turn, contain physical and biological features that are essential to the conservation of the species. 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.

Construction activities associated with the proposed projects may affect CCC and S-CCC steelhead, CCC coho salmon, and their critical habitats. The following may result from construction activities: unintentional direct injury or mortality during fish collection, relocation, and dewatering activities; loss of benthic habitat; temporary reductions in riparian vegetation and cover; temporary increases in suspended sediments; hazardous materials and contaminants from heavy machinery and construction materials; altered channel morphology; disturbance or direct injury from construction-related activities (e.g., noise), and permanent improvements to fish passage. These effects are described in more detail below.

2.5.1 Fish Collection and Relocation

To facilitate completion of each project, streams may need to be dewatered. As discussed above in Section 1.3.1, no more than 200 linear feet will be dewatered for each project. The Program proposes to collect and relocate fish in the work area prior to and during dewatering to avoid fish stranding and exposure to construction. Before and during dewatering of the construction site, juvenile steelhead and coho salmon will be captured by a qualified biologist using one or more of the following methods: block net, dip net, seine, and/or electrofishing. Collected fish will be immediately released downstream of the construction area. Depending on the number of fish captured and the size of the stream, fish may be released at multiple sites to minimize overcrowding of available habitat. Since construction is scheduled to occur between June 15 and October 15, relocation activities will occur during the summer low-flow period after emigrating smolts have left and before adults have immigrated for spawning. Only juvenile steelhead and coho salmon are expected to be in the action area during this construction period. Therefore, NMFS expects capture and relocation of listed species will be limited to pre-smolting juveniles.

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 amount of unintentional injury and mortality attributable to fish capture varies widely, depending on the method used, the ambient conditions, and the expertise and experience of the field crew. 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. Based on prior experience with current relocation techniques and protocols likely to be used to conduct the fish relocation, unintentional mortality of listed juvenile steelhead and salmon expected from capture and handling procedures is not likely to exceed 3 percent.

Relocated fish may also have to compete with other fish causing increased competition for available resources such as food and habitat. Reponses to crowding by salmonids include self-thinning, resulting in emigration and reduced salmonid abundance with increased individual

body size within the group, and/or increased competition (Keeley 2003). Some of the fish released at the relocation sites may choose not to remain in these areas and move either upstream or downstream to areas that have more vacant habitat and a lower density of fish. As each fish moves, competition remains either localized to a small area or quickly diminishes as fish disperse. In some instances, relocated fish may endure short-term stress from crowding at the relocation sites. Such stress is not likely to be sufficient to reduce their individual fitness or performance. Although sites selected for relocating fish will be pre-approved by NMFS, should have similar water temperatures as the capture sites, and should have adequate habitat to allow for survival of transported fish and fish already present, in some instances fish may endure short term stress from crowding at the relocation sites. NMFS cannot accurately estimate the number of fish likely to be affected by competition, but does not expect this short-term stress to reduce the individual performance of steelhead or coho salmon, or cascade through watershed population of these species based on the area that will likely be affected and the relatively small number of salmonids likely to be relocated. Fish that avoid capture during relocation may be exposed to risks described in the following section on dewatering (see Section 2.5.2 below).

To estimate the number of juvenile steelhead and salmon that may be present in the action area, NMFS used the data described above from surveys performed by the County of Santa Cruz within the San Lorenzo, Soquel, Aptos, and Pajaro watersheds, and surveys performed by DWAA within the San Lorenzo River watershed. Using the high end of the density data provided above in Section 2.4.2, estimates for the maximum number of CCC and S-CCC steelhead to be collected and relocated can be found in Table 5. For projects taking place in streams not listed in Table 5, the density estimate for the closest, connected stream was used.

Table 5. Maximum Steelhead Densities by Stream. Data derived from Section 2.4.2.

Watershed	Stream	DPS/ESU	Max Density (# fish/100 feet)
San Lorenzo	Upper Branciforte	CCC	44.0
	Middle Branciforte	CCC	69.9
	Lower Branciforte	CCC	70.0
	Lompico	CCC	123.3
Aptos	Valencia	CCC	43.0
Pajaro	Browns Valley	S-CCC	99.5
	Corralitos	S-CCC	87.1
	Shingle Mill	S-CCC	31.3

To calculate dewatering lengths, NMFS used the known dewatering lengths for each of the projects listed in Appendix A, combined with the Program dewatering limits described above in Section 1.3.1.3 for each additional project that may take place on salmonid streams identified above in Table 3. Using these data, maximum dewatering lengths for each stream, salmonid DPS/ESU, and the entire Program can be found in Table 6 below.

Table 6. Maximum Dewatering Lengths by Stream and ESU/DPS

Watershed	Stream	DPS/ESU	Max. Dewatering for Program (linear feet)
San Lorenzo	Granite Creek	CCC	364
	Branciforte	CCC	*934
	Lompico Creek	CCC	518
Aptos	Valencia Creek	CCC	400
Laguna	Reggiardo Creek	CCC	290
ESU/DPS Total Dewatering			**2,506**
Pajaro	Stream 415	S-CCC	245
	Browns Valley Creek	S-CCC	264
	Corralitos Creek	S-CCC	280
	Shingle Mill Gulch	S-CCC	420
DPS Total Dewatering			**1,209**
Program Total Dewatering			**3,715**
*Includes 250 linear feet of dewatering for each proposed dam removal			

Using the high end of the density data provided in Table 5[15], and the dewatering lengths in Table 6, NMFS estimates no more than 1,767 juvenile CCC steelhead will be present in the total 2,506 feet[16] of dewatered area when relocation and dewatering activities occur. Considering environmental variability including, interannual variations in temperature, variations in predator or prey abundance, habitat conditions in the action area, and other factors, NMFS assumes that during the three-year life of the Program as many as 25 percent more juvenile CCC steelhead may be present in the area to be dewatered. The 25 percent increase is based on NMFS' best professional judgement as to the likely variability in steelhead density during the three-year life of the Program. If twenty-five percent more than 1,767 juvenile CCC steelhead are present this would result in 2,208 CCC steelhead present in the total 2,506-foot dewatering area throughout the Program.

Using the high end of the density data provided above in Table 5[17] and the dewatering lengths in Table 6, NMFS estimates no more than 882 juvenile S-CCC steelhead will be present in the total

[15] Fish densities used to calculate fish abundance in the action area: Granite Creek–70 fish/100 feet; Branciforte Creek–44.0, 69.9, or 70.9 fish/100 feet (depending on project location); Lompico Creek–123.3 fish/100 feet; Valencia Creek–43 fish/100 feet; and Reggiardo Creek–44 fish/100 feet.

[16] There are five creeks listed in Table 3 where CCC steelhead are likely present. Thus, total linear feet of dewatering for this DPS equals: (5 future projects*200 feet) + (1,506 feet of dewatering for known projects) totaling 2,506 linear feet.

[17] Fish densities used to calculate fish abundance in the action area: Browns Valley Creek–99.5 fish/100 feet; Stream 415–99.5 fish/100 feet; Corralitos Creek–87.1 fish/100 feet; and Shingle Mill Gulch–31.3 fish/100 feet.

1,209 feet[18] of dewatered area when relocation and dewatering activities occur. Considering environmental variability including, interannual variations in temperature, variations in predator or prey abundance, habitat conditions in the action area, and other factors, NMFS assumes that during the three-year life of the Program as many as 25 percent more juvenile S-CCC steelhead may be present in the area to be dewatered. The 25 percent increase is based on NMFS' best professional judgement as to the likely variability in steelhead density during the three-year life of the Program. If twenty-five percent more than 882 juvenile S-CCC steelhead are present this would result in 1,103 S-CCC present in the total 1,209-foot dewatering area throughout the Program.

Described above in Section 2.4.2.3, DWAA (2006) encountered coho salmon within two Bean Creek survey reaches: one 3,007-foot long reach; and one 2,460-foot-long reach. DWAA (2006) extrapolated estimates of juvenile coho salmon densities are: 19 fish in the 3,007-foot reach, and 178 fish in the 2,460-foot reach. This indicates that densities of juvenile coho salmon are likely to be between 0.6 and 7.2 fish per 100 feet of stream.

Using density data from the site nearest to the action area (0.6 coho salmon per 100 feet of stream), and the dewatering lengths in Table 6, NMFS estimates no more than 16 juvenile coho salmon will be present in the total 2,506 feet[19] of dewatered area when relocation and dewatering activities occur. Considering environmental variability including, interannual variations in temperature, variations in predator or prey abundance, habitat conditions in the action area, and other factors, NMFS assumes that during the three-year life of the Program as many as 25 percent more juvenile CCC coho may be present in the area to be dewatered. The 25 percent increase is based on NMFS' best professional judgement as to the likely variability in coho density during the three-year life of the Program. The 25 percent increase is based on NMFS' best professional judgement as to the likely variability in coho density over the next three years. If twenty-five percent more than 16 juvenile coho salmon are present this would result in 20 coho salmon present in the total 2,506-foot dewatering area throughout the Program.

Applying applicable AMMs to fish collection, relocation, and dewatering activities is expected to appreciable reduce the effects of project actions on steelhead and salmon. Specifically, fish collection and relocation activities conducted by NMFS-approved fisheries biologists will ensure proper equipment operation and application of NMFS guidelines thereby minimizing injury and mortality to juvenile steelhead and salmon. Restricting the work window to June 15 to October 15 will limit the effects to stream rearing juveniles. Furthermore, projects requiring dewatering will be limited to four projects per creek for each construction season. NMFS expects applying AMMs and project limits will effectively minimize injury and mortality to CCC and S-CCC steelhead, and CCC coho salmon in the action area.

[18] There are four creeks listed in Table 3 where S-CCC steelhead are likely present. Thus, total linear feet of dewatering for this DPS equals: (4 future projects*200 feet) + (409 feet of dewatering for known projects) totaling 1,209 feet).

[19] There are five creeks listed in Table 3 where CCC coho salmon are likely present. Thus, total linear feet of dewatering for this ESU equals (5 future projects*200 feet) + (1,506 feet of dewatering for known projects) totaling 2,506 feet).

2.5.2 Project Site Dewatering

As described above, projects proposed under this Program may require dewatering to complete the project. Cofferdams constructed out of gravel bags, inflatable dams, or other non-erosive materials in conjunction with pipeline bypass systems will be used to temporarily divert flows around work sites during construction. NMFS anticipates temporary changes to instream flow within and downstream of the project site during installation of the pipeline bypass system and during dewatering operations. Once the installation of the diversion pipe and the actual dewatering operation is completed, stream flow above and below the work sites should be the same as free-flowing pre-project conditions, except within the dewatered reach where stream flow is bypassed. These fluctuations in flow are anticipated to be small, gradual, and short-term, but are expected to cause temporary loss, alteration, and reduction of aquatic habitat, and, in the case of the areas that will be dewatered, will likely result in mortality of any salmonids that avoid capture during fish relocation activities.

Stream flow diversion and dewatering could harm individual rearing juvenile steelhead and coho salmon by concentrating or stranding them in residual wetted areas before they are relocated. Juvenile salmonids that avoid capture in the project work area will likely die during dewatering activities due to desiccation or thermal stress. Because the pre-dewatering fish relocation efforts will be performed by qualified biologists, NMFS expects that the number of juvenile steelhead and coho salmon that will be killed as a result of stranding during dewatering activities will be very small, likely one percent of the fish within the action area prior to dewatering.

Dewatering operations may affect benthic (bottom dwelling) aquatic macroinvertebrates; an important food source for salmonids. Benthic aquatic macroinvertebrates within the project site may be killed or their abundance reduced when creek habitat is dewatered (Cushman 1985). However, effects to aquatic macroinvertebrates resulting from stream flow diversions and dewatering will be temporary because construction activities will be relatively short lived and the dewatered reach will not exceed 200 linear feet for any single project. Rapid recolonization (typically one to two months) of disturbed areas by macroinvertebrates is expected following rewatering (Cushman 1985, Thomas 1985, Harvey 1986). In addition, the effect of macroinvertebrate loss on juvenile salmonids is likely to be negligible because food from upstream sources (via drift) would be available downstream of the dewatered areas since stream flow, if present, will be bypassed around the project work site. Based on the foregoing, steelhead and coho salmon are not anticipated to be exposed to a reduction in food sources from the minor and temporary reduction in aquatic macroinvertebrates as a result of dewatering activities.

Beyond the dewatered area, the temporary cofferdams in the action area are not expected to impact juvenile steelhead and coho salmon movements beyond that caused by typical summer low flow conditions. Diversion dams could restrict movement of listed species in a manner similar to the normal seasonal isolation of pools by intermittent flow conditions that typically occur during summer within a portion of some streams through the range of CCC and S-CCC steelhead, and CCC coho salmon, including creeks within the action area (Table 3). Because the quality of habitat in and around the action area is adequate to support rearing salmonids, NMFS expects these fish will be able to find food and cover up- or downstream of the action area as needed during dewatering activities.

2.5.3 Increased Sedimentation and Turbidity

The proposed Program will result in the disturbance of the streambed and banks for construction. Construction activities within the action area may result in disturbance of the dewatered streambed and banks for equipment access, placement and removal of stream diversion structures, sediment removal, and placement of RSP on stream banks. These activities are likely to dislodge previously armored and sequestered inter-gravel fine sediment allowing it to be mobilized when the action area re-waters after in-water work is completed. Sediment may affect fish by a variety of mechanisms. High concentrations of suspended sediment can disrupt normal feeding behavior and efficiency (Cordone and Kelley 1961, Bjornn et al. 1977, Berg and Northcote 1985), reduce growth rates (Crouse et al. l 981), and increase plasma cortisol levels (Servizi and Martens 1992). High turbidity concentrations can reduce dissolved oxygen in the water column, result in reduced respiratory functions, reduce tolerance to diseases, and can also cause fish mortality (Sigler et al. 1984, Berg and Northcote 1985, Gregory and Northcote 1993, Velagic 1995, Waters 1995). Even small pulses of turbid water will cause salmonids to disperse from established territories (Waters 1995), which can displace fish into less suitable habitat and/or increase competition and predation, decreasing chances of survival. Increased sediment deposition can fill pools and reduce the amount of cover available to fish, decreasing the survival of juveniles (Alexander and Hansen 1986).

Although chronic elevated sediment and turbidity levels may affect salmonids and critical habitat, the temporary increases in sedimentation and turbidity resulting from the projects included in this Program are not expected to rise to levels sufficiently high enough to adversely affect salmonids. Sedimentation and turbidity are most likely to increase during construction and removal of temporary water diversion structures as well as during post-construction rewetting of the channel. The application of AMMs to all aspects of project planning, implementation, and cleanup is expected to substantially reduce or eliminate the impacts of sedimentation and turbidity on salmonids. Limiting the work window to June 15 to October 15 will limit any impacts to juvenile life stages. Additionally, there are a suite of AMMs specifically aimed at reducing erosion and scour in storage and staging areas, riparian areas, and water diversions (Caltrans 2019). With the implementation of these AMMs, in addition to the project limitations established in Section 1.3.1, NMFS anticipates that any elevated turbidity levels would be small, temporary, and well below levels and durations shown to impact salmonids. NMFS expects any sediment or turbidity generated by the projects covered under the Program would not extend more than 100 feet downstream of work sites, based on the methods used to control sedimentation and turbidity. Thus, NMFS does not anticipate this Program to result in harm, injury, or behavioral impacts to juvenile steelhead and coho salmon associated with exposure to elevated suspended sediment levels that could reduce their survival chances.

2.5.4 Bank Stabilization Installation

In contrast to minor short-term turbidity effects, fish response to impacts resulting from the proposed installation of the suite of bank stabilization treatments (described above in Section 1.3) will be much longer in duration. The expected habitat loss will impact steelhead and coho salmon fitness and survival in the action area. Fish migrating through and rearing within the action area along the proposed stabilization sites will experience degraded aquatic habitat caused

by the bank stabilization installation. The bank stabilization and its resulting effect on natural channel-evolution processes and instream habitat, are expected to last well into the future – at least several decades. Thus, for species with typically short life-spans (3-4 years for steelhead and 3 years for coho), the bank stabilization will result in decreased productivity and abundance of steelhead and coho salmon in portions of the action area over successive generations. In effect, the proposed bank stabilization will help perpetuate the diminished carrying capacity that already exists within the action area.

Quantifying the number of individuals injured or killed by the proposed action is difficult because some rearing individual steelhead or salmon in the action area would move away seeking more suitable habitat, however, a number of individuals would remain in the area directly adjacent to the stabilized bank. Some proportion (likely small) of these individuals would be indirectly injured or killed from bank stabilization and the resultant degraded cover and forage habitat. For example, some individuals would not be able to obtain sufficient size and would have significantly less survival probability during their first few months in the ocean.

2.5.5 Pollution from Hazardous Materials and Contaminants

Operating equipment in and near streams has the potential to introduce hazardous materials and contaminants into streams. The equipment needed to complete the embankment repairs has the potential to release debris, hydrocarbons, concrete, and similar contaminants into surface waters. Potentially hazardous materials include wet and dry concrete debris, fuels, and lubricants. 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 form construction equipment can contain a wide variety of polynuclear hydrocarbons (PAHs) and metals. PAHs can alter salmonid egg hatching rates and reduce egg survival as well as harm the benthic organisms that are a salmonid food source (Eisler 2000). Disturbance of streambeds by heavy equipment or construction activities can also cause the resuspension and mobilization of contaminated stream sediment with absorbed metals.

These effects have the potential to harm or injure exposed fish and temporarily degrade habitat. However, proposed AMMs will substantially reduce or eliminate the potential for construction material and debris to enter waterways. Limiting the work window to the dry season from June 15 to October 15 will limit hazardous material exposure to juvenile steelhead and salmon eliminate potential for contaminants to adversely affect the most sensitive life stages. Equipment will be checked daily to ensure proper operation and avoid any leaks or spills. Proper storage, treatment, and disposal of construction materials and discharge management is expected to substantially reduce or eliminate contaminants entering streams via runoff. Due to these measures, conveyance of toxic materials into active waters during project construction is not expected to occur, and the potential for projects covered under this Program to degrade water quality and adversely affect salmonids is improbable.

2.5.6 Disturbance or Direct Injury from Construction and Noise

Construction of the four retaining wall types at any location may require installation of piles and/or structural support elements with a mounted drill rig. This equipment has the potential to generate elevated levels of noise. Applying applicable AMMs to construction activities occurring near streams will substantially reduce impacts to CCC and S-CCC steelhead, and CCC coho salmon. Restricting the in-water work window to June 15 through October 15 will avoid impacts to adults and smolts, such that impacts could only be experienced by juvenile life stages. Furthermore, pile driving in flowing water is not covered under this Program and any sound transmission from a mounted drill rig is expected to be considerably reduced as it travels through the substrate. These measures will eliminate the potential for steelhead and coho salmon to be exposed to harmful levels of noise. Based on the above, NMFS believes that the implementation of AMMs will effectively minimize or eliminate any construction noise to steelhead and coho salmon. As a result, NMFS does not anticipate these activities will cause any injury to or elicit behavioral responses from steelhead or coho salmon.

2.5.7 Removal of Riparian Vegetation

This Program will result in temporary reductions in riparian vegetation during debris and sediment removal, clearing and grubbing, and tree removal for construction access and staging. Riparian vegetation helps maintain stream habitat conditions necessary for salmonid growth, survival, and reproduction. Riparian zones and wetland/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 stream bank stability (Platts 1991), source of woody debris that creates fish habitat diversity (Bryant 1983, Lisle 1986, Shirvell 1990), and both cover and shelter for fish (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. Removal of riparian vegetation increases stream exposure to solar radiation, leading to increases in stream temperature (Poole and Berman 2001).

Riparian vegetation provides much of the cover and habitat complexity required by migrating adults and rearing juveniles throughout the action area. Removal of riparian trees and vegetation within the work area will likely result in temporary and minor reductions in shade and cover for fish. AMMs applied to all stages of project planning, implementation, and site restoration is expected to substantially reduce the impact of riparian vegetation removal on steelhead and salmon. Aquatic and riparian vegetation removal will be avoided if feasible, otherwise it will be limited to the minimum necessary to complete the work. All soils disturbed during construction will be replanted with native vegetation and woody material will be retained in streams where feasible. Project sites will be monitored for five years following construction to ensure the success of revegetation efforts. While the temporary loss of cover may cause individual fish to seek alternative areas where suitable cover exists nearby, such temporary displacement of fish is not expected to reduce their individual performance because there is cover nearby to accommodate additional individuals without becoming overcrowded.

Spatial clustering of projects involving riparian vegetation removal has the potential to reduce habitat complexity and increase stream temperature. The project limitations in Section 1.3.1 place limits on the size and number of projects that can be completed per creek during each construction season. Bank stabilization projects that may require high amounts of vegetation removal will all require dewatering. The dewatering limitations for the Program, in addition to the project limits, restrict dewatering projects to no more than four per creek during each construction season. Furthermore, no more than a cumulative total of 400 linear feet of any creek will be dewatered during any construction season to prevent multiple projects from removing vegetation from long lengths of channel. AMMs require trees, shrubs, and groundcover be retained whenever possible and that all disturbed lands be revegetated with native or non-invasive plants following project construction. Mandatory revegetation of disturbed habitat will ensure that the loss of vegetation is temporary and recovery of habitat function will begin immediately following project completion, and will be monitored for five years. The project and Program limits established, along with the AMMs, are expected to substantially reduce the potential for additive impacts of multiple projects across the action area to adversely impact steelhead and salmon. Thus, NMFs does not expect temporary riparian vegetation removal to reach a scale where the fitness of steelhead or salmon will be reduced.

2.5.8 Critical Habitat Effects

The action area is designated critical habitat for CCC and S-CCC steelhead, and/or CCC coho salmon. Generally speaking, physical and biological features (PBFs) of critical habitat for both steelhead and coho salmon found within the action area include sites for migration, spawning, and rearing (see Section 2.2). Effects of the project on designated critical habitat include temporary minor disturbances to the streambed, bank, and flow from project site dewatering; temporary loss of riparian vegetation during debris and sediment removal, clearing and grubbing, and construction access and staging; temporary elevated turbidity levels from suspended sediment; and streambank habitat degradation and preclusion of natural fluvial and geomorphic channel dynamics from bank stabilization.

Regarding effects to critical habitat from project site dewatering, for the same reasons described above for juvenile steelhead and coho salmon, adverse effects to CCC and S-CCC steelhead, and CCC coho salmon critical habitat PBFs are expected to be temporary, insignificant, and will recover relatively quickly (one to two months) after the project site is rewatered. Similarly, for reasons described above for juvenile steelhead and coho salmon, short-term turbidity from elevated levels of suspended sediment may slightly degrade the value of critical habitat in the action area, but only temporarily. Based on the size of the area disturbed and stream and bank substrate conditions, NMFS expects turbidity after rewatering the project site to last for only a few hours. Turbidity and sediment deposited downstream resulting from this project, are unlikely to significantly impact migration, spawning, or rearing PBFs in the action area.

Streambank habitat degradation and long-term preclusion of natural fluvial and geomorphic processes resulting from bank stabilization is an adverse effect to CCC and S-CCC steelhead and CCC coho salmon critical habitat. Streams transport water and sediment from upland sources to the ocean and, generally speaking, the faster the streamflow, the greater the erosive force. Natural processes constrain and moderate these erosive forces, such as when complex structure

both within (e.g., boulders or woody debris) and adjacent (e.g., riparian vegetation) to the stream channel slows the water velocity and, by extension, its erosive force (Knighton 1998). Where existing geology and geomorphology allow, a stream channel will also naturally meander, eroding laterally and creating a sinuous longitudinal course that dissipates its hydraulic energy and reduces stream gradient and erosive forces. A meandering stream helps control the entrainment and transport of available sediment, and also creates and maintains both the hydraulic and physical components of instream habitat used by migrating, spawning, and rearing fish and other aquatic species. For instance, specific to steelhead and salmon, a meandering unconstrained stream channel sorts and deposits gravel and other substrate types necessary for optimal food production and spawning success. These processes contribute to the maintenance of a healthy and diverse riparian corridor for fish that supplies LWD, and allows floodplain engagement during appropriate winter flows (Spence et al. 1996).

By design, bank stabilization projects prevent lateral channel migration, effectively forcing streams into a simplified linear configuration that, without the ability to move laterally, instead erode and deepen vertically (Leopold et al. 1968; Dunn and Leopold 1978). The resulting "incised" channel fails to create and maintain aquatic and riparian habitat through lateral migration, and can instead impair groundwater/stream flow connectivity and repress floodplain and riparian habitat function. The resulting simplified stream reach typically presents poor functional habitat for rearing juvenile fish (Lau et al. 2006). Also, because bank stabilization structures are typically designed to withstand high streamflow caused by large storm events, the structures, and by extension the impacts to instream habitat, can be considered everlasting, harming future fish generations in perpetuity. Lastly, bank stabilization impacts extend not only temporally, but the altered geomorphic and hydraulic processes can propagate spatially, both up- and downstream of bank stabilization structures, dependent upon site- and structure-specific characteristics (Arnaud-Fassetta et al. 2005, as cited in Florsheim et al. 2008), meaning that bank stabilization projects often result in future bank stabilization projects in the same system. Natural earthen stream banks provide complex fish habitat (e.g., undercut banks, submerged rootwads, etc.) (Fischenich and Copeland 2001), and RSP and other hardened material (i.e., crib walls, soldier pile walls, etc.) is an immediate and long-term conversion of natural streambank to a relatively simple, homogenous streambank structure less suitable for juvenile steelhead and salmon (Schmetterling et al. 2001; Fischenich 2003).

Multiple bank stabilization projects have the potential to not only impact critical habitat on the scale of individual projects, but taken together on the scale of a watershed, extensive constriction and armoring of stream channels can adversely modify critical habitat and preclude recovery. The project and Program limitations, along with AMMs, are intended to limit these aggregate impacts to the extent possible. Program bank stabilization projects will incorporate bioengineered elements to the extent feasible in an effort to dissipate flow and create complex habitat. Furthermore, bank stabilization projects will be separated by at least 1,500 stream feet to prevent multiple projects from armoring long lengths of channel. While NMFS expects these measures to substantially reduce the potential for projects to impact CCC and S-CCC steelhead, and CCC coho salmon critical habitat within the action area, the impacts will not be wholly avoided and ongoing channelization impacts on critical habitat function in the action area will result from the Program.

Fish passage at Happy Valley Conference Center Dams No.1 and No. 2 are currently impaired. Under the current condition, both dams likely impair both adult and juvenile passage. The proposed project will remedy the existing condition by removing all concrete and metallic material associated with each dam[20].

The proposed action will improve critical habitat by remediating existing passage barriers. Under the current condition both dams preclude passage during low flows; and dam No.1 has a stable cascade through the apron that may also create a velocity barrier at very high flows from constriction of the channel. Thus, the current condition likely impairs both adult and juvenile passage. The remediation of tributary passage barriers is listed in the Final Recovery Plan for CCC Coho ESU and the Final Coastal Multispecies Recovery Plan (NMFS 2012; NMFS 2016). The project will remove the existing passage impediments, resulting in improved access for adult and juvenile S-CCC and CCC steelhead, and CCC Coho salmon in Branciforte Creek, identified as a "Priority 1" area for CCC Coho Recovery (NMFS 2012). Removal of these two dams will improve passage to the next upstream partial barrier at Pear Creek Lane[21], approximately 4,000 feet upstream.

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.

Residential land use and non-federal water diversions are expected to continue within the action area (NMFS 2012, NMFS 2016). Water diversion effects of reduced base flows within the action area are described in the Environmental Baseline section of this consultation. Diversions are not expected to change appreciably, and will continue to perpetuate into the future. Urban development, including rural residential and agricultural development is likely to continue throughout Santa Cruz County. NMFS assumes the rate of such development would be similar to that observed in the last decade.

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

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

[20] Portions of each dam that are keyed into the bank that have become integral to bank stability will remain in place to protect roadways and residential access.
[21] Located at approximately: 37.0204, - 121.9930.

add the effects of the action (Section 2.5) to the environmental baseline (Section 2.4) and the cumulative effects (Section 2.6), taking into account the status of the species and critical habitat (Section 2.2), to formulate the agency's biological opinion as to whether the proposed action is likely to: (1) Reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing its numbers, reproduction, or distribution; or (2) appreciably diminishes the value of designated or proposed critical habitat for the conservation of the species.

CCC and S-CCC steelhead were reaffirmed as threatened under the ESA (81 FR 33468), and recent status updates have concluded that both DPSs are likely to become endangered in the foreseeable future (Good et al. 2005). Abundance data for CCC steelhead has historically been severely limited; however, existing data suggest substantial reductions in abundance and negative population trends across their range (Good et al. 2005). Noted concerns affecting DPS viability include decreasing abundance in San Francisco Bay tributaries and Scott Creek (coastal Santa Cruz County), as well as the high ratio of hatchery fish within the Russian River Population. The San Lorenzo River steelhead population is considered a very important population within the DPS, and is a functionally independent population (NMFS 2016). S-CCC steelhead have exhibited a long-term negative trend with most sub-populations being unviable and exhibiting variable or negative population growth rates (Good et al. 2005). Based on extensive loss of historic habitat, and the degraded condition of many remaining spawning and rearing areas, many populations supporting the S-CCC steelhead DPS, including the Pajaro River population, are in poor condition and individuals occur in densities and abundance lower than historic conditions. Juvenile CCC and S-CCC steelhead are expected to be present in portions of the action area year round.

The CCC coho salmon ESU remains at risk of extinction (81 FR 33468). The NMFS's recovery plan (NMFS 2012) for the CCC coho salmon ESU identified the major threats to population recovery. These major threats include: roads, water diversions and impoundments; and residential development. The impacts of these major threats are described in Section 2.4.3. The only CCC coho salmon population affected by the proposed action is the San Lorenzo River population. This population is an independent population, and the Scotts Valley subwatershed, including Lompico Creek which includes a portion of the action area, is a core priority for protection and restoration with the Santa Cruz Diversity Stratum. CCC coho salmon occur sporadically in the San Lorenzo River watershed, and although there is potential for juveniles to occur in portions of the action area in very low densities, the San Lorenzo River population is at extreme risk of functional extirpation.

Due to the timing of the proposed action, no adult salmonid, or migrating salmonid smolts will be affected by project construction activities. Juvenile CCC and S-CCC steelhead, and CCC coho salmon are expected to be present in the action area during the three years to complete the Program. The number of individual juvenile CCC and S-CCC steelhead, and CCC coho salmon within the action area are expected to be low due to the small areas of stream affected, Program and Project limits (Section 1.3.1), and low summer stream flow conditions.

2.7.1 CCC and S-CCC Steelhead, and CCC Coho Salmon

As described in the Effects of the Action section above, adverse effects to CCC and S-CCC steelhead, and CCC coho salmon are likely to result from the installation of bank stabilization. Long-term habitat degradation from the bank stabilization is expected to perpetuate the reduced carrying capacity in the action area. NMFS is unable to calculate the anticipated mortality rate because there is uncertainty in the number of juvenile salmonids that may remain in the action area, and those that may move out of the action area, where there is more suitable habitat. The number of individual steelhead or coho exposed to the degraded conditions is likely small, as described above, and would likely make up a very small portion of the juvenile fish within the action area.

As described in the Effects of the Action section above, NMFS identified dewatering and fish relocation as the adverse effects to CCC and S-CCC steelhead, and CCC coho salmon individuals in the action area that would result from this Program for three years. Prior to dewatering the site for construction, fish would be collected and relocated from the work area. Experienced fish biologists are expected to work effectively and have low injury and mortality rates during fish collections. Fish that elude capture and remain in the project area during construction activities will likely be lost to thermal stress and desiccation. However, based on the low mortality rates for similar relocation efforts by qualified biologists, NMFS anticipates few, if any, juvenile listed salmonids may be harmed or killed by fish relocation and construction activities during implementation of this Program. Anticipated mortality from relocation is expected to be two percent of the fish relocated, and mortality expected from dewatering is expected to be one percent of the fish in the area prior to dewatering. The anticipated mortality rate from relocation and dewatering combined is expected to be three percent of the fish in the area dewatered. Because no more than 2,208 juvenile CCC steelhead, 1,103 juvenile S-CCC steelhead, and 20 juvenile CCC coho salmon are expected to be present within the 3,715 feet of dewatered area, NMFS expects no more than 67 juvenile CCC steelhead, 34 juvenile S-CCC steelhead, and 1 juvenile coho salmon will be harmed or killed by relocation or dewatering. Any listed salmonids present during the proposed action would likely make up a very small proportion of the population within the action area due to the small size of each relocation site. In addition, due to the relatively large number of juveniles produced by each spawning pair, spawning within the affected watersheds (including the action area) in future years would be expected to produce enough juveniles to replace any that may be lost at project sites in the next three years due to relocation and dewatering.

Based on the foregoing, it is unlikely that the small loss of juveniles by this Program as a whole would impact future adult returns of either the CCC and S-CCC steelhead DPS', or the CCC coho salmon ESU. The loss of these individuals is likely inconsequential to the numbers, reproduction, or distribution of these steelhead DPSs and CCC coho ESU because 1) the action area is relatively very small, 2) bank stabilization will not occur throughout the action area, 3) the removal of the two tributary passage barriers will restore access to a larger amount of habitat than will be impacted by bank stabilization, and 4) the losses of juvenile salmonids due to fish relocation and dewatering are limited to small areas and three years, allowing production elsewhere in the action area and larger watersheds in these DPSs and ESU to replace these

juveniles. Therefore, the Program is unlikely to appreciable reduce the likelihood of survival and recovery of the CCC and S-CCC steelhead DPS', or the CCC coho salmon ESU.

2.7.2 CCC and S-CCC Steelhead, and CCC Coho Salmon Critical Habitat

Project effects to CCC and S-CCC steelhead, and CCC coho salmon critical habitat include temporary minor disturbances to the stream bed, bank, and flow from project site dewatering; temporary elevated turbidity from sediment disturbance; temporary loss of riparian vegetation; and long-term streambank habitat degradation and preclusion of natural fluvial and geomorphic channel dynamics. As discussed above, the temporary effects associated with temporary elevated turbidity levels and the temporary minor disturbances to the stream bed, bank, and flow are not expected to adversely affect PBFs associated with critical habitat, because aquatic habitat at the site would be restored relatively quickly after the water diversion system is removed. CCC and S-CCC steelhead, and CCC coho salmon critical habitat will be adversely affected by bank stabilization installation. As described above, bank stabilization will degrade the available spawning, migrating, and rearing critical habitat PBFs in the action area by precluding natural fluvial and geomorphic processes within the action area for the foreseeable future.

This degradation of CCC and S-CCC steelhead, and CCC coho salmon PBFs in the action area, when added to the environmental baseline, is unlikely to appreciably diminish the value of designated or proposed critical habitat for the conservation of the species because large areas of underutilized, higher-quality habitat remain throughout reaches of the nine creeks that make up the action area from which the lost production can be regained. Additionally, following the Program's proposed dam removals on Branciforte Creek, the permanent improvements to instream habitat and passage conditions are expected to result in benefits to critical habitat within a portion of the action area. These dam removals will benefit all freshwater lifestages of CCC steelhead and CCC coho. Expected benefits to habitat resulting from improved instream habitat and passage conditions would include all freshwater life history stages: migrating and spawning adults, eggs and alevins, rearing juveniles, and emigrating smolts.

The cumulative impacts of non-federal future activities that are likely to occur in, or have affects in the action area were discussed in Section 2.6; Cumulative Effects, and included a discussion of the future effects of water diversions. Diversions in the San Lorenzo River and the Aptos Creek watersheds are expected to perpetuate the reduced base flows in the action area, and are identified as a threat to CCC and S-CCC steelhead, and CCC coho salmon populations in the San Lorenzo and Pajaro River, and Aptos Creek watersheds.

Global climate change presents another threat to the long-term persistence of CCC and S-CCC steelhead, and CCC coho salmon, especially when combined with the current depressed population status and human-caused impacts. Regional (*i.e.,* North America) climate projections for the mid to late 21st Century expect more variable and extreme inter-annual weather patterns, with a gradual warming pattern in general across California and the Pacific Northwest. Water temperatures may rise somewhat in the action area due to climate change over the next several decades, reinforcing the likelihood of degraded PBFs in the action area due to bank stabilization as described above.

The proposed action will degrade PBFs in the action area, namely those related to juvenile rearing. Yet, the effects of the proposed action, when added to the environmental baseline, cumulative effects, and species and critical habitat status, are not expected to appreciably reduce the quality and function of critical habitat at the larger CCC and S-CCC steelhead DPSs or CCC coho salmon ESU level, given the small area being degraded, the temporary nature of many of the impacts, and the relative abundance of habitat within the watersheds that make up the action area. The surrounding habitat unaffected by the proposed action, while degraded, is expected to support production of salmonids such that the anticipated long-term loss of small amounts of habitat due to bank stabilization will be ameliorated. Thus, the proposed action will not impair the ability of critical habitat to play its intended conservation role of supporting populations of CCC and S-CCC steelhead, and CCC coho salmon at the DPS and ESU levels, respectively.

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, any effects of interrelated and interdependent activities, and cumulative effects, it is NMFS' biological opinion that the proposed action is not likely to jeopardize the continued existence of CCC and S-CCC steelhead, and CCC coho or destroy or adversely modify its designated critical habitat.

2.9 Incidental Take Statement

Section 9 of the ESA and Federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. "Harm" is further defined by regulation to include significant habitat modification or degradation that actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding, or sheltering (50 CFR 222.102). "Incidental take" is defined by regulation as takings that result from, but are not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or applicant (50 CFR 402.02). Section 7(b)(4) and section 7(o)(2) provide that taking that is incidental to an otherwise lawful agency action is not considered to be prohibited taking under the ESA if that action is performed in compliance with the terms and conditions of this ITS.

2.9.1 Amount or Extent of Take

The amount or extent of take described below is based on the analysis of effects of the action done in the preceding biological opinion. If the action is implemented in a manner inconsistent with the project description provided to NMFS, and as a result, take of listed species occurs, such take would not be exempt from section 9 of the ESA. In this programmatic biological opinion, NMFS determined that incidental take is reasonably certain to occur as follows:

Take of listed CCC and S-CCC steelhead, and CCC coho salmon is reasonably certain to occur as a result of habitat loss due to bank stabilization. However, quantifying the number of fish impacted is difficult, given the complex and variable components at play. Individual fish behavior, and how that behavior adapts to evolving habitat conditions, will primarily influence how many fish will be impacted by the Program, and to what degree. In this circumstance,

NMFS cannot provide an amount of take that would be caused by the bank stabilization. In instances such as this, NMFS designates the expected level of take in terms of the extent of take anticipated. Here, the best available indicator for the extent of take is related to the area of habitat lost due to bank stabilization. This variable is directly proportional to extent and nature of harm attributable to this project. Therefore, for harm associated with permanent placement of hardscape bank stabilization within the Program action area (Figure 1), the linear length of streambank covered by bank stabilization will serve as an effective take indicator. Specifically, the anticipated take will be exceeded if bank stabilization exceeds 160 linear feet for any project, or if the cumulative amount of hardscape associated with bank stabilization projects exceeds 17.3% percent (0.04256 acres or 1,854 square feet) of the total acreage limits for the Program.

The number of CCC and S-CCC steelhead, and CCC coho salmon that are likely to be incidentally killed or injured during project dewatering and fish relocation activities is expected to be small and limited to juveniles. NMFS expects that no more than 2 percent of the fish within dewatered reaches will be injured or killed during fish collection and relocation activities. NMFS also expects that no more than 1 percent of the fish within the dewatered reaches will be injured or killed during dewatering activities. The number of salmonids expected to be present at a given work site will vary depending on the location and size of the project. Therefore, the number of salmonids captured and the amount of incidental take allowed will differ with project location and size. Table 7 below summarizes the number of juvenile CCC and S-CCC steelhead expected to be present within each project site and the amount of take allowed by project. Similarly, Table 8 below summarizes the number of juvenile CCC coho salmon expected to be present within each project site and the amount of take allowed by project.

Table 7. Estimated Juvenile CCC and S-CCC Steelhead Densities (from Table 5) and Allowable Take by Project.

Watershed	Stream and Project Location (PM)	DPS	Max Density (# fish/foot)	Length Dewatered	No. of fish captured
San Lorenzo	Branciforte Creek PM 0.92	CCC	0.44	110	48.4
	Branciforte Creek PM 2.22	CCC	0.70	124	86.8
	Branciforte Creek HVCCD No. 1	CCC	0.70	250	175.0
	Branciforte Creek HVCCD No. 1	CCC	0.70	250	175.0
	One Additional Branciforte	CCC	0.44	200	88.0
	Granite Creek PM 1.66	CCC	0.70	100	70.0
	Granite Creek PM 2.10	CCC	0.70	64	44.8
	One Additional Granite Creek	CCC	0.70	200	140.0
	Lompico Creek PM 0.75 & 0.77	CCC	1.23	160	196.8
	Lompico Creek PM 0.80	CCC	1.23	76	93.5
	Lompico Creek PM 1.22	CCC	1.23	82	100.8
	One Additional Lompico Creek	CCC	1.23	200	246.0
Laguna	Reggiardo Creek PM 4.06	CCC	0.44	90	39.6
	One Additional Reggiardo Creek	CCC	0.44	200	88.0
Aptos	Valencia Creek PM 2.43	CCC	0.43	200	86.0
	One Additional Valencia Creek	CCC	0.43	200	86.0
Pajaro	Browns Valley Creek PM 2.14	S-CCC	1.00	64	64.0
	One Additional Browns Valley	S-CCC	1.00	200	200.0
	Stream 415 PM 4.93	S-CCC	1.00	45	45.0
	One Additional Stream 415	S-CCC	1.00	200	200.0
	Corralitos Creek PM 4.28	S-CCC	0.87	80	69.6
	One Additional Corralitos Creek	S-CCC	0.87	200	174.0
	Shingle Mill Gulch PM 5.05	S-CCC	0.31	100	31.0
	Shingle Mill Gulch PM 5.31 &5.33	S-CCC	0.31	120	37.2
	One Additional Shingle Mill Gulch	S-CCC	0.31	200	62.0

Table 8. Estimated Juvenile CCC Coho Salmon Densities (from Table 5) and Allowable Take by Project.

Watershed	Stream and Project Location (PM)	DPS	Max Density (# fish/foot)	Length Dewatered	No. of fish captured
San Lorenzo	Branciforte Creek PM 0.92	CCC	0.006	110	0.70
	Branciforte Creek PM 2.22	CCC	0.006	124	0.77
	Branciforte Creek HVCCD No. 1	CCC	0.006	250	1.58
	Branciforte Creek HVCCD No. 1	CCC	0.006	250	1.58
	One Additional Branciforte	CCC	0.006	200	1.26
	Granite Creek PM 1.66	CCC	0.006	100	0.63
	Granite Creek PM 2.10	CCC	0.006	64	0.40
	One Additional Granite Creek	CCC	0.006	200	1.26
	Lompico Creek PM 0.75 & 0.77	CCC	0.006	160	1.01
	Lompico Creek PM 0.80	CCC	0.006	76	0.48
	Lompico Creek PM 1.22	CCC	0.006	82	0.52
	One Additional Lompico Creek	CCC	0.006	200	1.26
Laguna	Reggiardo Creek PM 4.06	CCC	0.006	90	0.57
	One Additional Reggiardo Creek	CCC	0.006	200	1.26
Aptos	Valencia Creek PM 2.43	CCC	0.006	200	1.26
	One Additional Valencia Creek	CCC	0.006	200	1.26

Using the salmonid density estimates in Table 5, and the estimated take in Tables 7 and 8, NMFS expects no more than 67 juvenile CCC steelhead, 34 juvenile S-CCC steelhead, and 1 juvenile coho salmon will be harmed or killed by relocation or dewatering over the three-year life of the Program. These density estimates are based on a 25 percent increase to account for environmental variability during the three-year life of the Program. The 25 percent increase is based on NMFS' best professional judgement as to the likely variability in salmonid densities over the three-year life of the Program.

Take will have been exceeded if capture, injury, or mortality estimates are exceeded; specifically, take will have been exceeded if:

- the estimated number of juvenile steelhead or salmon captured per project is exceeded, or
- the estimated number of juvenile steelhead or salmon injured and/or killed per project is exceeded, or
- more than 2 percent of relocated juvenile steelhead or salmon are injured and/or killed per project, or
- more than 1 percent of juvenile steelhead or salmon are injured and/or killed during dewatering per project.

2.9.2 Effect of the Take

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

2.9.3 Reasonable and Prudent Measures

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

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

1. Undertake measures to ensure that injury and mortality to steelhead resulting from fish collection, relocation, and dewatering activities is low.
2. Prepare and submit reports per the Program's Implementation Procedure (Section 1.4) to document the effects of construction, relocation, and dewatering activities as well as monitoring activities and application of the program.

2.9.4 Terms and Conditions

The terms and conditions described below are non-discretionary, and Caltrans or the County of Santa Cruz must comply with them in order to implement the RPMs (50 CFR 402.14). The County of Santa Cruz or any applicant has a continuing duty to monitor the impacts of incidental take and must report the progress of the action and its impact on the species as specified in this ITS (50 CFR 402.14). If the entity to whom a term and condition is directed does not comply with the following terms and conditions, protective coverage for the proposed action would likely lapse.

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

    a. Caltrans or the County 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. Caltrans or the County 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. Caltrans or the County shall ensure that all fisheries biologists working on this project be qualified to conduct fish collections in a manner which minimizes all potential risks to ESA-listed salmonids.

    c. 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 salmonids to an appropriate location. The biologist will notify NMFS staff at 707-575-6068 or elena.meza@noaa.gov, one week prior to capture activities in order to provide an opportunity for NMFS staff to observe the activities. During fish relocation activities the fisheries biologist shall contact NMFS staff at the above number, if mortality of federally listed salmonids exceeds 3 percent of the total for each species collected at each project site, at which time NMFS will stipulate measures to reduce the take of salmonids.

    d. Salmonids 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 salmonids will be relocated, as soon as possible, to a suitable instream location (pre-approved by NMFS) in which suitable habitat conditions are present to allow for adequate survival of transported fish and fish already present.

    e. If any steelhead or salmon are found dead or injured, the biological monitor will contact the Caltrans Liaison at 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 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, CA 95060.

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

a. Caltrans or their applicant must provide written reports to NMFS following the schedule outlined in the Implementation Procedure in Section 1.4. Reports must be submitted to NMFS North Central Coast Office, Attention: Caltrans Liaison, 777 Sonoma Avenue, Room 325, Santa Rosa, California 95404-6528.

2.10 Conservation Recommendations

Section 7(a)(1) of the ESA directs Federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of the threatened and endangered species. Specifically, conservation recommendations are suggestions regarding discretionary measures to minimize or avoid adverse effects of a proposed action on listed species or critical habitat or regarding the development of information (50 CFR 402.02). NMFS has no conservation recommendations at this time.

2.11 Reinitiation of Consultation

This concludes formal consultation for County of Santa Cruz Emergency Relief Program.

As 50 CFR 402.16 states, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained or is authorized by law and if: (1) The amount or extent of incidental taking specified in the ITS is exceeded, (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion, (3) the agency action is subsequently modified in a manner that causes an effect on the listed species or critical habitat that was not considered in this opinion, or (4) a new species is listed or critical habitat designated that may be affected by the action.

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

Section 305(b) of the MSA directs Federal agencies to consult with NMFS on all actions or proposed actions that may adversely affect EFH. The MSA (section 3) defines EFH as “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity.” Adverse effect means any impact that reduces quality or quantity of EFH, and may include direct or indirect physical, chemical, or biological alteration of the waters or substrate and loss of (or injury to) benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality or quantity of EFH. Adverse effects on EFH may result from actions occurring within EFH or outside of it and may include site-specific or EFH-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810). Section 305(b) also requires NMFS to recommend measures that can be taken by the action agency to conserve EFH.

This analysis is based, in part, on the EFH assessment provided by Caltrans and descriptions of EFH for Pacific Coast Salmon (Pacific Fishery Management Council (PFMC 2014), contained in the fishery management plans developed by the PFMC and approved by the Secretary of Commerce.

3.1 Essential Fish Habitat Affected by the Project

Effects of the proposed project will impact EFH for Pacific Coast Salmon (PFMC 2014).

3.2 Adverse Effects on Essential Fish Habitat

The potential adverse effects of the Project on EFH have been described in the preceding biological opinion and include temporary minor disturbances to the stream bed, bank, and flow from project site dewatering; temporary elevated turbidity levels from suspended sediment; streambank habitat degradation and preclusion of natural fluvial and geomorphic channel dynamics. As described in the biological opinion above, the project site dewatering and turbidity effects are anticipated to be temporary and minor due to the amount of area impacted relative to the total quantity of habitat available in the action area. However, the streambank habitat degradation and preclusion of natural fluvial and geomorphic channel dynamics will persist into the future.

3.3 Essential Fish Habitat Conservation Recommendations

Based on information developed in our effects analysis (see the preceding biological opinion), NMFS has determined that the proposed action would adversely affect EFH for various federally managed fish species within the Pacific Salmon FMP. Pursuant to section 305(b)(4)(a) of the MSA, NMFS offers the following EFH Conservation Recommendations to Caltrans to avoid, minimize, or otherwise offset anticipated adverse effects to EFH.

1. NMFS recommends that larger riparian trees removed by project activities be used elsewhere for aquatic habitat enhancement. Preferably, trees would be felled by pushing them over with an excavator or other means so that the root mass remains as intact as possible.

3.4 Statutory Response Requirement

As required by section 305(b)(4)(B) of the MSA, Caltrans must provide a detailed response in writing to NMFS within 30 days after receiving an EFH Conservation Recommendation. Such a response must be provided at least 10 days prior to final approval of the action if the response is inconsistent with any of NMFS' EFH Conservation Recommendations unless NMFS and the Federal agency have agreed to use alternative time frames for the Federal agency to respond. The response must include a description of measures proposed by the agency for avoiding, minimizing, mitigating, or otherwise offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with the Conservation Recommendations, the Federal agency must explain its reasons for not following the recommendations, including the scientific justification for any disagreements with NMFS over the anticipated effects of the action and the measures needed to avoid, minimize, mitigate, or off set such effects (50 CFR 600.920(k)(1)).

In response to increased oversight of overall EFH program effectiveness by the Office of Management and Budget, NMFS established a quarterly reporting requirement to determine how many conservation recommendations are provided as part of each EFH consultation and how many are adopted by the action agency. Therefore, we ask that in your statutory reply to the EFH portion of this consultation, you clearly identify the number of conservation recommendations accepted.

3.5 Supplemental Consultation

Caltrans 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 effects the basis for NMFS' EFH Conservation Recommendations (50 CFR600.920(1)). This concludes the MSA portion of this consultation.

4 DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

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

4.1 Utility

Utility principally refers to ensuring that the information contained in this consultation is helpful, serviceable, and beneficial to the intended users. The intended users of this opinion are Caltrans and the County of Santa Cruz. Other interested users could include citizens of affected areas, or others interested in the conservation of the endangered and/or threatened species discussed in this opinion. Individual copies of this opinion were provided to Caltrans. A complete record of this consultation is on file at the NMFS North-Central Coast Office in Santa Rosa, California.

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 reviewed in accordance with West Coast Region ESA quality control and assurance processes.

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6 APPENDICES

6.1 Appendix A: Detailed Project Descriptions

Project					In-Channel Work					Top of Bank Work		Total Impact Calculations				Habitat Enhancement	
Federal Number	Location	PM	Creek	Description	Dewatering Diversion (linear feet)	In Channel Wall (linear feet)	In Channel RSP (linear feet)	Total In-Channel Permanent Impacts ft2	Total In-Channel Temporary Impacts ft²	Within Top of Bank Wall (linear feet)	Within Top of Bank RSP (linear feet)	Temporary Impacts ft²	Total Permanent Impact (linear feet)	Total Permanent Impact Area ft²	Total Impact Area ft²	In Channel Habitat Mitigation ft²	Within Top of Bank Habitat Mitigation ft²
ER-32LO(266)	Branciforte Dr	PM 0.92	Branciforte Creek	50 linear feet soldier pile wall to be constructed with RSP at face down to the edge of creek. Permanent impacts include wall and RSP extending edge of creek. Temporary impacts: water diversion will be required for work along bank and placement of RSP and reconstructing half of the roadway for length of project.	110	0	70	140	1100	50	70	1300	70	550	4250	0	200
ER-32LO(007)	Branciforte Dr	PM 2.22	Branciforte Creek	64 linear feet soldier pile wall to be constructed with RSP at face down to the edge of creek. Temp. water diversion will be required for work along bank and placement of RSP. Permanent impacts include wall and RSP extending edge of creek. Temp impacts include reconstructing or overlaying 4920 sf of roadway. Culverts and drain inlets will be constructed along roadway out letting on banks with RSP.	124	0	84	168	1340	64	84	1540	84	676	4616	0	300
ER-32LO(081)	Browns Valley Rd	PM 2.93	Stream 415	Damage: Slipout (10-foot-long by 10-foot-wide) Repair: earthen fill shoulder repair with RSP Permanent Impacts: RSP at toe of repair. Temporary impacts: creek diversion and dewatering, reconstruction of 1/2 of roadway, construction access, ditch cleanout. Stream 415 is tributary to Brown's Creek	45	0	5	10	275	0	5	295	5	25	920	0	100
ER-32LO(064)	Browns Valley Rd	PM 2.14	Browns Creek	Damage: Existing cribwall scoured out and backfill material lost. Repair: 24-foot-long of crib wall. Repair will include dewatering stream, placing concrete pad at base of wall and backfilling cribs with new aggregate. 200 sf of roadway will be reconstructed. Permanent Impacts: concrete pad at base of wall. Temporary impacts: creek diversion and dewatering, reconstruction of 1/2 of roadway, construction access, ditch cleanout.	64	24	0	48	1480	24	0	1580	24	120	4100	0	50
ER-32LO(257)	Eureka Canyon Rd	PM 4.28	Corralitos Creek	Existing RSP slumped and undermined for 40 linear feet. Repair is to dewater stream through site, remove exist. RSP and excavate keyway before replacing rsp and adding additional. Portion of roadway will be reconstructed.	80	0	40	80	800	0	40	1000	40	360	2560	0	100
ER-32LO(229)	Eureka Canyon Rd	PM 5.05	Shingle Mill Gulch	Damage: 25-foot-long shoulder slipout approx. 10 feet over to creek. Currently RSP adjacent to site. Project will extend RSP to fill void, reconstruct app. 500 sf of roadway. A diversion will be required in-channel but complete dewatering will not be needed.	100	0	0	0	1000	30	30	1200	30	270	2070	0	250
ER-32LO(345)	Eureka Canyon Rd	PM 5.31/5.33	Shingle Mill Gulch	Damage: 80-foot-long shoulder slipout approx. 10 feet over to creek. Project will RSP embankment, reconstruct app. 400 sf of roadway. Dewatering of creek needed for placement of RSP. Debris from the storm and concrete chunks in channel will be removed while creek diversion is in place.	120	0	0	0	1300	0	80	1500	80	800	3500	900	500
ER-32LO(071)	Granite Creek Rd	PM 1.66	Granite Creek	Damage: 2 Slipouts 40LF and 10 linear feet and Sinkhole. Repair will consist of dewatering stream and placing RSP embankment and reconstructing a portion of roadway. Debris will be cleared from stream while it is dewatered.	100	0	60	120	1100	0	60	1300	60	300	2800	880	300

Project					In-Channel Work					Top of Bank Work		Total Impact Calculations				Habitat Enhancement	
ER-32LO(079)	Granite Creek Rd	PM 2.10	Granite Creek	24 linear feet soldier pile wall to be constructed with RSP at face down to the edge of creek. Temp. water diversion will be required for work along bank and placement of RSP. Permanent impacts include wall and RSP extending edge of creek. Temp impacts include reconstructing or overlaying 200 square feet of roadway. An overside drain will be constructed along roadway out letting on banks with RSP.	64	0	24	48	740	0	24	940	24	216	2356	0	400
ER-30R0(006)	Lompico Rd	PM 0.75 and 0.77	Lompico Creek	Damage: Slipout 100 linear feet. Repair: RSP 120 linear feet. Permanent Impacts include placement of RSP along creek bank. Temporary Impacts include reconstruction of 1/2 roadway, construction access, water diversion and debris removal.	160	0	120	240	1700	0	120	1900	120	1200	4300	0	0
ER-32LO(341)	Lompico Rd	PM 0.80	Lompico Creek	Damage: Slipout 30 linear feet. Repair: 36 linear feet RSP and MSE Wall. Permanent Impacts include placement of RSP along creek bank. Temporary Impacts include reconstruction of 1/2 roadway, construction access, water diversion, tree and debris removal	76	0	0	0	760	36	36	960	36	324	2484	0	0
ER-32LO(259)	Lompico Rd	PM 1.22	Lompico Creek	Damage: Slipout 45-foot-long Repair: 42 LF Soldier Pile Wall	82	0	0	0	820	42	42	1020	42	630	2850	0	0
ER-32LO(020)	Smith Grade Rd	PM 4.06	Reggiardo	Damage: Road Slipout 12 linear feet Repair: 24 linear feet soldier pile wall Permanent Impacts: Soldier Pile Wall, RSP Temporary Impacts: creek diversion and dewatering	90	0	0	0	450	24	44	650	44	316	2166	0	0
ER-32LO(093)	Valencia Rd	PM 2.43	Valencia Creek	Damage: One slipout (50-foot-long by 100-foot-wide) and one slipout (70-foot-long by 110-foot-wide) Repair: 140-foot-long soldier pile wall (outboard slope), temporary soil nail wall, 50-foot-long soldier pile wall (inboard slope), creek debris removal, bank stabilization. Soldier pile wall will be in upland / disturbed habitat (not riparian). Permanent Impacts: soldier pile retaining wall, RSP energy dissipation for cross culvert outlet. Temporary Impacts: creek diversion and dewatering, reconstruction of roadway, construction access, ditch cleanout, debris removal	200	0	0	0	3000	150	12	8000	150	660	11500	3750	9050
				Known Project Calculations	**1415**	**24**	**403**	**854**	**15865**	**420**	**647**	**23185**	**809**	**6447**	**50472**	**5530**	**11250**
				Maximum	**200**	**24**	**120**	**240**	**3000**	**150**	**120**	**8000**	**150**	**1200**	**11500**	**3750**	**9050**
				Future Project Calculations	**1800**	**50**	**450**	**1000**	**9000**	**450**	**450**	**10800**	**450**	**4250**	**17450**		
				Total Calculations for Known Projects Plus Future Projects	**3215**	**74**	**853**	**1854**	**24865**	**870**	**1097**	**33985**	**1259**	**10697**	**67922**	**5530**	**11250**

6.2 Appendix B: Program Implementation Forms

The Implementation Procedure outlined in Section 1.4 requires submittal of post construction reports by January 15 of the year immediately following construction. Reports must include details of the completed project, fish collection and relocation efforts, and site restoration efforts. The form below includes the minimum information necessary to satisfy reporting requirements. Photo documentation, project plans, and any additional information must be submitted to NMFS' Santa Rosa Office along with the report as separate files.

Santa Cruz County Emergency Relief Program

Action Notification Form

*Project Information

Project Name:

Project Location:

Project Start Date:	Select Date	Stream:	Latitude:
Project End Date:	Select Date	Watershed:	Longitude:

Is stream channel dewatering anticipated for this project? Select One

Approximate length of channel to be dewatered (in linear feet):

* Please attach a detailed project description and design plans that are at least 60% complete.

Santa Cruz County Emergency Relief Program

Post-Project Construction Report

General Information

Project Name:			
Project Location:			
Project Start Date:	Select Date	Stream:	Latitude:
Project End Date:	Select Date	Watershed:	Longitude:

Fish Relocation

Target Species: SCCC Steelhead | CCC Steelhead | CCC Coho

Relocation Date: Select Date Time: Duration:

Was NMFS notified at least two weeks prior to relocation activities? Select One

Describe the location fish were relocated FROM (e.g., water temperature, flow, turbidity, substrate type, habitat availability and quality).

Describe the location fish were relocated TO (e.g., water temperature, flow, turbidity, substrate type, habitat availability and quality).

Describe the methods used to collect, hold, and transport fish during relocation efforts.

What (if any) unanticipated circumstances arose during fish relocation activities?

Did these unanticipated circumstances have effects on steelhead or their critical habitat?

Name/contact information for the qualified biologist(s) involved in the relocation. Include the scientific collection permit number.

Fish Relocation

Name/contact information for the qualified assistant(s) involved in the relocation. Include the scientific collection permit number.

Please summarize the total number of fish captured, injured, and/or killed across all relocation events:

Species	Captured	Injured	Killed
CCC Steelhead			
SCCC Steelhead			
CCC Coho Salmon			

* Please attach photo documentation of stream sites steelhead were relocated from and to. Include photographs that show both upstream and downstream conditions. Attach photo documentation as a separate file.

Project Construction

Construction Duration From: Select Date To: Select Date

Total linear feet of stream disturbed……..

Total linear feet of stream dewatered……

Were all applicable terms and conditions from the Programmatic met? Select One

If no, describe which terms and conditions were not met and why?

Was the project installed as approved and authorized? Select One

If no, describe any change(s) and why the change(s) were necessary

Were there any unanticipated effects to steelhead or critical habitat during construction activities? Select One

If so, what Avoidance and Minimization Measures were implemented to minimize those unanticipated effects?

* Please attach a full copy of the as-built drawings as a separate file

* Please attach photo documentation of pre- and post-project conditions as a separate file. Photos should be taken from the four cardinal directions form established photo points for comparison to pre-project photo documentation.

Site Restoration

Was revegetation proposed as part of the approved project? Select One
Revegetation Duration From: Select date To: Select Date
Was revegetation implemented as proposed? Select One
If no, please explain

Describe any other site restoration actions that were included as part of this project.

Describe monitoring efforts that will be made to ensure post-project site restoration is successful.